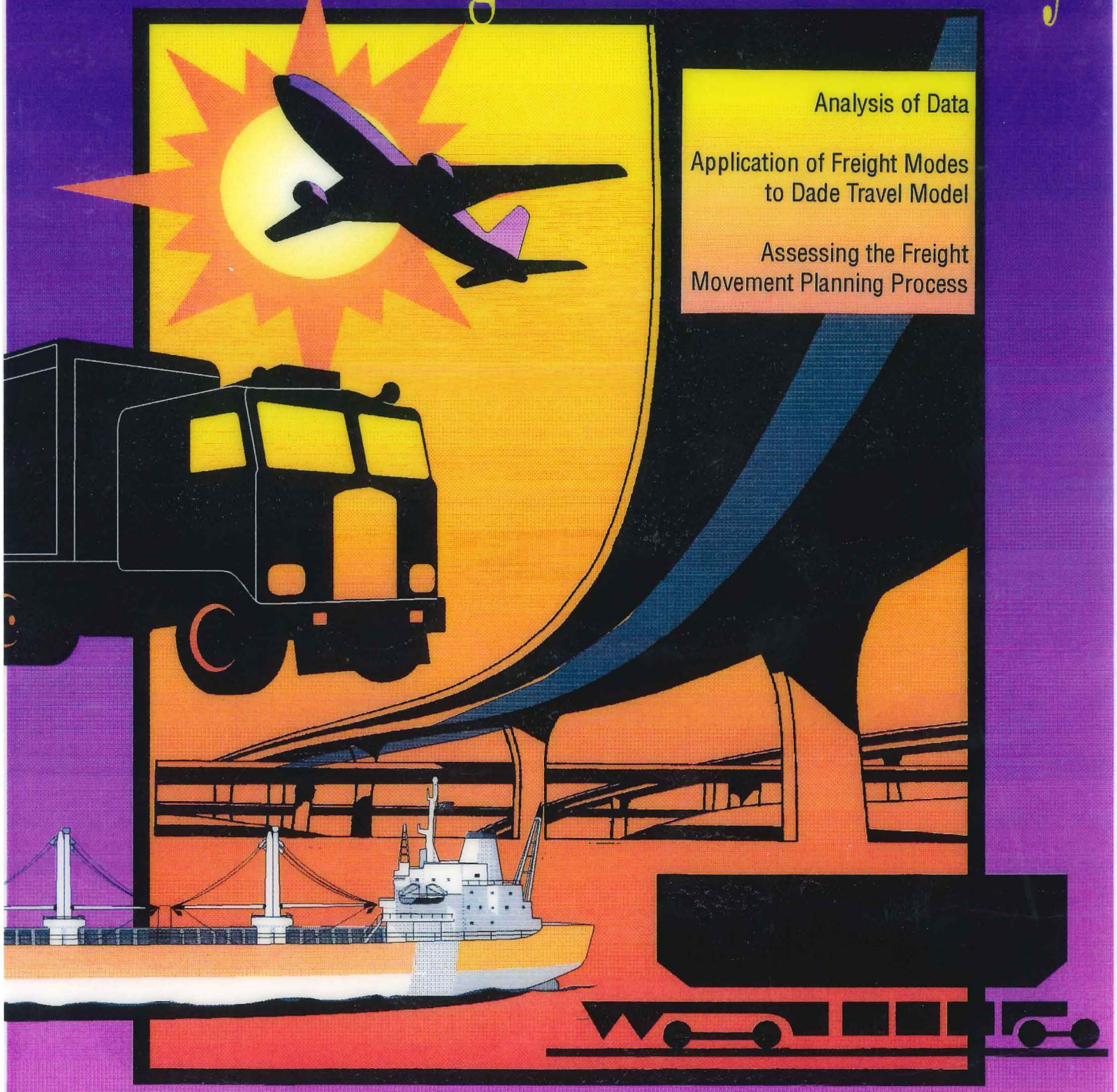
TECHNICAL MEMORANDUM #2

Freight Movement Study



Analysis of Data

Application of Freight Modes to Dade Travel Model

Assessing the Freight Movement Planning Process

Prepared For:
Dade County Metropolitan Planning Organization

November, 1995

Prepared By:
The Corradino Group

DRAFT

TECHNICAL MEMORANDUM #2

FREIGHT MOVEMENT STUDY

Task 3: Analysis of Data

Task 4: Application of Freight Modes to Dade Travel Model

Task 5: Assessing the Freight Movement Planning Process

Prepared for:

DADE COUNTY METROPOLITAN PLANNING ORGANIZATION

Prepared by:

THE CORRADINO GROUP

NOVEMBER, 1995

TABLE OF CONTENTS

W:\1669\TECHMEM2.DOC

LIST OF FIGURES

LIST OF TABLES

1. INTRODUCTION

The Dade County Metropolitan Planning Organization (MPO) is conducting the Dade County Freight Movement Study. The Corradino Group (TCG), a transportation planning and engineering firm, has been retained by the County to perform the study. The purpose of this study is to identify ways to improve freight movement on the surface transportation network through improvements to the roadway system and by incorporating freight movement into Dade County's transportation planning process.

This report is the second in a series that documents work on the study. The following tasks are documented in this report:

- Task 3: Analysis of Data,
- Task 4: Application of Freight Modes to Dade Travel Model, and
- Task 5: Assessing Freight Movement Planning Processes.

The Task 3 discussion in the report presents an analysis of data collected to this point on freight movement in Dade County. Work in this study has included two surveys to generate data about freight movement. The purpose of these surveys was to collect information that could lead to determination of the best way for Dade County to: establish a baseline of information on truck movements in Dade County; develop information to support a truck element in the travel model; and to develop and to understand truck driver concerns to support the process of identifying short-term recommendations to improve freight movement in the county.

Chapter 3 presents discussion of Task 4 of the Freight Movement Study, which focuses upon "Application of a Freight Mode to the Dade Travel Model." This section presents a national perspective on modeling of truck traffic, specifically highlighting the approach used in areas such as Phoenix, Chicago, and Vancouver. Then, a prototype "Dade Travel Model Truck Element" is defined and presented.

Chapter 4 considers Task 5 and reviews Freight Movement Planning Processes and how a process could be implemented in Dade County. In particular, consideration is given to how the proposed freight planning process meets the 23 statewide planning factors and 15 metropolitan planning factors as established under the Intermodal Surface Transportation Efficiency Act of 1991 and the proposed Florida Intermodal Management System.

2. ANALYSIS OF DATA

This section presents analysis based on the results of data collection efforts conducted as part of the Freight Movement Study. The purpose of this analysis is to identify truck travel patterns and issues associated with freight movement and truck traffic resulting from information developed during the study. Conclusions and recommendations relative to travel modeling in Dade County are proposed. Consideration of short-term improvements to the roadway network to improve freight movement and relieve traffic congestion completes the discussion.

2.1 EXISTING TRAFFIC CONDITIONS

Truck volume estimates on Dade County roadways were identified in Task 1 through the use of Florida Department of Transportation vehicle classification roadway counts. Based on these counts, approximate daily truck volumes were developed (Figure 2-1); these truck volumes are based on counts made at specific points on the roadway network. Projecting these counts across the roadway network provides a picture of the major truck movements in Dade County (Figure 2-2).

Figure 2-3 shows the level of service on Dade roadways as reported by the Florida Department of Transportation (December 1994). As can be seen, many of the roads with the heaviest truck movements (S.R. 836, I-95, Okeechobee Road) are operating at Level of Service D or worse.[1] Figure 2-4, which was developed as part of the "Proposed 1995 Evaluation and Appraisal Report for the Traffic Circulation Element,"[2] indicates that by 2005 traffic conditions in many parts of the County will deteriorate "...despite additional major highway and transit improvements." Corridors projected to operate at Level of Service D or worse include U.S. 1, I-95, NW 36th Street, S.R. 836, Flagler Street, SW 24 Street, SW 40 Street, SW 88 Street, SW 107 Avenue, SW 87 Avenue, NW 183 Street, Red Road, LeJeune Road, and NW/SW 27 Avenue.

Roadways with the heaviest truck movements that will be operating at LOS F will include I-95, S.R. 836, and U.S. 1. Okeechobee Road will be operating at Level of Service E.

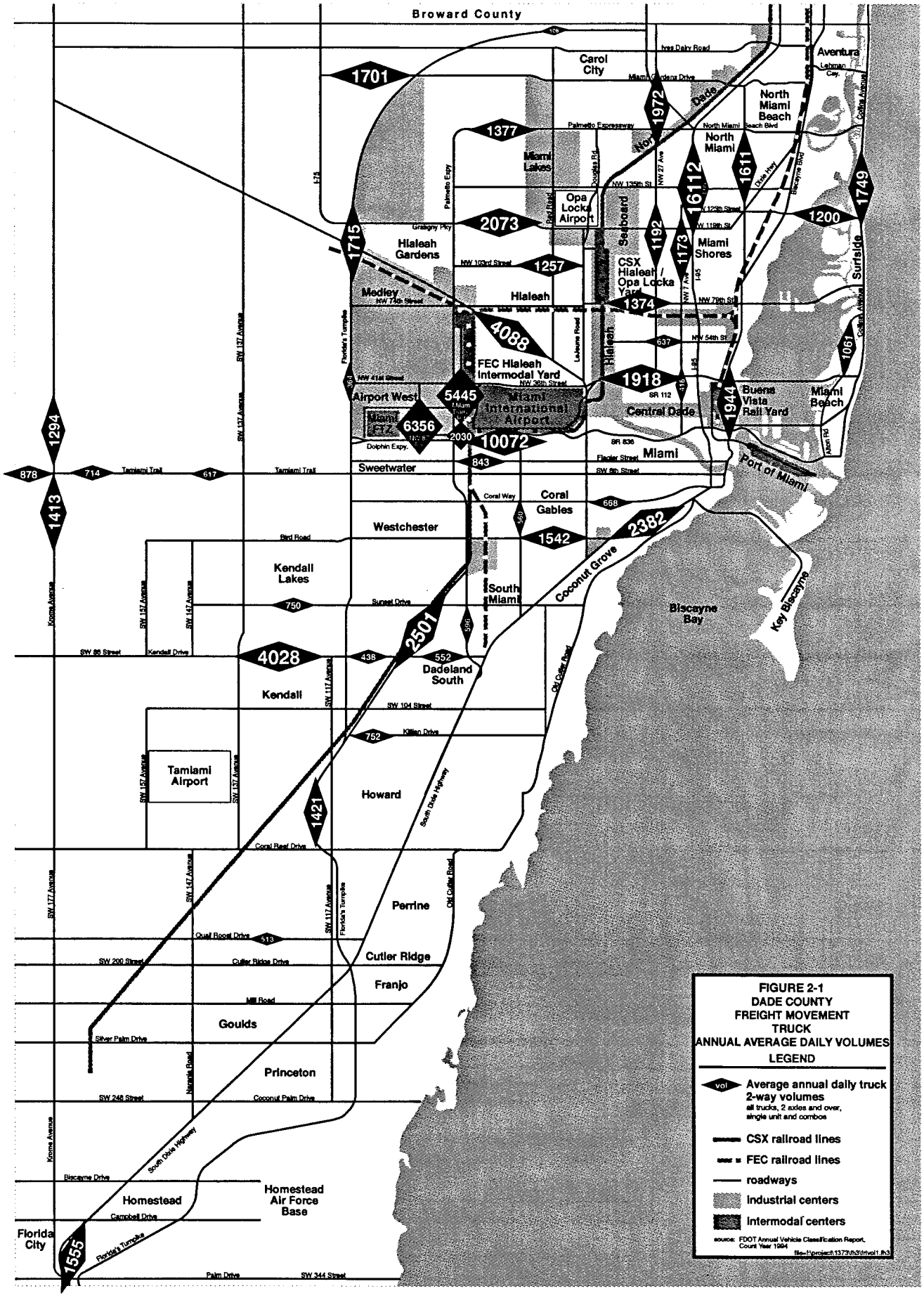
2.2 DADE COUNTY MAIL-BACK FREIGHT MOVEMENT SURVEY

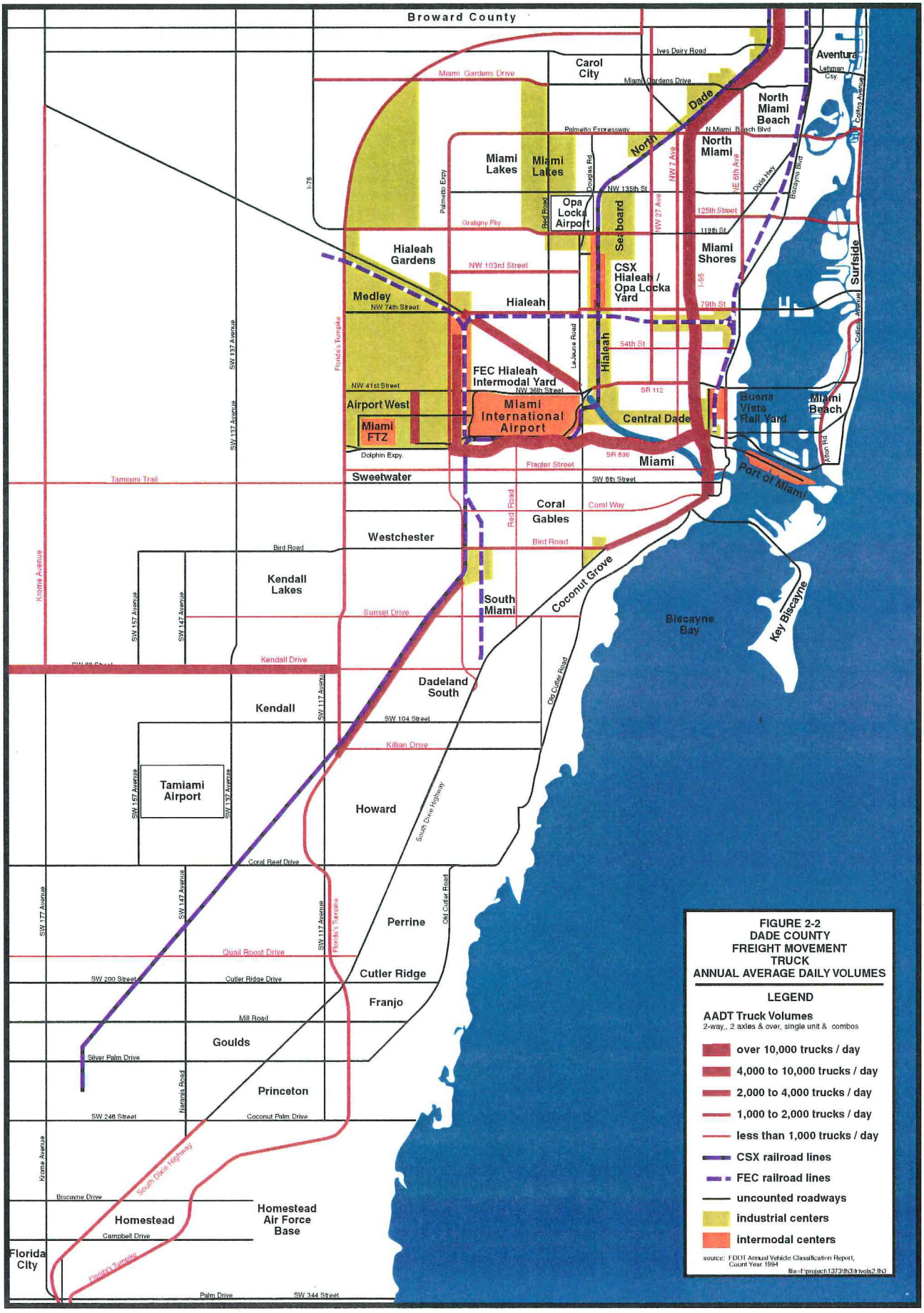
The first effort to develop information about trucking characteristics in Dade County was a survey of motorized freight industry as identified through Dun and Bradstreet and the Florida Trucking Association. Approximately seven hundred organizations were mailed surveys. Of these, about 10 percent returned completed surveys. A summary of the response to the survey was presented in Technical Memorandum #1 to this study. Several factors are significant.

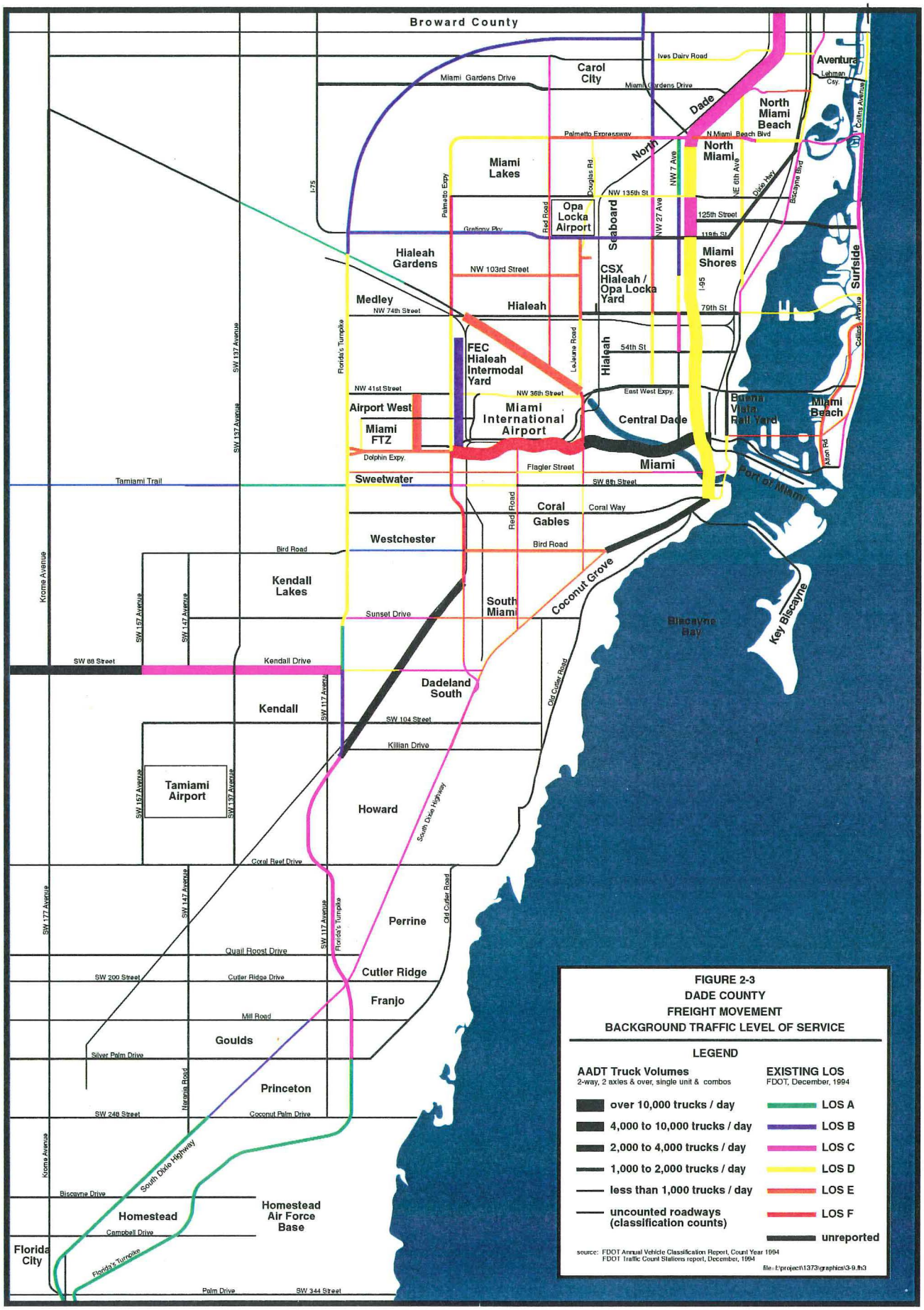
---

[1] Level of Service (LOS) on roadways refers to the flow of traffic, with LOS A indicating free-flow traffic and LOS F indicating no or minimal traffic movement.

[2] "Proposed 1995 Evaluation and Appraisal Report for the Traffic Circulation Element, II, Metropolitan Dade County, Florida Comprehensive Development Master Plan," prepared by the Dade County Planning Department, June 1995.


Broward County
Carol City
Aventura
North Miami Beach
North Miami
Miami Lakes
Opa Locka Airport
Hialeah Gardens
Medley
Hialeah
CSX Hialeah / Opa Locka Yard
Miami Shores
FEC Hialeah Intermodal Yard
Airport West
Miami International Airport
Central Dade
Buena Vista Rail Yard
Miami Beach
Sweetwater
Miami
Port of Miami
Coral Gables
Westchester
Kendall Lakes
South Miami
Coconut Grove
Biscayne Bay
Key Biscayne
Kendall
Dadeland South
Tamiami Airport
Howard
Perrine
Cutler Ridge
Franjo
Goulds
Princeton
Homestead
Homestead Air Force Base
Florida City
1701
1715
1377
2073
1257
1374
4088
5445
6356
10072
1918
1944
1972
16112
1611
1749
1200
1192
1173
1061
1294
1413
878
714
617
843
668
1542
2382
2501
4028
438
552
750
792
1421
513
1555
Tamiami Trail
Dolphin Expy.
Palmetto Expressway
Gratigny Pky
Florida's Turnpike
Dixie Highway
Biscayne Blvd
Collins Avenue
Surfside
Bird Road
Sunset Drive
Kendall Drive
SW 104 Street
Killian Drive
Coral Reef Drive
Quail Roost Drive
SW 200 Street
Cutler Ridge Drive
Mill Road
Silver Palm Drive
SW 248 Street
Coconut Palm Drive
Biscayne Drive
Campbell Drive
Palm Drive
SW 344 Street
Old Cutler Road
Krome Avenue
SW 137 Avenue
SW 147 Avenue
SW 157 Avenue
SW 177 Avenue
SW 117 Avenue
Douglas Rd
Le Jeune Road
Ives Dairy Road
Miami Gardens Drive
NW 135th St
NW 125th Street
NW 119th St
NW 103rd Street
NW 79th St
NW 54th St
NW 41st Street
NW 36th Street
SR 112
SR 836
Flagler Street
SW 8th Street
Coral Way
Abbot Rd
FIGURE 2-1
DADE COUNTY
FREIGHT MOVEMENT
TRUCK
ANNUAL AVERAGE DAILY VOLUMES
LEGEND
vol
Average annual daily truck 2-way volumes
all trucks, 2 axles and over, single unit and combos
CSX railroad lines
FEC railroad lines
roadways
industrial centers
intermodal centers
source: FDOT Annual Vehicle Classification Report, Count Year 1994
file=\project\1375\fh3\fhvol1.fh3


Broward County
Carol City
Ives Dairy Road
Miami Gardens Drive
Aventura
Lehman Cswy
Collins Avenue
North Miami Beach
N.Miami Beach Blvd
Dade
North
Palmetto Expressway
Miami Lakes
Douglas Rd
NW 7 Ave
North Miami
NE 6th Ave
Dixie Hwy
Biscayne Blvd
I-75
Palmetto Expy
Red Road
Opa Locka Airport
NW 135th St
NW 27 Ave
125th Street
Gratigny Pky
119th St
Seaboard
Hialeah Gardens
NW 103rd Street
CSX Hialeah / Opa Locka Yard
Miami Shores
I-95
Surfside
Medley
NW 74th Street
Hialeah
79th St
Florida Turnpike
SW 137 Avenue
LeJeune Road
Hialeah
54th St
FEC Hialeah Intermodal Yard
NW 41st Street
NW 36th Street
SR 112
Buena Vista Rail Yard
Miami Beach
Airport West
Miami International Airport
Central Dade
Miami FTZ
Dolphin Expy.
SR 836
Miami
Flagler Street
Port of Miami
Alton Rd
Tamiami Trail
Sweetwater
SW 8th Street
Coral Gables
Coral Way
Red Road
Westchester
Bird Road
Krome Avenue
Kendall Lakes
SW 157 Avenue
SW 147 Avenue
South Miami
Coconut Grove
Sunset Drive
Biscayne Bay
Key Biscayne
Kendall Drive
Dadeland South
Kendall
SW 117 Avenue
SW 104 Street
Killian Drive
Old Cutler Road
Tamiami Airport
Howard
South Dixie Highway
Coral Reef Drive
SW 177 Avenue
Perrine
Quail Roost Drive
Florida's Turnpike
Cutler Ridge
SW 200 Street
Cutler Ridge Drive
Franjo
Mill Road
Goulds
Silver Palm Drive
Princeton
Nanaria Road
SW 248 Street
Coconut Palm Drive
Biscayne Drive
Homestead
Homestead Air Force Base
Campbell Drive
Florida City
Palm Drive
SW 344 Street
FIGURE 2-2
DADE COUNTY
FREIGHT MOVEMENT
TRUCK
ANNUAL AVERAGE DAILY VOLUMES
LEGEND
AADT Truck Volumes
2-way., 2 axles & over, single unit & combos
over 10,000 trucks / day
4,000 to 10,000 trucks / day
2,000 to 4,000 trucks / day
1,000 to 2,000 trucks / day
less than 1,000 trucks / day
CSX railroad lines
FEC railroad lines
uncounted roadways
industrial centers
intermodal centers
source: FDOT Annual Vehicle Classification Report, Count Year 1994
file=f:\project\1373\fh3\fvols2.fh3


Broward County
Ives Dairy Road
Miami Gardens Drive
Carol City
Aventura
Lehman Csy.
Dade
North Miami Beach
Palmetto Expressway
N Miami Beach Blvd
North
North Miami
Miami Lakes
I-75
Palmetto Expy
Douglas Rd
NW 7 Ave
NE 6th Ave
Dixie Hwy
Biscayne Blvd
NW 135th St
Opa Locka Airport
Red Road
NW 27 Ave
Seaboard
125th Street
Gratigny Pky
118th St
Hialeah Gardens
NW 103rd Street
CSX Hialeah / Opa Locka Yard
Miami Shores
I-95
Surfside
Collins Avenue
Medley
NW 74th Street
Hialeah
79th St
Florida's Turnpike
SW 137 Avenue
LeJeune Road
Hialeah
54th St
FEC Hialeah Intermodal Yard
NW 41st Street
NW 36th Street
East West Expy.
Airport West
Miami International Airport
Central Dade
Bayfront Park Rail Yard
Miami Beach
Miami FTZ
Dolphin Expy.
Alton Rd
Flagler Street
Miami
Tamiami Trail
Sweetwater
SW 8th Street
Port of Miami
Red Road
Coral Gables
Coral Way
Westchester
Bird Road
Bird Road
Krome Avenue
Kendall Lakes
South Miami
Coconut Grove
Sunset Drive
Biscayne Bay
Key Biscayne
SW 157 Avenue
SW 147 Avenue
SW 88 Street
Kendall Drive
Dadeland South
Old Cutler Road
Kendall
SW 117 Avenue
SW 104 Street
Killian Drive
Tamiami Airport
SW 167 Avenue
SW 137 Avenue
Howard
South Dixie Highway
Coral Reef Drive
SW 177 Avenue
SW 147 Avenue
SW 117 Avenue
Florida's Turnpike
Perrine
Old Cutler Road
Quail Roost Drive
SW 200 Street
Cutler Ridge Drive
Cutler Ridge
Franjo
Mill Road
Goulds
Silver Palm Drive
Princeton
Naranja Road
SW 248 Street
Coconut Palm Drive
Krome Avenue
South Dixie Highway
Biscayne Drive
Homestead
Homestead Air Force Base
Campbell Drive
Florida City
Florida's Turnpike
Palm Drive
SW 344 Street
FIGURE 2-3
DADE COUNTY
FREIGHT MOVEMENT
BACKGROUND TRAFFIC LEVEL OF SERVICE
LEGEND
AADT Truck Volumes
2-way, 2 axles & over, single unit & combos
over 10,000 trucks / day
4,000 to 10,000 trucks / day
2,000 to 4,000 trucks / day
1,000 to 2,000 trucks / day
less than 1,000 trucks / day
uncounted roadways (classification counts)
EXISTING LOS
FDOT, December, 1994
LOS A
LOS B
LOS C
LOS D
LOS E
LOS F
unreported
source: FDOT Annual Vehicle Classification Report, Count Year 1994
FDOT Traffic Count Stations report, December, 1994
file: E:\project\1373\graphics\3-9.fh3

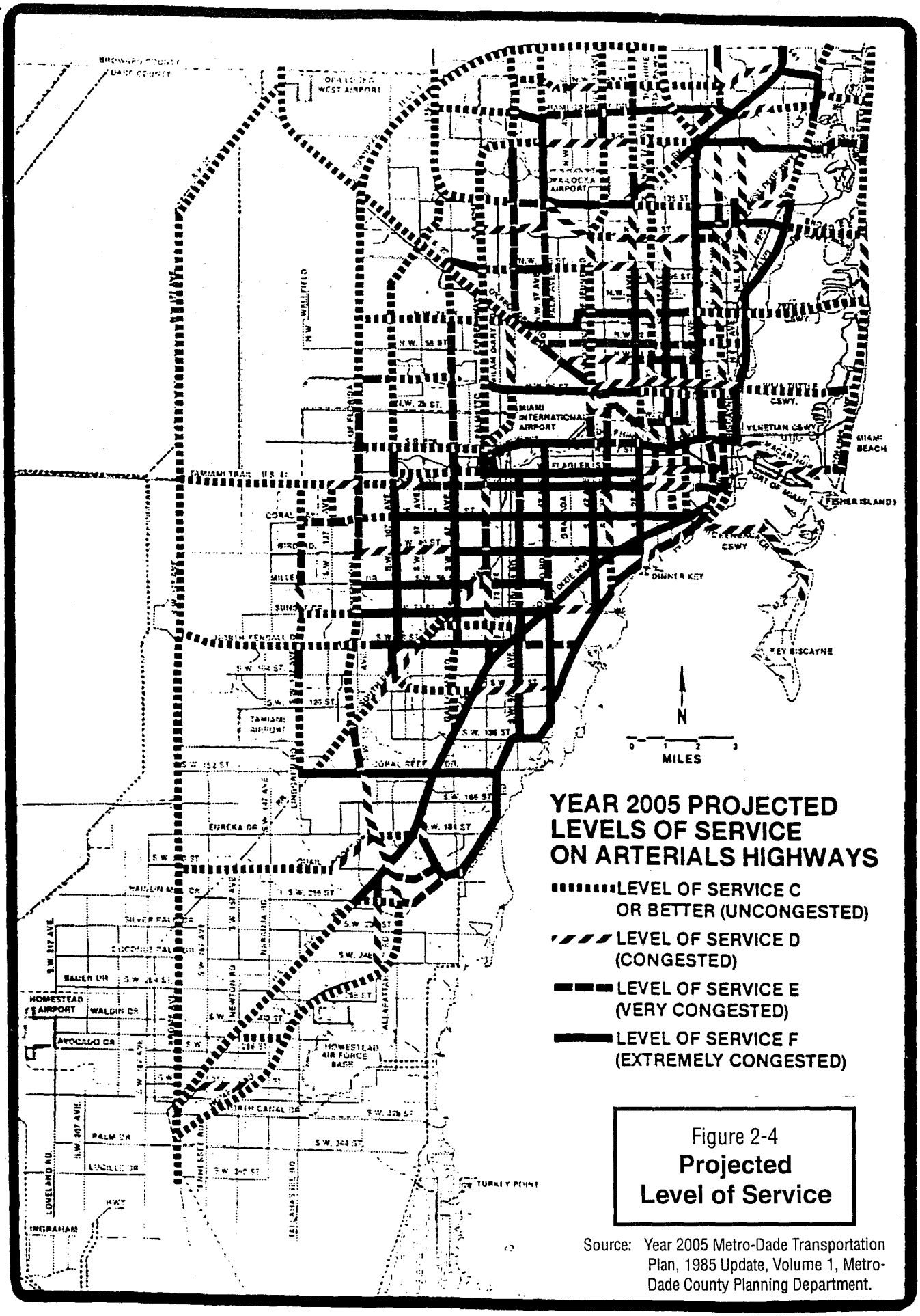


Figure 2-4
Projected Level of Service

Source: Year 2005 Metro-Dade Transportation Plan, 1985 Update, Volume 1, Metro-Dade County Planning Department.

The Port of Miami is the most commonly used major terminal facility. In addition, 44 percent of those respondents classifying themselves as container or truckload shippers want better rail or intermodal facilities. The airport was also identified as an important terminal. Twenty-two percent of the respondents handled air freight on a daily basis.

According to the response from the survey, most companies surveyed (80%) stated their shipments are within Dade County, indicating that local truck trips are the greatest percentage of all truck trips.

The distribution of responses is shown in Figure 2-5. The area with the greatest response density is West Dade, particularly in the triangle bounded by Okeechobee Road/Miami International Airport area. While a significant number of responses also came from North Dade, there were fewer in South Dade. Based on the distribution of responses, the heaviest loads of truck traffic accessing the roadway network would be on S.R. 836, S.R. 826, and Okeechobee Road.

The survey identified that 80 percent of respondents need to be on roads during peak hours. This is supported by input from the advisory committee established for the study, which indicated that although some companies are moving towards right-time deliveries, for many types of shipments the best time to operate is during the day.

Many trucking organizations (75%) responded to a direct question that a freight-only lane would be important. Interestingly, the FDOT has recently suggested that the I-95 HOV facility and the access to Golden Glades adjacent right lane be restricted to exclude use by trucks. This would continue a precedent established in Broward and Palm Beach Counties. Although it is unclear what effect this would have on truck traffic on I-95, it may spur movement of trucks to other facilities and should engender discussion about better approaches to handle truck traffic in Dade County.

Although the response to the survey was nearly ten percent, which is considered an acceptable response to this type of survey, the sample size was not sufficient to permit judgments about subgroups (i.e., less-than-truckload, truckload, etc.). While general conclusions and information useful to this study can be developed, this type of study would be highly unlikely to develop a base of information suitable for travel modeling or for any data statistically valid on a less than aggregate level than the survey response as a whole.

2.3 ORIGIN-DESTINATION TRUCK SURVEY

The consultant team conducted personal driver interview, origin-destination surveys at three intermodal trucking locations in Dade County. These were the Port of Miami, the Miami Free Trade Zone, and the F.E.C. Hialeah Intermodal Yard (Figure 2-6). The interviewers were bi-lingual and the survey forms were prepared in English and Spanish. Because each location involved an area where trucks arrive from a destination, and then go to a destination, each completed survey represented two truck trips.

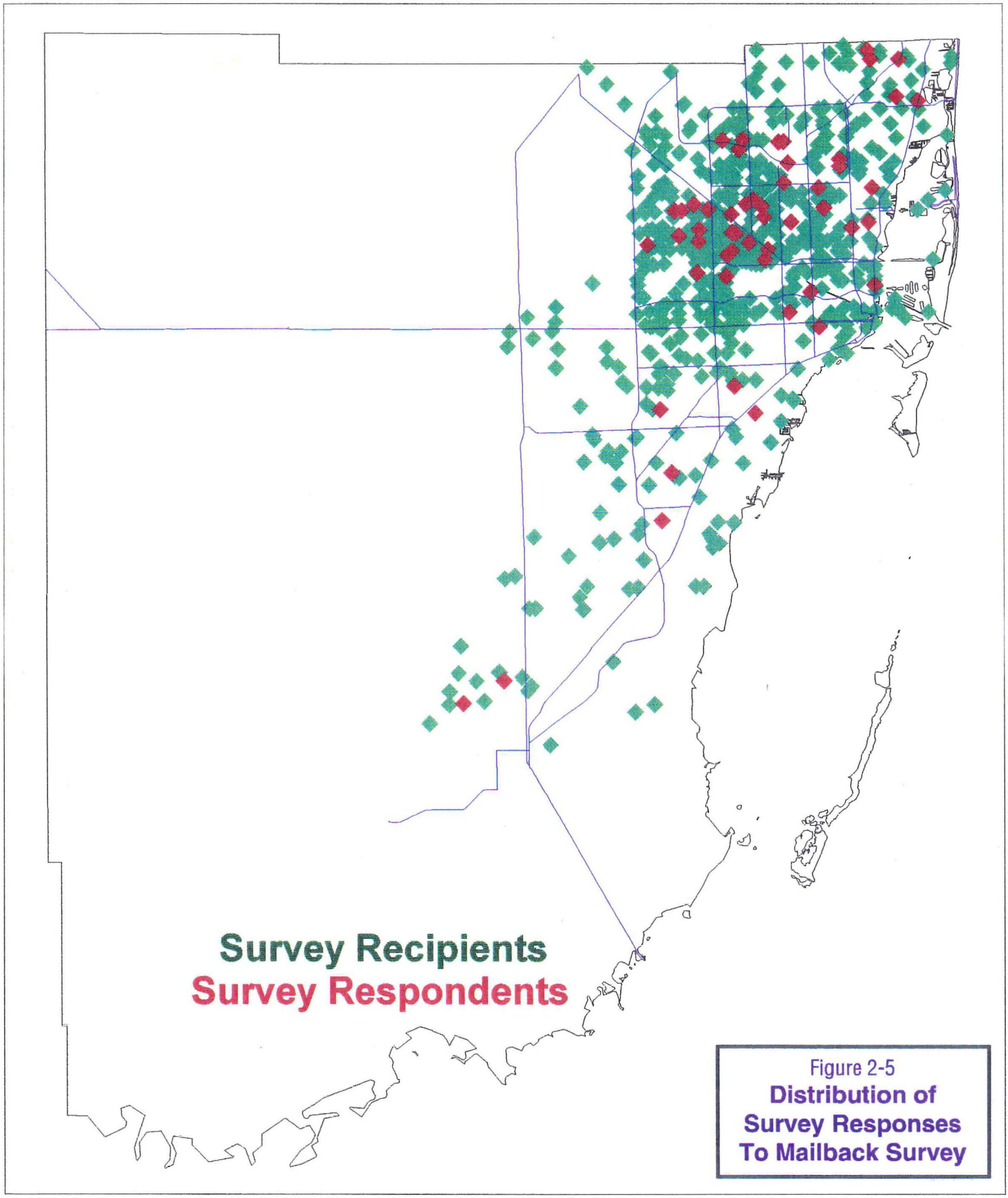
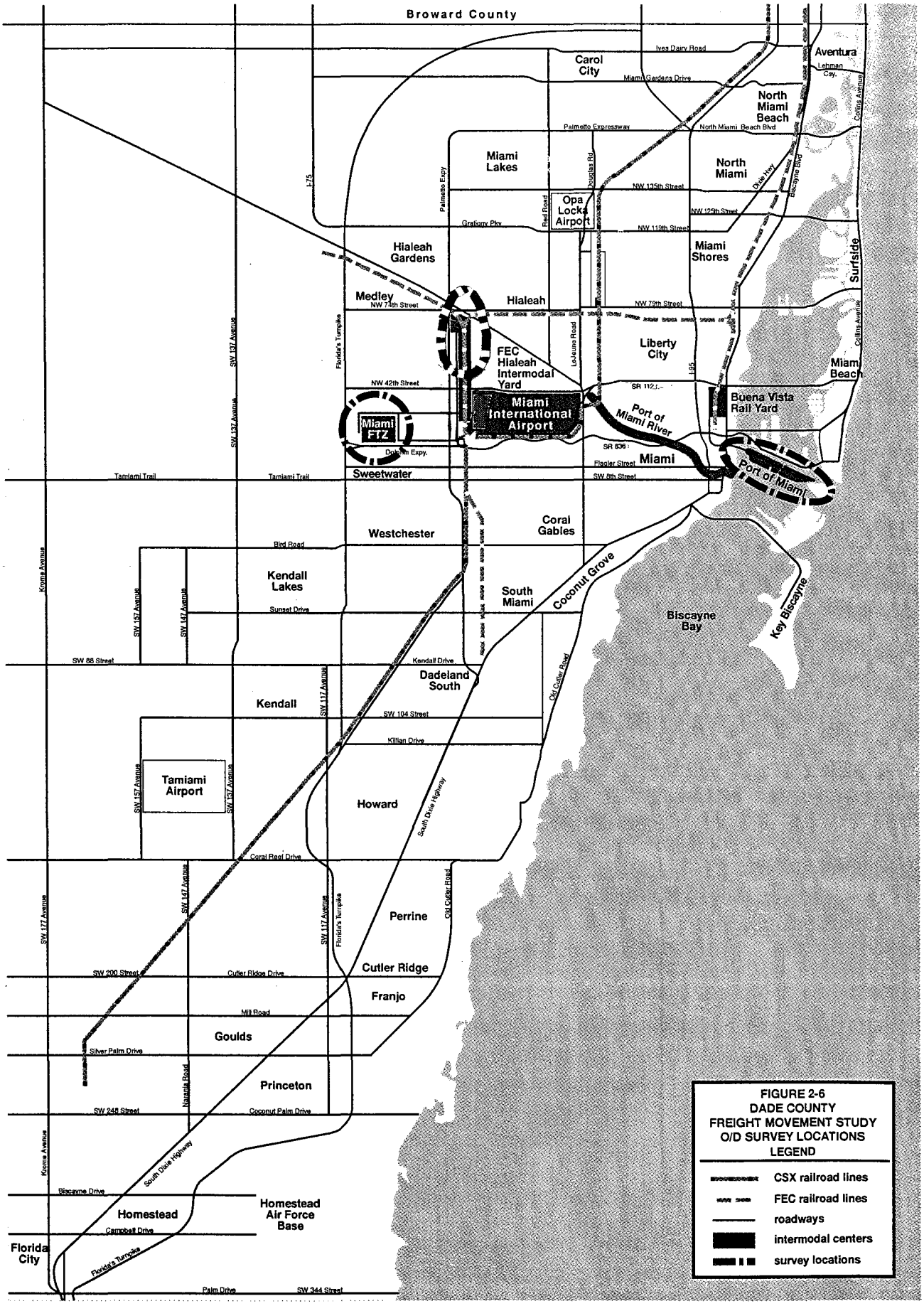


Figure 2-5
Distribution of Survey Responses To Mailback Survey


Broward County
Carol City
Ives Dairy Road
Miami Gardens Drive
Aventura
Lehman Cay.
North Miami Beach
North Miami Beach Blvd
Collins Avenue
Palmetto Expressway
Miami Lakes
Douglas Rd
North Miami
Dixie Hwy
Biscayne Blvd
NW 135th Street
NW 125th Street
I-75
Palmetto Expy
Red Road
Opa Locka Airport
Gratigny Pky
NW 119th Street
Hialeah Gardens
Miami Shores
Surfside
Medley
NW 74th Street
Hialeah
NW 79th Street
Florida's Turnpike
SW 137 Avenue
FEC Hialeah Intermodal Yard
LeJeune Road
Liberty City
I-95
Miami Beach
NW 42nd Street
SR 112
Buena Vista Rail Yard
Miami International Airport
Port of Miami River
Miami FTZ
Dolphin Expy.
SR 836
Flagler Street
Miami
Port of Miami
Tamiami Trail
Sweetwater
SW 8th Street
Coral Gables
Westchester
Bird Road
Kendall Lakes
South Miami
Coconut Grove
Krome Avenue
SW 157 Avenue
SW 147 Avenue
Sunset Drive
Biscayne Bay
Key Biscayne
SW 88 Street
Kendall Drive
Dadeland South
Old Cutler Road
Kendall
SW 117 Avenue
SW 104 Street
Killian Drive
Tamiami Airport
Howard
South Dixie Highway
Coral Reef Drive
Perrine
Cutler Ridge
SW 200 Street
Cutler Ridge Drive
Franjo
Mill Road
Goulds
Silver Palm Drive
Princeton
Homestead Air Force Base
SW 248 Street
Coconut Palm Drive
Biscayne Drive
Homestead
Campbell Drive
Florida City
Palm Drive
SW 344 Street
FIGURE 2-6
DADE COUNTY
FREIGHT MOVEMENT STUDY
O/D SURVEY LOCATIONS
LEGEND
CSX railroad lines
FEC railroad lines
roadways
intermodal centers
survey locations

The trip origins and destinations were coded to the 1990 Metro-Dade County traffic analysis zone (TAZ) map. There are 1,164 zones in the 1990 TAZ system. (The Port of Miami is in TAZ 2, the Miami Free Trade Zone is in TAZ 482, and the F.E.C. Intermodal Yard is in TAZ 451.)

Surveys were conducted from 8 a.m. to 12 noon on a typical weekday at each location. Traffic counts (tubes) were set in place to record all vehicles 3 axles and greater for a 24-hour period. Four hundred and eight surveys were obtained (Table 2-1) from 791 trucks (a 48% sample).

The surveys (Appendix A presents the survey form used) captured the information at the location of the interview (Free Trade Zone, Port, or F.E.C.), the time of the interview, the location of the trip origin prior to coming to the interview location, and the trip destination anticipated after leaving the interview location. The greatest number of completed surveys was obtained from the Port of Miami, where surveys were conducted at two of the three stevedore[3] operations on the site POMTOC and Universal. The fewest number of surveys were obtained at the Miami Free Trade Zone, which also had the fewest number of trucks.

Three hundred and eighty surveys of the 408 received were satisfactorily coded for use in developing origin distinction data. Each survey that was used included information on origin, survey location, and destination TAZ's. In addition to the Dade County TAZ's, special zones were established for Port Everglades, Broward County, Palm Beach County, Florida's West Coast, Central Florida, North Florida, and Out-of-State origins or destinations. Each record was then broken down into two origin-destination trips. These were then accumulated and sorted to obtain a file that contained the origin traffic analysis zone, the destination TAZ, and the number of trips between the two. This file was input to TRANPLAN (a transportation modeling program), which produced a trip matrix. Each survey record was weighted to represent the daily sampling rate at each of the three survey sites. The matrix was then assigned to the Dade County highway network (the highway network is one part of the Dade County Travel Model) and a band width plot was produced. The total number of modeled trips was 733 (obtained by multiplying 380 useable survey records by 2, to account for the dual trip of each interviewee, and subtracting 27 one-way trips that were not useable because of bobtailing, which occurs when a trucker drops off a shipment and then leaves the facility without a load or a defined destination). Trips are assigned on the highway network by the TRANPLAN computer software. Each of the 733 trips is assigned to its appropriate origin and destination TAZ. The computer program determines the minimum path between the two zones and assigns the trip to the path.

The TRANPLAN simulation of the truck trips, shown in Figure 2-7, indicates concentrations of movement along S.R. 836, S.R. 112, Okeechobee Road, I-95, and throughout the CBD. This data substantiates the responses of truck drivers whenever asked what roads they typically traveled (discussed next). Clearly the heaviest movements are to west and northwest Dade County and north along I-95. However, while the trip routes appear to be heavily concentrated along specific routes, examination of trip ends at the TAZ level indicates a wide dispersion of trip ends. Of 733 trip records identified in the survey, there were 317 different origin-destination pairs (Appendix B).

[3] Responsible for loading and unloading ships. In the container industry, stevedore firms manage the flow of containers into and out of a port by truck.

Table 2-1

Dade County MPO Freight Movement Study
On-Site O/D Survey

	FEC	PORT	TRADE	TOTAL
Responses	106	213	61	380
% Surveyed[1]	48%	42%	100%	
Truck Trips[2]	445	849	122	750
Total Trucks[3]	223	507	61	1,600
Daily Truck Trips[4]	1,562	2,138	246	2,999
Daily % Surveyed[5]	13.57%	19.92%	49.59%	

1 Based on actual number of trucks entering facility (each response provided an inbound and outbound trip record).
2 During survey period (total 2-way trips recorded during survey period).
3 Percent of trucks surveyed.
4 24-hour 2-way tube count; does not include all trucks entering Port of Miami.
5 Percent of 2-way Daily Trips surveyed assuming each response is two trip records.

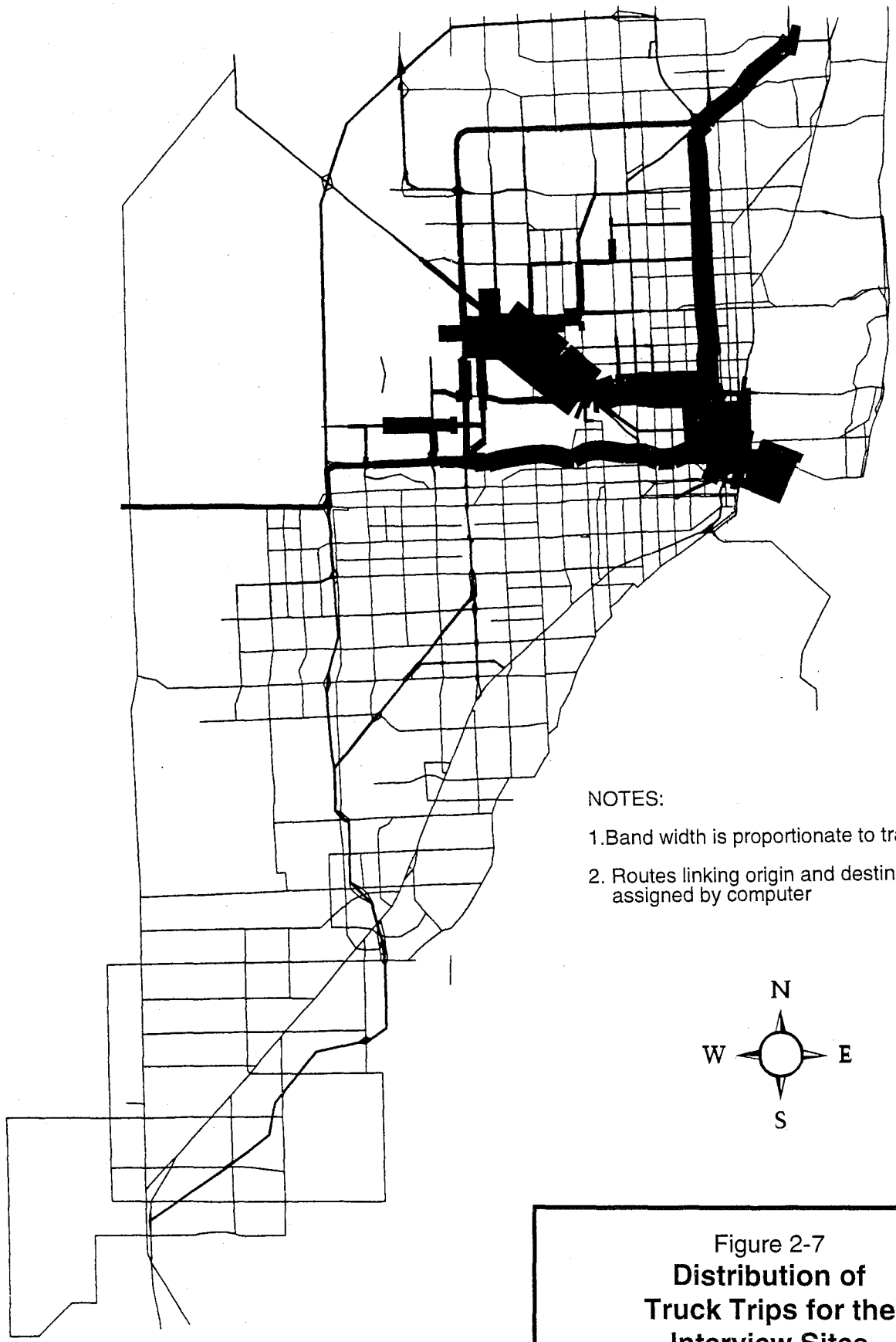


Figure 2-7
Distribution of Truck Trips for the Interview Sites

Analysis of the most frequently cited origins and destinations was performed as depicted in Figure 2-8. Appendix C presents the origin and destination data by TAZ as defined by the interviews at each survey location (to avoid bias, this analysis does not reference the total number of trips at the survey location -- as each of the three locations is an origin and destination of the respective trip ends of every survey record). Based on the survey at these three locations, the F.E.C. Intermodal Yard is the most prominent origin and destination with the Port of Miami having the next greatest number of trip ends. Interestingly, Broward County and Port Everglades combined represent nearly 10 percent of the total trip origins and destinations while the airport accounts for less than three percent. This is an indication of the lack of interaction between the Port of Miami and the airport. Other locations with substantial total origins and destinations are Medley (south of Okeechobee Road), the area west of the Palmetto just south of 36th Street, and the area just west of the intermodal yard.

The surveyors asked drivers about the most frequently traveled roads for both the inbound and outbound trip (respondents could identify more than one facility). Table 2-2 presents the response. Not surprisingly, the greatest number of drivers cited I-95, with S.R. 112, S.R. 836, and S.R. 826 being the next most frequently cited. Although as noted earlier, there is a basic concurrence between the TRANPLAN simulation and driver responses, comparing the drivers' responses to the TRANPLAN simulation, it is interesting to note that the computer appears to assign more trips to Okeechobee Road than would appear to be using it based on the trucker response, and conversely fewer trips are assigned to S.R. 836 than would appear to be using it based on trucker response.

2.4 25TH STREET TRAFFIC STUDY

The Florida Department of Transportation recently conducted a traffic study of the NW 25th Street Corridor between NW 87th Avenue and NW 67th Avenue, a total length of 3.2 kilometers.[4] The purpose of the study was to evaluate existing and projected traffic conditions in the corridor and to define the existing demand of truck traffic for a direct connection between S.R. 826 and the Miami International Airport Westside Cargo Area. The study involved a traffic operational analysis as well as origin and destination surveys of truck traffic.

The Westside Cargo Area (WCA) is the most significant truck traffic generator in the NW 25th Street Corridor, which is primarily dedicated to industrial use. Over 20 percent of traffic in the corridor is truck traffic.

The origin and destination survey indicated that approximately 56 percent of the trucks leaving the WCA were going directly to or west of S.R. 826 and approximately 71 percent of the traffic going to WCA on NW 25th Street was coming from S.R. 826 or west of S.R. 826. A 1995 truck volume count performed as part of the study indicated that 1,757 trucks daily entering and exiting the WCA.

[4] "Final Traffic Report, Engineering Concept Study, NW 25th Street, prepared for the Florida Department of Transportation District Six, prepared by Marlin Engineering, September 1995.

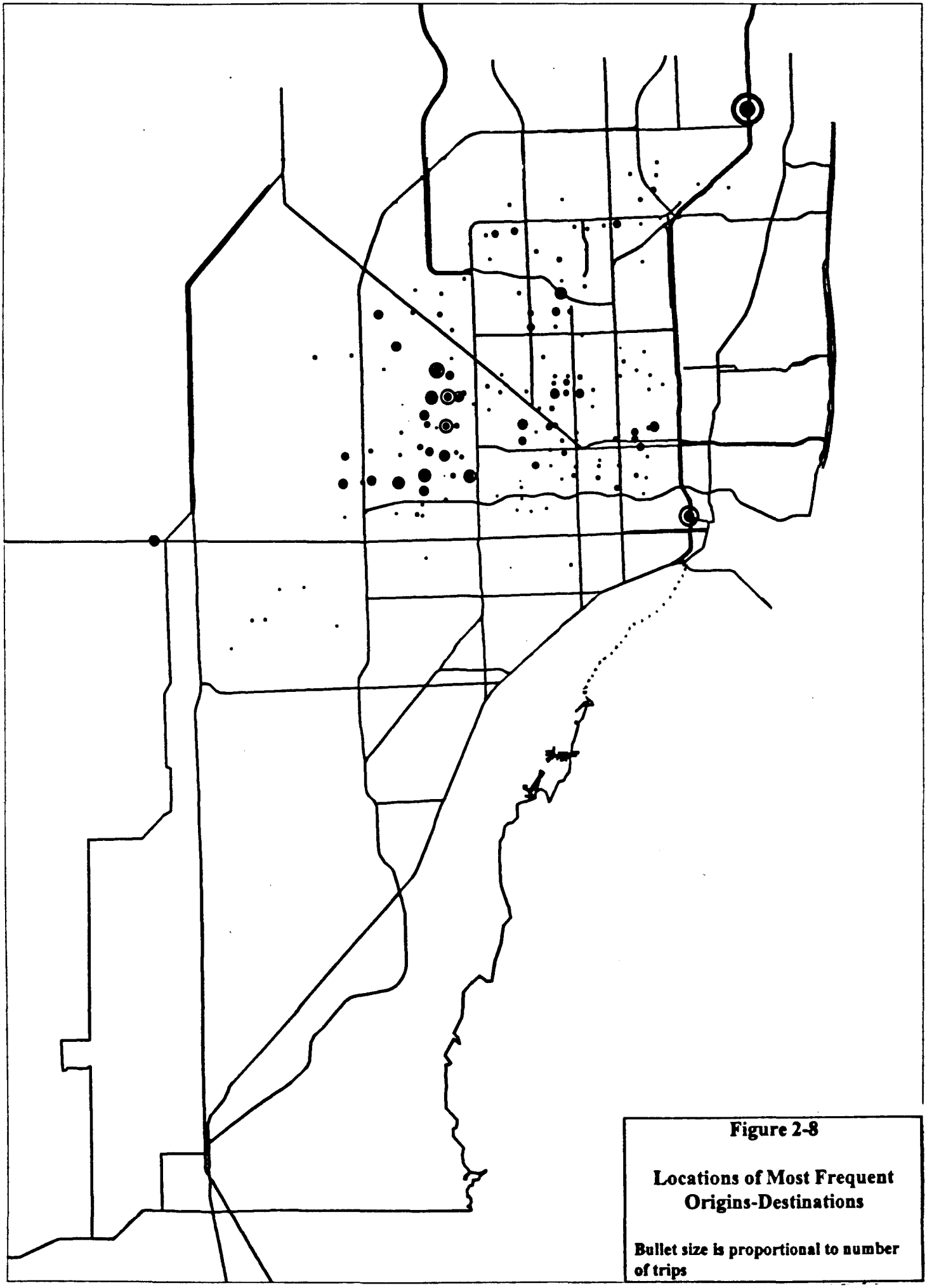


Figure 2-8

Locations of Most Frequent Origins-Destinations

Bullet size is proportional to number of trips

Table 2-2

On-Site O/D Survey Responses
Roads Reported Traveled by Drivers Interviewed
At All Survey Sites
(Percentage of Total Responses)

ROAD	ORIGIN	DEST.	TOTAL[1]
I-95	29%	32%	61%
SR 112	17	20	37
SR 836	19	18	37
SR 826	17	19	36
NW 25 St.	13	14	28
NW 74 St.	12	8	20
Okeechobee Road	8	9	17
NW 72 Ave.	9	6	16
NW 36 St.	7	3	10
NW 107 Ave.	3	4	7
I-75	2	3	5
NE 2 Ave.	3	1	4
Le Jeune Rd.	2	2	4
NW 87 Ave.	2	1	3
NW 27 Ave.	2	2	3
US 1	1	2	3
NW 21 St.	1	1	3
NW 32 Ave.	2	1	3
I-395 (MacArthur Cty)	1	1	3
I-595 (Broward Cty)	0	2	2
NW 82 Ave.	1	1	2
NW 57 Ave.	1	2	2
NW 12 Ave.	1	1	2
NW South River Drive	1	1	2
Florida Turnpike	2	0	2
NW 58 St.	1	1	2
NW 79 St.	1	1	2

1 Respondents could cite more than one roadway so total is greater than 100%. A response of 0 indicates the roadway had percentage response less than 0.5% of total.

Table 2-2 (Continued)

On-Site O/D Survey Responses
Roads Reported Traveled by Drivers Interviewed
At All Survey Sites
(Percentage of Total Responses)

ROAD	ORIGIN	DEST.	TOTAL[1]
NW 74th St.	1%	1%	2%
Biscayne Blvd.	1	1	2
NW 79th Ave.	1	1	2
NW 62 St.	1	0	2
N. Miami Ave.	1	1	1
NW 84 Ave.	0	1	1
NW 71 St.	1	1	1
NW 2 Ave.	1	0	1
NW 42 Ave.	1	1	1
U.S. 27	0	1	1
NW 46 St.	1	1	1
NW 74 Ave.	0	1	1
NW 97 Ave.	1	1	1
NW 119 St.	1	0	1
NW 17 Ave.	1	1	1
NW 39th Ave.	0	1	1
NW 20 St.	0	1	1
SR 441	0	1	1
SR 595	1	0	1
NW 30 St.	0	1	1
Perimeter Rd.	1	0	1
NW 135 St.	0	1	1
NE 2 St.	0	0	1
NW North River Dr.	1	0	1
E. 49 St.	1	0	1
NW 4 Ave.	0	1	1
NW 5 St.	0	1	1

1 Respondents could cite more than one roadway so total is greater than 100%. A response of 0 indicates the roadway had percentage response less than 0.5% of total.

Table 2-2 (Continued)

On-Site O/D Survey Responses
Roads Reported Traveled by Drivers Interviewed
At All Survey Sites
(Percentage of Total Responses)

ROAD	ORIGIN	DEST.	TOTAL[1]
NW 6 St.	0%	0%	1%
NW 36 Ave.	0	0	1
NW 49 St.	0	1	1
NW 37 Ave.	1	0	1
NW 12 St.	0	1	1
I-195	0	1	1
NW 183 St.	0	0	1
NW 103 St.	0	0	1
NW 103 Ave.	1	0	1

1 Respondents could cite more than one roadway so total is greater than 100%. A response of 0 indicates the roadway had percentage response less than 0.5% of total.

The report concluded that a direct connection between the WCA and S.R. 826 is a viable option for future analysis.

The results of this study indicate that the Airport West area is and will continue to be a significant generator of truck traffic, with truck activity increasing to over 3,000 trips per day. Combined with the information produced during the origin-destination surveys at the F.E.C., Port, and Free Trade Zone, it was ascertained that S.R. 826 plays an equally significant role in truck traffic and overall trip distribution as I-95, S.R. 836, and S.R. 112.

2.5 FREIGHT MOVEMENT PROFILE

As part of the overall goal of the MPO Freight Movement Study, work has focused upon developing new data and reviewing existing data concerning truck activity in Dade County.

Given the resources of this study, a complete county-wide survey was not feasible; similar surveys in other locations have ranged from $50,000 to over $300,000 in cost. There are many other organizations putting trucks on the road. These include retailers such as Winn Dixie, Walgreens, and Publix; other companies involved in distribution such as UPS, Pepsi, and Dominos; and public utilities such as Florida Power and Light, the United States Post Office, and BellSouth. However, the work conducted to date in this study allows several conclusions to be made.

Truck trip activity in Dade County is focused east-west along the general S.R. 112/S.R. 836 corridors; north on I-95; and for both directions on S.R. 826. Okeechobee Road is a major corridor. Although the base trip activity appears focused on these key corridors, there are hundreds of individual trip ends as cited in the survey. Of the 700+ trips recorded during the survey at the Port, the Free Trade Zone, and the F.E.C. Intermodal Yards, there were over 300 traffic analysis zone pairings, despite the fact that the survey had only three central focus points.

There is significant movement from Dade County to Broward County and Port Everglades (more so than was indicated during preliminary discussions with the trucking industry and the Port of Miami).

On-site data collection efforts have been very successful in both the work conducted for this study and the airport study. Because of the number of central terminal locations in Dade County and the apparent cooperation experienced to date from the truckers, on-site surveys may be the most effective way in the near-term to collect data needed for county-wide modeling and transportation planning activities.

3. APPLICATION OF FREIGHT MODES TO THE DADE COUNTY TRAVEL MODEL

In order for an urban area to incorporate truck/freight planning into its transportation program, accurate and reliable truck travel data is needed for analysis. In Dade County, the data needed for truck model development does not currently exist. Obtaining the data, and maintaining a reliable data base, would be costly. This section provides discussion relative to: (1) the advisability of including forecasts of truck traffic in the model; (2) a description of the structure that would be feasible for incorporation of truck traffic into the Dade model; (3) the database required to support the model; and (4) how such a database might be acquired.

3.1 NEED FOR A TRUCK ELEMENT IN THE DADE TRAVEL MODEL

The Metropolitan Planning Organization currently uses a FSUTMS[1] travel model, based on TRANPLAN, which is operated on an IBM RS/6000 computer. Currently, truck assignments are a function of a "truck/taxi" trip purpose, which is based on surveys conducted in the 1970's. The model uses Internal/External (IE) and External/External (EE) trip tables that recognize only vehicle trips.

There are several reasons why the County should consider including a uniquely designated truck element in the urban area travel model.

Trucks are a significant contributor to congestion in Dade County. As discussed in the previous section and presented in Figure 2-4, in 2010 much of the County will be experiencing Level of Service (LOS) D or worse levels of congestion (LOS is a reference for congestion ranging from A, free-flow traffic, to F, extremely congested). The 2015 Long-Range Plan Update, expected to be approved by December 1995, was not available for use in this document. Trucks represent a significant number of trips on the roadway network (nearly 10% of current traffic). As an example, on I-95, with an Annual Average Daily Traffic (AADT) volume of 184,500, trucks represent 16,112 trips, or nearly 10 percent. Trucks also have significant impact on pavement deterioration, noise, accidents, and air pollution.

Including truck traffic in the Dade model will allow a more accurate projection of roadway needs (e.g., trucks have different highway geometric needs than automobiles, and roadways with a higher percentage of trucks require more frequent maintenance and reconstruction, etc.), will allow consideration of design enhancements at key access and egress points at major terminals and operations points, and will allow for improvements to the transportation system that may alleviate impacts from the trucks.

The Intermodal Surface Transportation Efficiency Act (ISTEA) has mandated that States develop management systems for transportation functions. These include the Congestion Management System, the Public Transportation Management System, the Intermodal Management System, the Bridge Management System, the Pavement Management System, and the Safety Management System. In Dade County, the Congestion Management System, the Public Transportation

[1] Florida Standard Urban Transportation Model Structure (FSUTMS is a set of standardized procedures used for travel demand modeling.

Management System, and the Intermodal Management System are being cooperatively integrated by FDOT and the MPO into a unified system known as the Integrated Management System. ISTEA requires that emphasis be placed on improving intermodal connectivity. Incorporating truck movements into the planning process will provide a basis for overall improvement to intermodal connectivity, and developing a model that incorporates truck travel will allow the exploration of surface transportation problems associated with and particular to trucking.

The following discussion focuses upon a review of truck travel surveys and modeling activity, a discussion of the type of model structure that may be appropriate for including truck traffic into Dade's travel model, the data needed to support the model, and the means and resources to obtain the data.

3.2 REVIEW OF CURRENT LITERATURE ON TRUCK TRAVEL SURVEYS AND MODELING EFFORTS

Work associated with assessing the feasibility of including freight in the Dade model and developing recommendations for incorporation of freight into the model included review of literature associated with freight movement modeling and data collection efforts. These include the following reports:

- Truck Travel Surveys: A Review of the Literature and State-of-the-Art
  Author: Samuel W. Lau, Planning Section, Metropolitan Transportation Commission, Oakland, California, January 1995

- Trucking in Greater Vancouver: Demand Forecast and Policy Implications, TRANSPORT 2021 Technical Report 7, August 1993.

- Florida's Intermodal Planning Process
  Author: Florida Department of Transportation, with the assistance of Wilbur Smith Associates, Kimley-Horn and Associates and Leftwich Consulting Engineers, March 1994

- Development of an Urban Truck Travel Model for the Phoenix Metropolitan Area
  Author: Earl R. Ruiter, Cambridge Systematics, Inc./Prepared for the Arizona Department of Transportation in cooperation with the U.S. Department of Transportation Federal Highway Administration, February 1992

- Review of the current CATS Travel Demand Estimation Practices, January 31, 1994, Prepared for the CATS by Parsons Brinckerhoff Quade & Douglas, Inc. and Chicago Area Transportation Study (CATS) Research News, 30th Anniversary Issue, Volume 26, Number 1, February 1987.

The purpose of this review is to profile past experiences, as well as current practices on truck travel demand forecasting for metropolitan planning organizations. The review provides a basis for the analysis relative to application of a freight element in the Dade County model.

3.2.1 MTC Truck Travel Surveys - A Review of the Literature and State-of-the Art

Overview of Report

The following discussion is based upon the "Truck Travel Surveys" report prepared by the Metropolitan Transportation Commission (MTC) in Oakland. This report presents a thorough compilation of past literature and current practices on truck surveys and truck travel demand forecasting. The report identifies that "...few urban areas in the country have had extensive experience in conducting truck surveys and truck travel demand forecasting." As is true in Dade County, most MPO's or regional transportation planning agencies generate their truck trip estimates based on origin-destination studies conducted in the 1960's and 70's. The report cites Chicago, Ontario, Vancouver, Phoenix, Alameda County, California, New York-New Jersey, El Paso, and Houston-Galveston as having conducted significant efforts to collect truck travel data or develop new techniques for forecasting truck traffic. Chicago, Phoenix, El Paso, and Vancouver have used their truck survey data to develop regional truck travel demand models.

The recent truck travel surveys cited above all collected origin-destination information, and with the exception of two surveys, requested land use at the destination. Trucks were classified in the surveys by weight, number of axles, or by truck type. Surveys were done by roadside interview (3) or trip diaries (5). Only one survey collected data on truck driver characteristics and, interestingly, only one survey collected route choice information for the surveyed trip. The most common survey method for conducting truck travel surveys was the combined telephone-mailout-mailback method. This method was deemed more cost effective and yielded a reasonably high response rate. Most of the surveys ranged in cost from $90,000 (in Phoenix, where the combined telephone-mailout/mailback method was used and resulted in 720 surveys) to $312,000 in New York-New Jersey, where roadside interviews were conducted (resulting in 14,671 completed surveys). The City of El Paso conducted telephone interviews and obtained 188 surveys for $65,000.

The primary uses of the truck data were for regional truck travel model development and corridor/route analysis. Ontario was cited as having used truck data for time series comparisons, evaluation of road design and geometric, pavement management planning, truck-related accident analysis, dangerous goods movement regulation and enforcement, understanding truck driver characteristics, and for planning truck driver education programs. Data have also been used to generate truck activity maps, estimation of truck vehicle miles traveled (VMT) and emissions, and intermodal analysis of truck movement.

Some of the common findings of the MTC review were as follows:

- The share of different truck sizes used varied from urban area to urban area.
- Light trucks had a higher average trip frequency than heavy trucks
- Heavy trucks made longer trips and traveled more miles on an average day than light trucks

- Trip time increases with vehicle weight

- Most "first" truck trips occurred early in the morning (between 6:00 a.m. and 9:00 a.m.)

- Most truck trips occurred during the midday (9:00 a.m. and 3:00 p.m.)

- Truck travel during peak hours varied considerably by community and ranged from less than 9 percent to as high as 17 percent of the total volume during peak periods

- Truck traffic typically occurs on weekdays and decreases significantly on weekends

- Although only one survey cited in the MTC review analyzed route choice for return trips, it found that 73% of drivers said they would use the same route for the reverse trip

- Over one-third of all commercial vehicles stops were made on-street, as opposed to a terminal or receiving dock, according to the one survey in the MTC review that collected stop information

- Light trucks make more residential trips than any other category, while retail attracted both light and medium truck trips. Heavy trucks dominated in terminal/warehouse land uses.

The MTC report made several recommendations for conducting a regional truck survey and developing a truck travel forecasting model:

- For internal-to-internal (II) and internal-to-external (IE) trips, the sample should be drawn from the Department of Motor Vehicles registration file or regional truck registration files. A combined telephone mailout-mailback survey type was recommended.

- For external-to-internal and external-to-external trips, it was recommended that roadside intercept surveys be conducted at various roadway facilities and links in the network. Weigh in motion stations and toll plazas were recommended as appropriate locations. Vehicle classification counts should be conducted at the same time as the surveys.

- For obtaining trip diaries, a combination of fleet-employer samples and truck unit samples would be desirable. Small operators should be over-sampled as previous efforts indicate that large fleet operators tend to respond better than small operators.

- Time of day, day of week, and seasonal variations in truck travel should be targets for examination.

- Origins and destinations of trips that begin and end within the study area should be geocoded to the TAZ level.

Applicability to Dade County

Validation of a truck modeling element in the Dade travel model would require extensive data about truck travel that is not currently available. Key information is origin and destination of trips. Traditionally, this information is collected by surveys, such as roadside interviews or mailback surveys. For trucks, roadside interviews could be practical at locations such as terminal yards (similar to the survey conducted by the consultant as part of this study at the Port of Miami, F.E.C. Hialeah Intermodal Yard, Miami Free Trade Zone). A recent project by the Florida Department of Transportation involved interviewing trucks on 25th Street as they left Miami International Airport. Interviewers approached the trucks as they waited in traffic and conducted the surveys during the wait.

As discussed in Chapter 2, there have been two efforts conducted in this study to collect information on trucks. The first was a mailback survey. A list of approximately 800 companies involved in trucking in Dade County was obtained from Dun and Bradstreet. The mailback response to the survey was slightly less than ten percent. To increase the response, telephone calls were made to those firms that did not respond to the survey. Following that initiative, responses had been obtained from about 12 percent of the trucking organizations based in Dade County as identified through Dun and Bradstreet and the Florida Trucking Association. A second survey effort involved conducting personal interviews at three major intermodal locations in Dade County. These were the Port of Miami, the Miami Free Trade Zone, and the F.E.C. Hialeah Intermodal Yard. This effort resulted in a 48 percent surveillance rate of traffic at these three locations combined.

Origin-destination data for every trip are included in a trucker's waybill. If a truck has several trips scheduled, the information on the trips is included. At transfer terminals such as the Port of Miami, the F.E.C. Intermodal Yard, and the Free Trade Zone, truckers must log their waybills. At the F.E.C., there are plans to have this process computerized in the next year. The waybills for truckers passing through the Port of Miami are maintained by the union. Through these sources, it may be possible to eventually obtain verifiable origin-destination data without conducting surveys. Because of the heavy use of the port and F.E.C. for truck activity, acquiring origin-destination information from secondary sources (i.e., waybills, computer records, etc.) may be very practical.

3.2.2 Greater Vancouver Regional District (GVRD) Truck Model

Overview of Report

The Greater Vancouver (Canada) Regional District (GVRD) truck model was based on the 1988 truck survey data. The model was developed to estimate 24-hour light and heavy truck travel demand for current and future years. Light trucks are classified as having a gross vehicle weight (GVQ) of 4,500 - 20,000 kilograms[5]. Trucks over 20,000 kg are classified as heavy trucks. Each

[5] One pound = 2.2 kilograms.

weight class has different trip generation and distribution characteristics as described below. 1988 truck survey origin-destination data were used to calibrate the 1989 GVRD Truck Model. The model was subsequently validated to 1991 conditions using truck screenline data. The model is composed of three main components:

1. **A traffic zone system:** comprising 445 traffic zones. The size of the zones varies according to population and employment densities. There are 11 external zones (at six border crossings, airport and ferry terminals) at entry points to the region to account for traffic entering and leaving the region.

2. **A regional light and heavy truck network:** The network is composed of freeway, arterial and collector facilities. Each roadway link contains information on the number of lanes, posted speed limits, capacity, and turning restrictions.

3. **A truck demand modeling procedure:** This is a procedure that estimates the number of 24-hour light and heavy truck trips.

The truck demand modeling procedure is a three-step procedure that includes: 1) trip generation, 2) trip distribution, and 3) trip assignment. The trip generation stage estimates the number of truck trips produced and attracted by each traffic zone based on population, wholesale, manufacturing, and non-wholesale employment for that zone. The trip generation equations for light and heavy trucks are:

$$\text{Light}_i = 0.327Wh_i + 0.0213nwh_i + 0.0103Pop_i$$

where,

Light_i = 24-hour light truck trips produced by zone i
Wh_i = wholesale employment in zone i
NWh_i = non-wholesale employment in zone i
Pop_i = population in zone i

and,

$$\text{Heavy}_i = 0.164Wh_i + 0.0665Man_i$$

where,

Heavy_i = 24-hour heavy truck trip produced by zone i
Wh_i = wholesale employment in zone i
Man = manufacturing employment in zone i

The trip distribution stage is applied using the Fratar modeling technique. Truck trips between origins and destinations are allocated based on the observed heavy and light truck trip

distribution patterns. This stage produces a set of 24-hour trip tables for light and heavy trucks. External truck trips are subsequently added to these trip tables.

The final step involves trip assignment - allocating light and heavy truck trips to the computerized network. The network assignment is based on the link travel times derived from the 1991 automobile assignment. This means autos are assigned first and trucks are assigned to travel paths based on congested travel times. The three-step modeling process, together with the traffic zone system and computerized network system, produces estimates of 24-hour light and heavy truck link volumes. These 24-hour link volumes can be factored down to represent travel demands for different time periods during the day.

Applicability to Dade County

The GVRD Truck Model results produced the following findings for the base model year 1991:

- Light truck trips outnumbered heavy truck trips by two to one in the Vancouver region.
- The number of daily truck trips in the GVRD exceeded 100,000 trips, and about 15 percent of all truck traffic in the region had an origin or destination outside the region.
- Truck traffic accounted for 3 percent of total daily vehicular traffic, with almost 85 percent of the truck traffic operating within Greater Vancouver.
- External truck traffic accounted for 15 percent of the total goods movement in the region by volume.

The GVRD model considers only two truck classes (light and heavy), while the Phoenix and CATS model have three and four truck classes respectively in their final selection. The GVRD model considers separate truck network and its assignment. These concepts of truck network and/or a separate assignment could be adapted to Dade County. The key results from the Vancouver study should be carefully compared to the Dade County due to geographic variation. Like the CATS and Phoenix truck travel models, the GVRD model also builds on its own truck survey. The trip distribution phase of each of these studies is heavily dependent on the O/D information from truck travel survey. For the Dade County truck model, a similar survey collecting the origins and destinations of truck trips geocoded to TAZ's should be considered. Trip generation equations of the GVRD model are very simple and could be easily transferred to the Dade County model after proper translation of employment categories.

3.2.3 Florida's Intermodal Planning Process

Overview

Florida's Intermodal Planning Process is one element of Florida's Transportation Planning Process. The major steps in the Intermodal Planning Process are:

- Criteria for Programs and Projects
- Data Management System

- Demand Forecasting Process
- Needs Identification Process
- Funding
- Advanced Technologies and Innovative Techniques
- Strategy and Action Identification
- Prioritization
- Implementation Plan

The process is being developed as a tool to guide the Florida Department of Transportation (FDOT) and local governments in performing intermodal transportation planning. The strategy developed as part of the process is intended to serve as the foundation for Metropolitan Planning Organizations (MPOs) and local governments to use in developing and updating their own intermodal plans.

In Florida, "intermodal" refers to the movement of both goods and people, thus including both intermodal (linkages, interactions and movements between modes of transportation) and multimodal (collectively addressing all modes of transportation). *The report identifies that a key limitation to intermodal planning is the lack of data, particularly relative to private sector transportation movements and origin-destination of freight (and passengers) in the intermodal environment.*

The Intermodal Planning Process calls for establishment of an Intermodal Data System (IDS), that will eventually include a data base containing existing physical characteristics and related information to be used in the intermodal planning process for all categories of intermodal systems in Florida. In review of the various modes (air, sea, freight, transit, etc.) a significant gap was identified in the availability of highway freight movement data. The 1993 Commodity Flow Survey by the Bureau of Census presented data on 24 million shipments, but because it was aggregated at the multiple Bureau of Economic Analysis areas, its applicability at the state and local level is limited.

The report identifies a Central Office Steering Committee to guide the collection of data for the IDS. District offices will be the clearinghouses for collected data. They could work closely with MPOs in their region to gather the necessary data. The primary output of the IDS will be the Intermodal Facility Evaluation Report (IFER), which is intended to be produced annually and provide an inventory of data collected and the evaluation of each intermodal facility studied.

The implementation of demand forecasting modeling for the Statewide Intermodal Planning Process will include auto, truck, and public transit highway passenger trip modes. Air passenger and freight movement, as well as high speed rail and Amtrak passenger trips will be simulated. Water passenger trips would be considered in the form of special generators. Freight movements would be replicated through spreadsheet analyses and then assigned onto the intermodal network, where applicable. Bicycle and pedestrian movements would not be modeled.

The Statewide Highway Forecast Model and local urban area models are recommended to serve as the base for the Statewide Intermodal Planning Process' intermodal demand forecasting model. The Statewide model provides a statewide highway network for evaluating Florida intercity auto, truck and bus highway travel.

Truck trip movements are not currently modeled as a unique standard element of statewide or urban area highway modeling in Florida. The "Florida's Intermodal Planning Process" report proposes that truck movements become an integral part of the overall intermodal modeling process, with the initial truck highway assignment modeling limited to truck travel. A modeling procedure similar to the San Francisco Bay Area Truck Travel model is recommended in the report. In the San Francisco model, the truck travel model has four procedures: trip generation; trip distribution; peak hour factoring; and trip assignment. Truck, rail, port, and pipeline freight movement for selected commodities are based on spreadsheet calculations and not included in the highway network assignment because of the extensive data base required. Freight movement trip production and travel patterns, as well as commodities categories, are based on field observed conditions. Should Florida follow the recommendation, these particular points would need to be included in the proposed truck model.

Information needed to quantify truck travel movements would be obtained by surveying selected station points throughout Florida, statewide, local or both. Survey data are recommended to include: axle size, commodity type, trip type, origin/destination, route, and trip frequency.

The report identifies that current state-of-the-art modeling in Florida uses FSUTMS for transportation demand modeling. FSUTMS models do not currently address many intermodal factors. Changes to the existing modeling structure are proposed to be examined. Some possible modifications are proposed. In the near term, adjustments to incorporate freight are not proposed. As possible "ultimate" model modifications, it is proposed that all passenger and freight movements be modeled.

Applicability to Dade County

The Statewide Intermodal Planning Process identifies modeling of freight movement as an "ultimate" goal. This is due to the recognition in the report that data to support such modeling is not currently readily available. Through the Intermodal Data System, proposed in the report, a structure for assembling a statewide data base on all modes, including freight, is defined. The MPOs have the opportunity to participate in this data base development. As Dade County considers development of a freight mode for its model, the data elements required should complement those anticipated to be collected for the state process. In particular, it is recommended that Dade County and other MPO's work with the state to develop coordinated date requirements and collection procedures in order to share the cost among all government bodies of developing and using truck database information.

3.2.4 Development of an Urban Truck Travel Model for the Phoenix Metropolitan Area (1992)

Overview of Report

The Arizona Transportation Research Center, the Arizona Department of Transportation commissioned development of a travel survey of commercial vehicles operating in the Phoenix area. Survey data were used for development of commercial vehicle trip generation, distribution, and traffic assignment models. The models were designed to be incorporated into a UTPS-based travel model system.

The Phoenix commercial vehicle survey provided detailed information on 3,402 trips made by 606 commercial vehicles registered in Maricopa (Phoenix) County. Each trip had both its origin and destination within the transportation study area. The purpose of the survey was to develop new models for internal commercial trips only. The sampling frame for the survey was a computerized file of 157,000 commercial vehicles registered in the County obtained from the Department of Motor Vehicles and a listing of 2,300 vehicles owned by the U.S. Postal service and garaged in the County.

The survey method was a combined telephone/mailback technique. This approach was adopted after obtaining low response rates in an initial pretest which relied entirely on a mailout/mailback method. The questionnaire, which was mailed to contacts (vehicle owners) who agreed to participate, was a one-day trip diary. The report identifies that the confidence level of the survey was 95%. Approximately 30 percent of those who were mailed questionnaires after telephone contact responded to the survey (a total of 1726 surveys were mailed, resulting in 525 responses).

In order to expand the successfully coded vehicle and trip records to represent total commercial vehicle travel by vehicles registered in Maricopa County, expansion factors were developed for each data record. The variables affecting these expansion factors are:

- The percentage of vehicles in use for commercial purposes within the Phoenix metropolitan area on a typical weekday;
- vehicle weight-class:
  - 0 - 8,000 pounds
  - 8,000 - 28,000 pounds
  - 28,000 - 64,000 pounds and
  - over 64,000 pounds of gross vehicle weight;
- zip code of vehicle owner.

Overall, the survey represented a 0.5 percent sample of all commercial vehicles based in Maricopa County. In addition to vehicle factors, additional truck-specific factors were used to

account for each truck's unreported trips beyond the ten maximum trips which the survey asked to be reported.

Travel Characteristics of Commercial Vehicles

As shown in Table 3-1, the average vehicle surveyed reported making 7.7 trips per day. The averages by weight class are:

Table 3-1
Travel Characteristics of Commercial Vehicles

Vehicle Weight (lbs.)	Average Trips (Per Day)	Average Miles-Per-Day	Average Miles-Per-Trip
0 - 8,000	7.2	79.0	11.0
8 - 28,000	12.1	56.2	4.7
28 - 64,000	8.0	74.0	9.2
64,000+	4.7	156.8	33.4
Total	7.7	78.5	10.2

Vehicles in the heaviest category make a few long trips and in so doing generate many more vehicle miles per day then are generated by the lighter vehicles.

The time-of-day pattern for commercial vehicles is much different than that for private autos. Rather than AM and PM peaks, truck travel typically increases steadily to a single peak hour, and then begins decreasing steadily. The peak hour by vehicle type ranges from the hour ending at 9:00 a.m. to the hour ending at 2:00 p.m., and the percentage of total daily travel occurring in the peak ranges from 11 to 15 percent.

Comparing the peaking characteristics of commercial vehicles with other private vehicles, the AM peak period is found to be as important for commercial vehicles as for private vehicles. During the PM peak periods, when traffic volume is greatest in total, commercial vehicle's percentage of daily traffic is only ten percent of that for private vehicles.

In the survey form, truck drivers were asked to select eleven land use categories. These eleven categories were subsequently aggregated into eight categories to match the land use data used in the travel forecasting process for the Phoenix metropolitan area. Table 3-2 shows the distribution of land uses for the Phoenix truck survey. Three land uses - residential, retail and manufacturing/warehousing - account, overall, for approximately equal shares of all trip ends. Together, these three land uses account for nearly two-thirds of all reported trips. Distributions of truck trip travel times, and the corresponding averages, are shown in Table 3-3.

These distributions are based on the times between successive vehicle stops and they include time spent during stopping. Overall, the average trip time is 28.1 minutes. Generally, average

Table 3-2

Land Uses at Trip Ends for the Phoenix Truck Survey

	Vehicle Weight (lbs.)				
Land Use at Stop	**0 - 8,000 (%)**	**8 - 28,000 (%)**	**28 - 64,000 (%)**	**64,000+ (%)**	**Total (%)**
Residential	19.5*	35.8	18.6	26.7	22.9
Retail	20.0	18.5	22.9	7.4	19.5
Manufacturing, Warehousing	22.2	15.8	23.6	16.6	20.8
Transportation, Utilities, Communications	2.0	1.6	3.7	9.6	2.2
Medical, Government	4.0	0.4	4.0	6.4	3.4
Office, Services	11.2	3.2	1.8	1.2	9.0
Garaging locations	9.3	18.4	13.1	19.0	11.5
Other	11.8	6.3	12.3	13.1	10.7

* Percentage of all commercial vehicle trips.

Source: Development of an Urban Truck Travel Model for the Phoenix Metropolitan Area, Cambridge Systematics and the Arizona Department of Transportation, February 1992.

Table 3-3

Distribution of Trip Durations for Phoenix Truck Survey

Time Range (minutes)	Vehicle Weight (lbs.) 0 - 8,000 (%)	8 - 28,000 (%)	28 - 64,000 (%)	64,000+ (%)	Total (%)
0 - 5	18.5*	37.7	13.3	1.8	20.4
5 - 10	17.2	16.6	17.2	2.8	16.1
10 - 15	17.3	10.5	20.5	5.8	15.3
15 - 20	8.6	10.6	8.5	5.7	8.5
20 - 25	6.1	3.2	4.4	6.5	5.3
25 - 30	9.6	7.9	8.5	13.6	9.0
30 - 45	8.8	3.6	8.5	15.5	7.8
45 - 60	3.6	4.1	5.5	9.2	3.7
60 - 75	4.8	0.2	2.6	9.2	3.9
75 - 90	2.1	0.2	2.0	5.3	1.7
90 - 105	0.1	0.5	0.7	4.3	0.3
105 - 120	0.8	0.2	1.4	5.8	0.8
120+	2.6	4.7	6.8	14.5	7.2
Average (min.)	23.9	18.8	30.1	57.6	28.1

Note: These trip durations include time for loading, unloading, etc., at each stop.

* Percentage of all commercial vehicle trips.

Source: Development of an Urban Truck Travel Model for the Phoenix Metropolitan Area, Cambridge Systematics and the Arizona Department of Transportation, February 1992.

Vehicle Weight (lbs.)	Average Trip Distance (miles)	Speed (miles/hour)	Percentage of Vehicle Trips Stopping On-Street
0 - 8,000	14.1	35.4	36.8
8 - 28,000	8.5	27.2	50.2
28 - 64,000	13.3	26.5	10.9
64,000+	27.1	28.2	17.5
Total	13.3	28.4	38.3

trip times increase with increasing vehicle weight. A similar distribution of trip distances based on starting and ending odometer readings for individual trips shows the following averages of trip distance and speed by vehicle weight categories.

While this table also shows that over one-third of commercial vehicle stops are made on-street, there is considerable variation of this statistic for the separate vehicle categories.

Truck Travel Model

- Trip Generation

For the trip generation model, two alternative forms, linear regression models and land-use based models, were evaluated. The land-use based models appeared to be superior because of their lower linear coefficients of variation.

Since the survey included information on land uses at trip ends and the Maricopa Association of Governments (MAG) zonal data included the number of residents and employment by land use category, it was possible to analyze trip generation rates by land use categories. The five land use categories available in the MAG zonal data and the corresponding categories used in the truck survey have the following correspondence:

MAG Zonal Employment-Category	Truck Survey Land Use Category
Retail	Retail
Industrial	Manufacturing, warehousing
Public	Medical, government
Office	Office, services
Other	Transportation, utilities, communication, other

The equation for each of the above five land use category trip rates has the following form:

$$\text{Truck trip rate for land use category } i = \frac{\text{study area trips to land use category } i}{\text{study area employment at land use category } i}$$

An additional land use category - residential land - was also included in the survey. Trip rates for trips to and from this land use category was defined as:

$$\frac{\text{total study area trips to residential land}}{\text{total study area households}}$$

The equation for the trip generation models for each vehicle weight category is:

$TRIPS_{wi} =$

$$t*TOTHH_i + u*RETEMP_i + v*INDEMP_i + w*PUBEMP_i + x*OFFEMP_i + y*OTHEMP_i + z*RESHH_i$$

where

$TRIPS_{wi} =$	total average weekday commercial vehicle trips for vehicle weight category *w* originated from and destined for zone or district *i*;
TOTHH*i* =	total households in zone or district *i*;
RETEMP*i* =	total retail employees in zone or district *i*;
INDEMP*i* =	total industrial employees in zone or district *i*;
PUBEMP*i* =	total public employees in zone or district *i*;
OFFEMP*i* =	total office employees in zone or district *i*;
OTHEMP*i* =	total other employees in zone or district *i*;
RESHHi =	total resident (non group quarters, non temporary, and non seasonal) households in zone or district *i*.

Information on land uses to and from the garaging locations was not requested in the travel survey. To overcome this data limitation, the equations estimated for trips to and from garaging locations were added to equations based on the trip rates. The final land-use based models for the five vehicle weight categories are shown in Table 3-4.

- Trip Distribution

Six zonal trip tables (four for each vehicle weight class, one which combines the two heaviest groups, and one which includes all weighted survey trips) were analyzed using a table of zone-to-zone off-peak highway skimmed travel times for Phoenix's existing highway system.

The total one percent of weekday Daily Trips and the average trip length for these trip tables are:

Vehicle Weight (lbs.)	Total Weekday Daily Trips (miles)	Percent of Weekday Daily Trips	Average Trip Time (minutes)
0 - 8,000	702,377	74.5	16.4
8,000 - 28,000	187,855	20.0	11.9
28,000 - 64,000	31,944	3.4	16.2
64,000+	19,430	2.1	23.1
28,000+	51,377	5.5	18.8
All Trucks	941,613	100.0	15.6

Table 3-4

Final Trip Generation Model for Phoenix Truck Traffic

Vehicle Weight (lbs.)					
Independent Variable	**0 - 8,000**	**8 - 28,000**	**28 - 64,000**	**64,000+**	**28,000+**
Total households	0.15433*	0.06859	0.00671	0.00590	0.01260
Retail employment	0.59091	0.13253	0.03075	0.00609	0.03685
Industrial employment	0.64087	0.09972	0.03210	0.01781	0.04991
Public employment	0.29491	0.00596	0.01349	0.01049	0.02398
Office employment	0.30925	0.02119	0.00225	0.00095	0.00320
Other employment	0.76348	0.10567	0.04026	0.03500	0.07527
Residential households	0.04004	--	0.00288	--	0.00288
Group quarter households	--	7.52348	--	--	--
Total area (acres *100)	--	--	--	0.00365	0.00365
Vehicles	--	--	--	0.00062	0.00062

* Commercial vehicle one-way trips per one unit of the independent variable.

Source: Development of an Urban Truck Travel Model for the Phoenix Metropolitan Area, Cambridge Systematics and the Arizona Department of Transportation, February 1992.

The average travel time by vehicle weight category are much smaller than those obtained from drivers' reported stopping times per trip, reflecting the absence of stopped time from the averaging process and reflecting differences between times based on minimum paths in a highway network and times reported by truck drivers. The average trip times for the two heaviest vehicle categories are quite different, but a final decision to combine these into a single heavy vehicle category (28,000+) was not made until initial gravity model calibration results were obtained.

For consistency with the MAG's other trip purpose distribution models, a gravity model was used to simulate trip distribution. An iterative application of the TRANPLAN gravity model calibration program was used to calibrate the model, supplemented by a spreadsheet to help make manual friction factor adjustments. The model calibration process involved reestimating each friction factor using a correction term equal to the desired fraction of trips in a travel time range divided by the previously estimated fraction in this range. The travel time ranges were selected to ensure that the resulting friction factors would always decrease as travel times increase. Comparisons of the predicted and observed trip time (Table 3-5) distribution from the final calibration runs for all three vehicle weight categories did not show any variations. The average trip lengths were also matched closely.

- Calibration and Traffic Assignment

MAG, does not have a process to make separate truck assignments independent of passenger vehicle assignments. Survey data in these study areas have been used mainly for truck modeling. However, both studies applied equivalent vehicle factors to the truck trip table before combining it with the automobile trip table. A two-step adjustment was made to the calibration process for the truck assignment in the Maricopa County travel model. Those are:

- The commercial vehicle trips were expanded by weight class to account for the average number of axles per vehicle in each weight class.

- The total commercial vehicle trips were expanded by VMT to match those estimated with the reported VMT for the Phoenix region.

The second adjustment process accounts for any underreporting of vehicle registration in Maricopa County. The combined registration/under-reporting factor is 1.623. The axles per vehicle trip factors are derived from the commercial vehicle survey. Table 3-6 shows the axles distribution by number of axles and weight classes.

When the averages of Table 3-6 are divided by two, factors are obtained which can be used to increase the number of medium and heavy vehicle trips to account for those made by vehicles with more than two axles. Overall, this adds 3.3 percent more vehicle trips and vehicle miles of travel to that provided by the unadjusted vehicle trip model.

Table 3-5

Observed and Predicted Trip Time for the Final Calibrated Phoenix Truck Distribution Models

Vehicle Weight (lbs)						
	0 - 8,000		8 - 28,000		28,000+	
Trip Time (minutes)	Observed (%)	Predicted (%)	Observed (%)	Predicted (%)	Observed (%)	Predicted (%)
0 -5	21.2*	21.0	42.3	41.3	23.8	21.8
6 - 10	20.4	20.8	20.2	19.4	12.8	13.4
11 - 15	19.2	19.1	10.3	10.8	11.6	12.2
16 - 20	12.4	12.6	9.4	9.7	11.6	12.6
21 - 25	6.5	7.6	5.1	5.	11.	11.8
26 - 30	8.2	6.6	1.9	3.8	8.0	10.0
31 - 40	6.1	6.3	7.9	5.7	13.2	10.4
41 - 50	2.3	2.9	1.8	2.6	4.7	4.7
51 - 60	1.5	1.8	0.6	0.9	2.2	2.4
61 - 70	2.2	0.9	0.6	0.3	0.7	0.7
71 - 80	--	0.3	--	--	0.1	0.1
81 - 90	--	0.1	--	--	--	--
91 - 100	--	--	--	--	--	--
101 - 110	--	--	--	--	--	--
Average Trip Time (mins)	16.4	16.1	11.9	12.2	18.8	18.9

* Percentage of total vehicle trips by weight category.

Source: Development of an Urban Truck Travel Model for the Phoenix Metropolitan Area, Cambridge Systematics and the Arizona Department of Transportation, February 1992.

Table 3-6

Axles per Vehicle Trip for Phoenix Travel Study

Vehicle Weight (lbs)				
Number of Axles	**0 - 8,000 (%)**	**8 - 28,000 (%)**	**28,000+ (%)**	**All Vehicles (%)**
2	100*	96.3	24.1	95.6
3	--	1.9	57.5	3.2
4	--	1.6	2.4	0.4
5	--	0.2	14.0	0.7
6	--	--	2.0	0.1
Averages	2.000	2.056	3.124	2.066

* Percentage of all commercial vehicle trips by weight class.

Source: Development of an Urban Truck Travel Model for the Phoenix Metropolitan Area, Cambridge Systematics and the Arizona Department of Transportation, February 1992.

Applicability to Dade County

The Phoenix commercial vehicle survey experience produced a list of requirements and suggestions for model transferability to other urban areas. These requirements and suggestions include:

- A file from the state vehicle registration agency of all commercial vehicles registered to owners in the study area;
- The ability to geocode street addresses to traffic analysis zones (TAZs);
- Current zonal data on households and employment by type; on vehicles; and on land area;
- A matrix of zone-to-zone off-peak uncongested highway travel times in the year of the truck travel survey;
- An existing model system to which truck travel models can be added or replaced;
- Estimates of regional VMT by commercial vehicle type and by private automobiles.

Because travel patterns vary from one urban area to another, the best approach for developing a truck travel model in another community would be to repeat the travel survey and model development tasks. Although the models developed for Phoenix appear to have performed acceptably for forecasting truck travel, the study does cite inherent trade-offs between the cost of conducting a truck survey and the precision of a truck forecasting model. The Phoenix models could be adapted to Dade County by adjusting the models to match local information. Changes in the trip generation model coefficients would be required to match local measures of vehicle registrations, or vehicle miles of travel (not likely to be available without a travel survey). In addition, gravity model friction factors for truck travel would have to be revised to match local data on trip lengths.

The report notes that the ultimate extension of the models developed in Phoenix would involve their generalization to create a "national model." This would assume the Quick Response System (Sosslau, A.B., et al, Quick-Response Urban Travel Estimation Techniques and Transferable Parameters, Users Guide, NCHRP Report 187, Washington, D.C., 1978) as a base and would involve combining the existing models with information on national travel characteristics. This would provide urban areas with versions of the models developed in this project with acceptable levels of accuracy for sketch planning purposes.

As Dade County considers incorporating a truck element in its modeling process, data collection on truck activity over and above what is done in this study will be required. The Phoenix experience mirrored the first survey attempt on this study with a poor response to an unsolicited mailout-mailback survey. Future survey efforts should consider a telephone/mailout-mailback technique as an appropriate and cost-effective way to generate truck travel information suitable for incorporation in a model.

3.2.5 Truck Modeling Efforts of Chicago Area Transportation Study (CATS)

Overviews of CATS Studies

In the 1970s, the Chicago Area Transportation Study (CATS) began developing separate trip forecasting models for passenger vehicles and commercial vehicles. It was one of the first of such efforts in the country. Recognition of a change in travel patterns led CATS to conduct a commercial vehicle survey in 1986 to provide updated truck travel data. The CATS practice was not to do separate forecasts and trip assignments for commercial and passenger vehicles but to "translate" commercial vehicle trips into passenger equivalents (VEQs) before assigning vehicle trips to the highway network. Converting trucks to VEQs provides a correct view of the impact of trucks on the traffic stream, but eliminates the ability to specifically estimate the number or percentage of trucks on any given roadway link. This practice was initiated with the recognition that trucks are slower, wider, and longer than cars and that they affect traffic flow and the performance of all vehicles on the network. Trip generation rates and trip lengths for the truck trip generation and distribution models were developed from the CATS 1986 commercial vehicle survey. The survey yielded information allowing the calculation of the average number of truck trips by type for different land uses. The origin-destination and trip length information from the survey were used to recalibrate the truck trip distribution model.

In the CATS study, four categories of trucks are forecast:

1. "B" trucks, the lightest weight class of commercial vehicles that weigh less than 8,000 pounds gross weight.[6]
2. Light trucks, which weigh between 8,000 and 28,000 pounds gross weight.
3. Medium trucks, weighing between 28,000 and 64,000 pounds gross weight.
4. Heavy trucks of more than 64,000 pounds gross weight.

The VEQ graphs established from the 1986 survey are as follows:

VEQ class	VEQ factor	Maximum Gross Wt. (Lbs)
B truck	1	8,000
light	1	28,000
medium	2	64,000
heavy	3	80,000

The two most important measures of travel behavior are trip frequency and trip length. Trip frequency is the number of trips made in a 24-hour period. Trip length is the average roadway distance of a trip. These statistics for the 1986 CATS' truck survey are:

[6] "B" truck group includes pick-ups and vans in its weight group that are being operated commercially on private (passenger) vehicle registrations for such activities as messenger services, point-of-sale advertising, home furnishings consulting, etc.

Vehicle Class	Daily Trip Frequency	Average Trip Length (Miles)
B Truck	6.9	11.1
light	7.9	9.6
medium	9.3	10.5
heavy	5.9	24.9

The 1986 CATS Commercial Vehicle Survey resulted in the following conclusions for the truck travel survey and travel characteristics:

- B trucks made more residential trips than any other truck category.
- Almost three-quarters of all International Registration Plan[8] vehicles were from outside the six-county study area.
- With the exception of heavy trucks, trip frequency increased with vehicle weight.
- Heavy trucks made much longer trips, compared to light trucks.
- Weighing the average trip frequency and trip length by the number of working vehicles in each class, the study found that almost two-thirds of all commercial vehicle miles of travel were made by B trucks. When weighting the average trip frequency and trip length by the number of working vehicles in each class and by the appropriate vehicle equivalency (VEQ) factors, the results showed that almost half of all commercial equivalent miles of travel were made by B trucks.
- "B" truck trip ends dominated all land uses except for the landfill and in-transit (i.e., leaving the region) categories.
- A strong relationship existed between heavy trucks and terminal/warehouse land uses.
- Retail land uses attracted many more B class, light, and medium truck trips than trips from the heavy class.

A more complete set of trip characteristics can be obtained by examining the relative distribution within each vehicle class. To provide a profile of trips generated and destined to different land uses, survey respondents were asked to provide land use data. The eleven land use categories cited and coded from the survey are:

- Residential
- Retail
- Manufacturing

[8] Vehicles with registrations that allow them to operate in multiple states.

- Terminal/Warehouse
- Public/Government
- Office/Service
- Construction
- In-Transit (i.e. E-E leaving the region)
- Landfill
- Agricultural
- Other/Mining

A correspondence was made between the land use categories and the data in the socioeconomic file. Using the correspondence and the number of trips in each category, the number of trips going to each zone within the region was calculated. Such an iteration is conducted for each land use category and for each vehicle type.

- Heavy trucks were found to dominate the in-transit category. Of all heavy trucks, almost nine percent were found to be in-transit. Of all commercial vehicle trips in the in-transit category, 44.8 percent were made by heavy trucks.

- A need exists for the development of a coding scheme on restricted links for trucks in the modeling network. Since commercial vehicles are converted to passenger vehicle equivalents, it was difficult to identify which trips were truck trips and exclude from being assigned to serve routes where, in practice, they were forbidden by law.

Applicability to Dade County

Over the last two decades, CATS has developed and refined the truck travel forecasting effort. Many studies since have cited CATS's pioneering efforts in truck travel forecasting. Since the 1986 CATS survey, separate reports have been written based on the data and findings of the commercial vehicle survey. Vehicle classes of CATS study would be a candidate for Dade County Truck Model. The travel characteristics of the selected vehicle classes are very dissimilar to be considered in trip generation and trip distribution as aggregated. Chicago's position as a central shipping point with strong intermodal connections indicates correlation to the Dade freight situation.

3.3 POTENTIAL DADE COUNTY TRUCK MODEL

3.3.1 Introduction

This section defines a framework for a Dade County Truck Model which could be implemented with proper data and resources (defined later in this section). There are four types of freight traffic within most urban areas. These are (1) long-haul traffic; (2) short-haul extra-regional traffic; (3) local distribution traffic, and (4) through traffic. Each is different in character, involves different actors, and employs different modes. The proposed structure does not attempt to provide freight mode-choice surveys and/or modeling efforts (competition among rail, truck,

air, and ship, for example). The model structure answers only the truck traffic question and proposes to model other freight modes through special generators.

Truck traffic has different travel characteristics than passenger vehicles. Their impact on the urban roadways requires a separate modeling approach and technique to estimate future trips. Travel demand forecasting for Dade County follows FSUTMS conventions and uses a fairly conventional trip purpose split as follows: home-based-work trips, home-based-shopping trips, home-based-social-recreational trips, home-based-other trips, non-home-based trips, truck/taxi trips, internal/external and through trips. The model has approximately 1,200 zones and is fully operational on RS/6000 computer platforms. It uses two networks - highway and transit - and performs modal splits between these models with a sophisticated nested logit mode choice model. Currently, the Dade County travel model uses the following thirteen-step menu to complete a model run.

1. External → EXT
2. Generation → GEN
3. Highway Network → HNET
4. Highway Paths → HPATH
5. Distribution → DISTRIB
6. Transit Network → TNET
7. Transit Path → TPATH
8. Mode Split → MODE
9. Transit Assignment → TASSIGN
10. Highway Assignment → HASSIGN
11. Transit Evaluation → TEVAL
12. Highway Evaluation → HEVAL
13. Air Quality Analysis → EMIS
14. Exit to System

3.3.2 Model Framework

The proposed truck model structure is based on several assumptions regarding truck traffic. This includes: (a) truck types (for example, light and heavy); (b) freight carried by trucks only; (c) separate truck assignment (use of all-or-nothing assignment); and, (d) combined auto and truck assignment using the FSUTMS equilibrium assignment. The "assignment" of traffic in the model refers to the allocation, or assignment, of specific trips on the roadway network. To obtain a picture of how trucks would function on an uncongested network, an all-or-nothing assignment (which assumes the trip follows the shortest path possible) is used. A second profile is presented using total traffic. Under total traffic, an equilibrium assignment is used which assigns trips based on congestion. Using the all-or-nothing assignment element as a starting point assumes trips on the free-flow path is available.

An example of the modules recommended for incorporating truck traffic into the Dade County Model is:

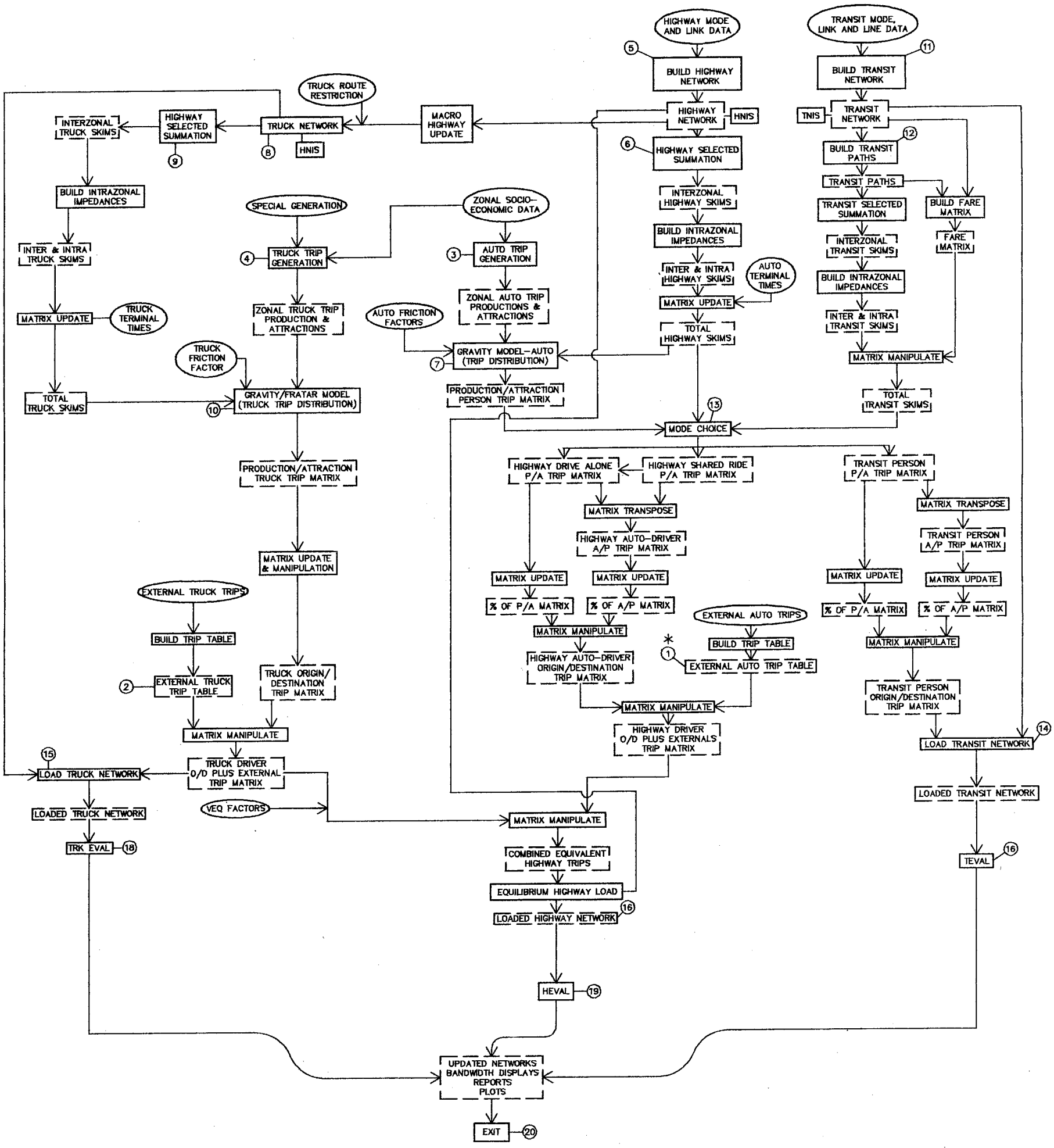
Module Description	Suggested Program/Name	Status
1. External - Auto	→ EXTAUTO	Modified
2. External - Truck	→ EXTTTRK	New
3. Generation - Auto	→ GENAUTO	Modified
4. Generation - Truck	→ GENTRUCK	New
5. Highway (Auto) Network	→ HNET	Unmodified
6. Highway (Auto) Paths	→ HPATH	Unmodified
7. Distribution - Auto[9]	→ DISTRIB	Unmodified
8. Truck Network	→ TRKNET	New
9. Truck Paths	→ TRKPATH	New
10. Distribution - Truck	→ DISTTRK	New
11. Transit Network	→ TNET	Unmodified
12. Transit Paths	→ TPATH	Unmodified
13. Mode Split	→ MODE	Unmodified
14. Transit Assignment	→ TASSIGN	Unmodified
15. Truck Assignment	→ TRKASIN	New
16. Highway (Auto and Truck) Assignment	→ HASSIGN	Unmodified[10]
17. Transit Evaluation	→ TEVAL	Unmodified
18. Truck Evaluation	→ TRKEVAL	New
19. Highway (Auto and Truck) Evaluation	→ HEVAL	Unmodified
20. Exit to System		

These status of these modules are categorized as "modified," "unmodified," and "new" based on action necessary to change the script and/or program. Figure 3-1 presents the suggested Dade County Travel Model with a truck element. It should be noted that the Dade County transit and highway models are much more sophisticated than this representation, housing nested logit mode choice models, multi-path, multi-period transit assignment, and HOV and TOLL modeling capabilities. For simplicity, details of those features are not shown in Figure 3-1. However, the nineteen modules necessary for the truck modeling activity are depicted in the diagram to show the interconnection among the modules. A description of the modules for which status identified as "new" and "modified" follows:

Module 1 and 2 (EXT AUTO, EXT TRK):

Through-trip tables for auto and truck need to be built based on an external station survey. South Florida is unique in that there is minimal flow of through truck traffic (of note, the Dade County model does not have an element to model external-external automobile traffic). Virtually all trucks coming into South Florida that are line-haul trucks must turn around and go back out of South Florida.

[9] In this pre-distribution stage, all person trips (both auto and transit) are distributed.
[10] Module 16 is classified as unmodified because factoring is being accomplished under module 16.



LEGEND

TRANPLAN/FSUTMS PROCESS

TRANPLAN/FSUTMS I/O FILE

USER INPUT ASCII DATA

* NUMBERING SYSTEM CORRESPONDS TO MODULE DESCRIPTIONS LISTED ON PAGE 43

FIGURE 3:1 - FLOW DIAGRAM OF A SUGGESTED TRUCK MODEL WITH AUTO AND TRANSIT MODELS.

F:\1669\1669FC.DWG

External-internal truck traffic would have to be separated from total external-internal traffic. Existing external station survey data should be examined to see if the auto and truck external-internal trip table could be assembled separately. This should be possible as FDOT usually records vehicle type information. A simple distribution of trucks and auto at each external station could be a starting point for separate auto and truck external trips. Truck trips should have separate distribution patterns among the internal zones than the auto trips.

Module 3 (GENAUTO)

The truck-taxi trip generation model for auto trips should be modified. The current truck/taxi purpose could be replaced with several purposes. The current FSUTMS truck-taxi (TT) equation is:

$$TT = 0.3 \text{ (dwelling units)} + 0.45 \text{ (total employment)}.$$

A possible scheme for replacing the truck/taxi trip would be new purposes for taxis and for light, medium, and heavy trucks. From trip end data obtained from travel surveys, a new equation for taxi trips should be developed. The State of Florida Model Task Force Committee is currently involved in testing alternative model structure for trip generation. Researchers are using travel data from several recent surveys. Those survey data should be analyzed for a possible trip generation model for the taxi trips. If this scheme does not work out for the immediate application of the proposed model structure, borrowing a taxi-trip model from another urban area should be considered. Any necessary change in the trip generation program is expected to be minimal unless the model selected for the taxi trips uses an independent variable either nonexistent in the current Zdata files or not easily available at the zonal level.

Module 4 (GENTRK)

A new truck travel survey providing information on trip end land-use variables and origin-destinations should be considered for developing a useful truck model. Survey analysis should determine the number of truck trip purposes as well as the land use variable and origin-destination movements for the trip generation equation. However, alternatives for Dade County are proposed in the absence of such a survey. The categories of trucks used by the three MPOs reviewed in the previous section in their truck models are:

MPO	Truck Category	Weight (maximum gross weight unless specified)
Chicago (CATS) (1986)	B Truck	8,000 lbs.
	Light	28,000 lbs.
	Medium	64,000 lbs.
	Heavy	84,000 lbs.
Phoenix (MAG) (1991)	Type 1	8,000 lbs.
	Type 2	28,000 lbs.
	Type 3	More than 28,000 lbs.
Vancouver (GVRD) (1991)	Light	4,500 - 20,000 kilograms
	Heavy	More than 20,000 kilograms

The Chicago Area Transportation Study (CATS) made a correlation between the surveyed land use categories (Residential, Retail, Manufacturing, Warehouse/Terminal, Government/Public, Service/Office, Construction, In-Transit, Landfills, Agricultural, Other) and a socioeconomic data file. Then an iterative procedure was used to determine the number of trips going to each zone for each land use category and vehicle type. Phoenix used a truck travel survey similar to the CATS travel survey. MAG has developed a trip generation model based on their travel survey for each of their vehicle type. The independent variables used in the Phoenix model are: total households, pubic employment, office employment, other employment, resident households, group-quarters households, total acres and vehicles. In the Vancouver model, trip generation equations for light and heavy trucks were developed based on a travel survey. The predictor variables used in the models are: population, wholesale, manufacturing, and non-wholesale employment.

Transferability of the MAG and GVRD trip generation model is assessed (Table 3-7) by comparing their predictor variables against zonal data of the Dade County travel model. Table 3-8 presents the 1990 Dade County employment in 2-digit SIC codes from two sources. The figures in this table were used as weights to derive a preliminary truck trip generation model for Dade County by transferring MAG's model coefficients (refer to Table 3-4).

Dade County employment categories were expressed in terms of the MAG's predictor variables. The derived Dade County Truck Trip Generation Models are shown in Table 3-9. The preliminary estimate of the coefficients can be used as a starting point. A validation effort may need to modify these coefficients for transferring the MAG model to Dade County. For example, differences in the commercial vehicle registration in two areas need to be compared to correct for regional biases. It is preferable to have models using their own travel survey. Models in Table 3-9 are proposed to avoid major collection/assembly of zonal data. Data on group-quarters households and total TAZ area need to be assembled at the zonal level. 1990 Census contains information on group-quarter households. Total TAZ area could be easily obtained from a GIS-mapping of zonal data.

The model in Table 3-9 uses the same truck classes used in MAG models. Once again, determination of trip classes will be best made through a travel survey identifying classes of vehicles that have dissimilar trip rates and average trip length. Such a survey may indicate the need for four truck classes (splitting the 28,000+ truck classes into two categories, one being 28,000 to 64,000 pounds and the other 64,000+).

Table 3-7

Correspondence between PHOENIX/GVRD Truck Generation Predictor Variables and Dade County Zonal Data

MAG Predictor Variables	GVRD Predictor Variables	SIC Codes[1]	Dade County Zonal Data[2]	
			Apply Directly	Do Not Apply Directly
Total households			Tot. Occu. Dwelling Units	
Resident Households			Tot. Perm. Occu. Dwelling Units	
Group Quarter HHs			Available	
Total Acres (*100)			Available	Available
Vehicles			Vehicles available in SF and MF Dwelling Units	
Retail Employment		50 - 51 52 - 59	Commercial Employment	
Industrial Employment		1 - 39	Industrial Employment	
Public Employment		91 - 99		Part of Service Employment
Office Employment		60 - 67 70 - 89		Part of Service Employment
Other Employment		40 - 49		Part of Service Employment
	Population		Available	See footnote 1
	Wholesale Emp.	50 - 51		Part of Commercial Employment
	Non-wholesale Emp.	1- 49 52 - 99		Total minus Wholesale Employment
	Manufacturing	20 - 39		Part of Industrial Employment

[1] Assigned SIC codes need to be verified from PHOENIX/GVRD officials.

[2] SIC for FSUTMS place of work employment:

Category	SIC-Code
Commercial	50 - 59
Industrial	1 - 39
Service	40 - 49, 60 - 99

Source: The Corradino Group

Table 3-8

1990 Dade County Place of Employment

Industry	SIC Code	CTPP Part B (A)	FDLES T6.23 (B)	Total Employment (A + B)/2	Percent	Dade Co. Employment Class
Agriculture, forestry, and fisheries	01 - 09	16081	12544	14313	1.5786%	Industrial
Mining	10 - 14	678	858	768	0.0847%	Industrial
Construction	15 - 17	58656	37748	48202	5.3164%	Industrial
Manufacturing	20 - 39	104398	87733	96066	10.5954%	Industrial
Transportation, communication & other public utilities	40 - 49	97809	78799	88304	9.7394%	Service
Wholesale trade	50 - 51	60825	69582	65204	7.1916%	Commercial
Finance, insurance & real estate	52 - 59	160135	164265	162200	17.8897%	Commercial
Services	60 - 67	77299	69469	73384	8.0938%	Service
Public Administration	70 - 89	318449	296489	307469	33.9120%	Service
Nonclassifiable (others)	91 - 98	39492	55013	47253	5.2117%	Service
	99	6575	438	3507	0.3867%	--
Total		940397	872938	906668	100.0000%	

(A) CTPP (Statewide), PART B
(B) 1992 Florida Statistical Abstract, Table 6.23

Source: The Corradino Group

Table 3-9

Dade County Truck Trip Generator Model Derived from Phoenix Truck Model

Independent Variable	Vehicle Weight (lbs.)		
	0 - 8,000	8 - 28,000	28,000+
Total Occupied DU	0.15433 [1]	0.06859	0.01260
Total Permanently Occupied DU	0.04004	--	0.00288
Group Quarter Households	--	7.52348	--
Total Area (acres *100)	--	--	0.00365
Vehicles	--	--	0.00062
Industrial Employment	0.64087	0.09972	0.04991
Commercial Employment	0.59091	0.13253	0.03685
Service Employment	0.38500	0.03405	0.01747

[1] Preliminary estimate of trucks one-way trips per unit of the independent variable.

Source: The Corradino Group

Another alternative transferred model (for only two truck classes) is proposed in Table 3-10. These models are directly taken from the GVRD model based on assumptions of employment correspondence. Although the models in Table 3-10 are much simpler, the assumptions behind transferability favor models of Table 3-9 over those in Table 3-10. However, both of these proposed models could be tested for Dade County.

The proposed model structure provides only for modeling truck traffic. The influence of other freight modes as well as the zones which will not be captured by the usual trip generation rates needs to be modeled through special generation techniques similar to those employed in auto trips.

Module 8 and 9 (TRKNET and TRKPATH)

The GVRD truck model uses a separate truck network for its light and heavy trucks. Neither CATS nor MAG truck models use a separate truck network. In order to produce separate estimates of truck traffic, a separate truck network should be built. Generally, MPO's have a truck route plan designating where truck movements are permitted. In most cases, the truck network should share the regional road network with passenger vehicles. In general, the truck network should be comprised of freeway, arterial and collector facilities. Minimal representation is given to local and residential roadways. Trucks (especially heavy trucks) may be restricted from certain roads on the county/MPO's truck route plan. For instance, weight limitations, truck maneuvering requirements, and local noise ordinances may forbid trucks to use certain roads and routes for through travel, or prohibit them from operating at certain times.

A highway network should be the starting point to build a truck network. TRANPLAN's "Macro Highway Network Update Procedure" may be employed to build the truck network from the highway networks. Each roadway link should contain speed and capacity or the information to obtain it. Analogous to the highway network, a speed capacity table for the truck network could be developed based on network attributes (for example, facility type, area type and number of lanes).

These attributes usually will come from the highway network. Additional data which affect the speed and capacities for the trucks should be considered. Alternatively, the posted speed limit for each route could be taken as a measure of truck speed and could be entered directly into the truck network. Two other major data items that need to be entered in the truck network are truck counts and the screenline information. Screenlines for the highway network could be used for the truck network. In the future, the location and number of screenlines could be adjusted based on validation requirements and/or major truck movements. For truck traffic counts, information from the FDOT's truck classification program could be utilized to develop the default truck percentages possibly by facility type and/or sectors. These percentages could be used to derive the truck traffic counts from the counts on the highway network. It is suggested that the derived default truck count at each screenline locations be replaced by the actual truck count if and when they become available. In addition, any other known truck count should replace the default truck count on the network.

Table 3-10

Dade County Truck Trip Generator Model Derived from GVRD Model

Independent Variable	Vehicle Category	
	Light (≤20,000 kg)	Heavy (> 20,000 kg)
Population	0.0103	
Commercial	0.327	0.164
Non-Commercial	0.0213	
Industrial		0.0103

Assumption on Employment - Correspondence:

GVRD	→	Dade
Wholesale	→	Commercial
Non-wholesale	→	Non-wholesale
Manufacturing	→	Industrial

TRANPLAN's "Highway Selected Summation" procedure could be employed to build truck paths. Any turning restrictions would be modeled through the turning prohibitor file (namely TRKTCARD.YYA). It may be necessary to have separate networks and paths for light/medium and heavy trucks to account for their differing speed and capacity characteristics as well as for differing limitations on the use of certain facilities. To keep the model simple, an initial truck model should consider only a common network. However, differing limitations on turning restrictions could be implemented through separate TRKTCARD.YYA files. An example of turning restrictions is a prohibition of trucks from using HOV lanes (such as is being proposed in Dade County). Terminal times for the truck trips are usually much different from the auto trips. These numbers typically weight class-based, should be derived from survey results. Intrazonal impedances for the truck trips could follow the same procedure used for auto trips. The resultant skims would then be used to distribute the truck trips among the zones.

Module 10 (DISTTRK)

In this report three MPOs (MAG, CATS, GVRD) reported using their own truck survey to develop the truck trip generation and distribution models. In the GVRD truck model, both heavy and light truck trips are allocated between origins and destination based on observed distribution patterns and then by applying the Fratar modeling technique. In the MAG truck model, TRANPLAN's "Gravity Model" technique is primarily used to calibrate the distribution parameter based on the travel survey distribution patterns. CATS used its 1986 truck survey to

develop the truck trip table. It is suggested that the Dade County MPO undertake a travel survey similar to CATS/MAG/GVRD truck study to develop information for the truck trip distribution model. Because current modeling capacity does not allow for modeling of chained trips, the survey information would focus on single trips. At a minimum, information on the truck trip length distribution by the truck type selected in the truck trip generation module would be necessary for the truck trip distribution model. TRANPLAN's GRAVITY/FRATAR model could be used to distribute the truck trips between origin and destination zones. In the absence of a origin-destination survey, the friction factor from the MAG model could be borrowed for the initial model runs and the truck trip length distribution, then model trip length will be validated against the survey trip length data, gathered from a small scale travel survey.

Module 15 (TRK ASIN)

Among the three MPOs (MAG, CATS, or GVRD) whose studies for truck trip models are referred to in this report, only GVRD used truck trip assignment. Automobile assignments linking travel time was used in the GVRD truck trip assignment. CATS and MAG recognize the slow moving characteristics and capacity limitation of truck trips through using passenger car equivalents (VEQ's) before combining truck trips to the automobile trips. For Dade County's proposed model, both techniques are suggested. A truck assignment will be carried out by an all-or-nothing assignment technique on the truck network. At the same time, truck trips should be factored through VEQ's to combine with auto driver trips for the combined highway assignment. In this process of combined assignment, the truck path would not be preserved in the equilibrium assignment. An alternative to this approach is to preload the truck trips from the all-or-nothing truck assignment with appropriate VEQ's applied to the truck trips. The equilibrium assignment for auto trips would then be performed on the preloaded truck assignment. In this process, the truck paths will be preserved.

Module 18 (TRKEVAL)

An evaluation routine similar to the highway evaluation routine (HEVAL) should be developed to assess the truck model. At the initial stage of truck model validation, truck screenlines should be assessed to modify distribution as well as generation parameters of truck trips. The overall truck-VMT from the model could be also checked against any independently estimated truck-VMT data.

Another alternative approach for simultaneous auto and truck assignment is to use TRANPLAN's high occupancy vehicle (HOV) assignment method. In this approach, three modes of traffic should be defined as follows:

- Truck only trips (mode 1),
- All single occupant vehicles (mode 2), and
- Carpool trips (mode 3).

An assignment group (an attribute of links file) for links where trucks are allowed should be identified and coded. Truck trips should be factored by VEQ's before assignment. After

assignment, the assigned truck loadings should be divided by VEQ's to get the actual estimate of truck traffic. The role of VEQ's in the assignment is to consider delay for trucks more appropriately in the equilibrium assignment algorithm.

3.3.3 Data Requirements to Support Potential Dade County Truck Model

Inclusion of an original truck element in the Dade County travel model will require specific data, some of which exist and some of which have to be revised or generated. These are:

1. Speed and capacity information for each link in the highway network (on hand).

2. Truck classification counts and screenline information (revised).

3. Truck trip length distribution by truck type (new).

4. Origins and destination of truck trips (new).

Speed and capacity information, along with classification counts, will be required. FDOT has some counts available, but it is anticipated that enhanced counts could be required. The number of counts will be determined by locations and availability of existing counts, and the degree to which truck information is available for screenlines (used to evaluate model performance).

Information on truck trip length distribution and origin-destination by type will need to be collected. As noted previously, the consultant has conducted two survey efforts of truck movement as a part of this study. The mailback survey distributed by the consultant resulted in about a ten percent response, which is considered acceptable for most surveys. But because of the significant differences in the types of organizations involved in trucking, very small percentages from every subgroup were actually received. Planning efforts in other communities had better experience with combination mailback-telephone surveys or traditional origin-destination personal interview surveys. The consultant also conducted personal interview surveys at three locations in Dade County. These surveys were very successful.

Information on truck trips can also be developed through review of trip logs, accessing computer inventories, etc., if allowed by the private sector. Because Dade County has a large number of fixed locations where many truck trips can be intercepted, there are a number of survey options to be explored for acquiring origin-destination data. In addition to the intermodal yards, interviews similar to those conducted by the consultant could be performed periodically at truck locations throughout the County.

The Freight Movement Plan for Dade County, that will be produced through this study, will include identification of recommendations for establishing a reliable base of information for supporting a truck element in the Dade County travel model.

4. ESTABLISH A FREIGHT MOVEMENT PLANNING PROCESS

This chapter develops and proposes a Freight Movement Planning Process for Dade County. The process must be consistent with the 23 statewide planning factors and the 15 metropolitan planning factors. It must also be consistent with and complement the six management systems as established under the Intermodal Surface Transportation Efficiency Act (ISTEA) and the proposed Florida Intermodal Management System.

In Dade County, the Congestion Management System, the Public Transportation Management System, and the Intermodal Management System are being integrated into a unified system known as the Integrated Management System (IMS). The freight movement planning process would work within the framework of the IMS. Freight and Truck Movement Planning Committee, made up of private sector representatives of freight companies and organizations, would be established with rotating membership to meet consistent with MPO policy for similar committees. This committee would provide input into the local transportation planning process, especially the annual TIP approval and amendment process, and the Long-Range Transportation Plan project priority and selection processes, relative to the needs of the freight industry, particularly relative to traffic and roadway concerns, and guidance in the project prioritization process.

This chapter is presented in three sections. First, the statewide planning factors (stipulated under ISTEA) are addressed. The fifteen metropolitan planning factors are addressed in the second section. (The legislation including the planning factors is included in Appendix B.) The third section summarizes the Freight Movement Planning process proposed for Dade County.

4.1 INTEGRATION OF DIFFERENT FREIGHT MODES

This study focuses upon freight movement which utilizes the surface transportation system of Dade County, i.e., the highway network, roads and streets. For a vehicle to be considered as part of the freight movement system, it must be used primarily for the movement of freight from a loading, or origination point, to an unloading, or destination point. The primary classification of freight movement is recommended to be:

1. Intermodal Freight Movement - movements in which the point of origin of the freight is a transportation mode (air, water, rail, road) different than the transportation mode for the subsequent movement of the freight. These are the freight movements that are truly intermodal. They are of special importance in this study because the freight facilities for three of the four modes (air, water, and rail) are extremely limited in number and fixed in location. These characteristics directly signify that all freight utilizing these modes, whether moving into or out of the area, must utilize the same small subset of highway facilities if they are making any movements other than transfer between cargo carriers within the same mode, such as movement from an inbound ship to an outbound ship without leaving the port.

The primary movements within intermodal freight movement consist of movements to and from Dade County warehouse/distribution facilities, manufacturing sites, and intermodal transfer facilities.

2. Delivery/Distribution Movements - The distribution and delivery movements of freight within Dade County are almost always conducted by trucks using the highways, roads and streets of Dade County. These movements can further be divided into three subtypes:

   - Delivery to manufacturing/industrial users. These movements can be estimated generally using the land use maps of Dade County which identify industrial/manufacturing land uses. Shipments to and from these sites may be intermodal (shipping freight to and from air, water, or rail facilities); or movements to other destinations by roadway within, or outside of, Dade County, Florida.

   - Delivery to commercial sites. These shipments typically begin at a warehouse or distribution facility, although they may be directly from a manufacturing site or an intermodal transfer facility. The largest number of these trips are to major shopping malls, downtown Miami, and similar retail centers where the truck traffic necessarily competes with private vehicle movements.

   - Materials delivery to construction sites. These movements, which include large numbers of trucks from the quarries in West Dade, involve movements which are constantly changing as development projects shift.

   - Residential delivery. This typically involves small package delivery to residential addresses throughout Dade County and does not permit modeling other than as an estimated and small percentage of the vehicles using the roads classified as minor collector or less.

4.2 MEETING STATEWIDE AND METROPOLITAN TRANSPORTATION PLANNING PROCESS FACTORS

4.2.1 The Fifteen MPO Factors

ISTEA lists fifteen factors that must be considered as part of the planning process for all Metropolitan areas. These factors shall be explicitly considered, analyzed as appropriate, and reflected in the planning process products. This section describes the way in which these fifteen factors are addressed within this freight movement study. The fifteen MPO factors and the way in which they have been considered or addressed by the present study are identified here:

1. **Preservation of existing transportation facilities and, where practical, ways to meet transportation needs by using existing transportation facilities more efficiently;**

   Truck volumes have a great impact on highway pavement life. In most pavement design procedures, the composition of pavement (thickness, materials, depth of subbase) is determined by the number of applications of a standard axle load during the pavement's

design life. More applications shorten the life of the pavement. Auto volumes usually are not part of the calculation. Thus freight movement, trucks, have a great impact here.

The preservation of existing transportation facilities can only be done effectively if good information is available concerning the impact of current and projected use upon the facility. In the case of pavement, bridges, and congestion, if preservation projects are to be scheduled and budgeted in a manner that will ensure the continued usefulness of the facility for its design purpose then the deteriorating effects of routine use must be accurately estimated. This requires a valid and reliable methodology for estimating the number and size of trucks and the materials being carried for each facility to be managed.

Maintenance priorities must be cognizant of the impact of freight movement on each facility and its resultant effect on the life expectancy of the facility. Design standards for construction should consider roadway materials and depth as well as curves, intersections, clearances, grades, and other factors which can limit a facility's utility for trucking use or eliminate it entirely as a freight movement option. Maintenance construction scheduling should be planned in coordination with truckers and shippers to mitigate the impact of a temporary loss of capacity.

The balance between allowable truck and trailer lengths and gross weights which might reduce the volume or significantly impeded the flow of traffic, and the impact of larger trucks on the roadway surface must be carefully maintained. This information should be developed in conjunction with freight movers and highway design engineers.

Currently it is cost effective to make periodic traffic counts to determine the number and size of trucks using key roadway links. While there is automatic equipment that can count trucks, few agencies have it. Thus, most truck counts come from manual classification counts. The work in this study identified clearly the general lack of suitable truck traffic data on the roadway network. Through DOT's IMS data collection efforts, emphasis should be placed on establishing regular automatic counts capacity access the roadway network.

2. Consistency of transportation planning with applicable Federal, State, and local energy conservation programs, goals, and objectives;

Any measures which reduce delay on the region's roadways will reduce energy consumption. Virtually every improvement considered in this study would, if adopted, have this effect. Improvements in signalization, scheduling rail movements away from peak hours, and improving access to intermodal facilities would all reduce delay both for freight and for all other vehicular traffic.

3. The need to relieve congestion and prevent congestion from occurring where it does not yet occur;

Relieving congestion within Dade County is a traffic problem of proportions that include issues of freight movement. In general, congestion poses two questions to the freight movement community: (1) can freight movement vehicles be persuaded (or permitted) to use alternate routes rather than more congested major arterials?; and, (2) can truckers be influenced to use the more congested routes at times other than peak drive times? Freight movement is driven by the economic considerations of minimizing costs and maximizing mobility. This is in contrast to passenger vehicle movement which is often driven by factors such as work schedules, convenience, comfort, familiarity, and habit, in addition to the minimization of travel time and distance. Understanding the driving forces behind freight movement scheduling, it is apparent that it is in the best interest of freight movers to operate their vehicles, insofar as possible, on less congested roadways and at times other than peak drive times. The timing of deliveries is often a function of the requirements of the customer to have just-in-time delivery or delivery during limited hours of operation, thus constraining some delivery alternatives.

While the delivery of fresh baked goods to grocery stores as they open each morning has been cited as an example of this need to be on the roads in peak drive time, it is not the only example; many retail and non-retail businesses make demands upon freight movers that require travel during the hours when most passenger vehicles are also on the road. Innovative steps have been taken in recent years in the freight movement industry to permit deliveries at hours when traffic is at its lowest. These include providing drivers with keys to customers' facilities and to burglar alarms so that they may make nighttime deliveries to customers whose facilities are not attended during those hours. Insofar as possible, truckers encourage this and benefit from such efficiencies. However, nighttime driving has a relatively high risk of accident and only a minority of businesses are willing or able to permit unattended access to their facility by delivery drivers during off hours.

Analogous attempts at relieving congestion by altering schedules have focused on reducing the use of the highway network by passenger vehicles, as opposed to freight-moving vehicles, during peak drive time. Staggering the beginning hours of work, utilizing flex-time for some workers, and permitting increasing amounts of work to be done at home using modern telecommunications techniques rather than at the work site. All serve to either eliminate or shift peak period traffic away from the most congested conditions. While each of these has had some effect, none of them have proven to be major relievers of traffic congestion. Nevertheless, this topic of scheduling the use of highways proactively will continue to receive attention by MPOs and by freight movement advisory councils.

The issue of identifying alternate, less congested routes for freight movement is even more problematic. There is no generally available truck route plan or system in Dade County. Some areas, such as Pinellas County, have established truck plans and routes. For the most part, freight movement is conducted by, and through, vehicles which require wider roadways and turn radii than are found on typical residential streets throughout the community, as well as for the preponderance of right turn movements at even major intersections. They also benefit greatly from free flow with minimal traffic control devices. Study research indicates that some of the larger trucking firms look aggressively for better routing for their vehicles

along major corridors through Dade County, but the constraint to operate on roadways with design characteristics that permit safe and efficient truck movement limits the options. It is possible that the MPO will be able to identify one or more routes, parallel to currently congested routes, which through some modest upgrade(s) could be made more suitable to and useful for truck movement. This topic should continue to be explored.

Looking to the future, it is important that projections of commercial/industrial/residential growth be refined and that the land uses wherein such growth will occur be reviewed carefully for freight movement access. There are too many cases in Dade County of roads which must be accessed by trucks (mini-warehouse developments are an example) and which have geometrics which make such access both difficult and potentially hazardous. When reviewing the anticipated growth for the next 20 years and beyond, roadways could be designed, and turns could be built with sufficient geometric characteristics, to permit easier flow of freight transported by both straight trucks and tractor trailers.

In the course of looking at future growth, it is recognized that some new intensive warehouse and distribution area may be needed in southern Dade County and that its development could and should be controlled rather than occurring haphazardly. Because such areas ideally require particular kinds of roadways for the truck traffic servicing them, these facilities should be located in close proximity to one another, to utilize the same roads for access and egress to the major highway network, and sized to allow for future growth of the activity areas and the probable increase in trucking to serve the areas.

4. **The likely effect of transportation policy decisions on land use and development and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans;**

Among the land use and development issues which address freight movement concerns are:

- The utilization of land use controls to consolidate warehouse and distribution facilities in a fashion that will permit the construction or re-construction of roadways to serve the movements between these facilities and the highway network which is utilized by freight movers. This will reduce the number of roadways which will require a higher design standard to accommodate the length and weight of increased volumes of trucks and semi-trailers.

- Land use controls which accommodate large trucks and trailers in and to the commercial areas of new development and provide for loading and unloading of these vehicles in a manner which minimizes competition with passenger vehicle movements.

- Policies regarding access to multimodal facilities which separate automobile traffic and passenger bus traffic from truck movements to the extent possible.

- Infill policies which seek opportunities to elevate the design and construction of older areas and their roads to accommodate current freight movement appropriate to the land use being developed.

5. **Programming of expenditures for transportation enhancement activities;**

Programming of expenditures for transportation enhancement activities must focus on the best possible identification of present and future problem sites. These will include not only major collector (and above) corridors but will also include many local streets and intersections which truckers report as difficult or hazardous and other intersections which might provide a more direct route for trucks but which are largely unused because they are impractical and hazardous to navigate given present design and conflicting traffic. Among the solutions which should be explored are improved turn geometry, limited parking to permit use of a wider piece of the roadway in making turns, traffic signals, and prohibitions against trucks on certain congested roads where suitable and not inefficient alternative routes exist or can be arranged.

A particular problem exists in local access and egress to the Port of Miami because inbound and outbound trucks and tractor trailers are forced to utilize city streets for some 8 to 12 blocks between the interstate system and at the port. A tunnel, known as the Port of Miami tunnel, is identified in the County 2015 Transportation Plan, is an example of a solution to a problem that would be highly effective, but which has been slow to realization because of its cost and funding constraints.

6. **The effect of all transportation projects to be undertaken within the metropolitan planning area, without regard to the source of funding;**

All transportation projects proposed for the metropolitan area, regardless of funding source, should be reviewed by a freight movement advisory at an early stage for advice and comment regarding their singular and combined impacts upon the flow of freight in the area. Among the topics to be reviewed by this growth would be connectivity with existing freight movement routes and the impact on the cost of freight movement.

These reviews should also consider alternate routes that are proposed to be used during any necessary construction delays and the timing of such construction as it affects major freight movement throughout Dade County.

7. **International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, recreation areas, monuments and historic sites, and military installations;**

Issues regarding access to ports, airports, railroads, and related intermodal transportation facilities should be viewed on both a macro and a micro level in Dade County. At the micro level, those local roads and streets providing connectivity between the highway network of major collectors and above with the intermodal transfer facilities, in particular the Port of Miami, should be reviewed during the transportation planning process to identify the most cost-effective routes that can be taken by freight moving on the highways. These routes will then be explored to see what limitations exist that prevent them from being used by trucks,

semi-trailers, passenger buses, and other freight-bearing vehicles and, where necessary and possible, recommendations will be made for altering such things as roadway width, turn geometrics, parking restrictions that might degrade turn geometrics, and truck prohibitions in cases where that may be necessary.

On the macro level, a review will be made of the routes that provide most of the freight movement between intermodal transfer facilities on an east-west corridor beginning at the Port of Miami extending through Miami International Airport to the warehouse distribution facilities located west of the airport and on to the Free Trade Zone. Recommendations will be made concerning improvements that must be made to improve the quality of freight movement along this east-west corridor. At the same time, a review of north-south freight movement, primarily on the interstate highway system and the H.E.F.T. and the major arterials and limited-access roads of the highway network, will be reviewed for potential improvements in capacity and freeflow speeds.

Finally, growth projected to take place in Dade County, primarily in the southern half of Dade County, will be reviewed to see what impact it will have upon connectivity of the major intermodal transfer facilities.

8. Connectivity of roads within metropolitan areas with roads outside those areas;

The focus on connectivity will be on the movements north-south to and from Broward County and east-west to and from the central and northwestern portions of South Florida. The very limited number of roadways moving east-west into Dade County are complete portions of the statewide highway network and have no connectivity problems. Likewise, major north-south arterials utilized for freight movement are already part of the highway network and have seamless connectivity between Broward and Dade County in all cases.

9. Transportation needs identified through the use of the six management systems;

In this early stage of utilization of the ISTEA-mandated management systems, initial attention is being paid to ensure that the management systems most significantly impacting freight movement (pavement, bridge, and congestion) each accurately reflect the role of the highway network in moving freight. The pavement and bridge management systems, for example, will not be able to project life-cycle costs nor to schedule maintenance, preservation, improvement, and enhancement (P/I/E) projects unless they include accurate data concerning the number and type of trucks using those facilities. Once this verification has been obtained, the output from these systems should be reviewed to enable FDOT and the MPO to provide pro-active planning for potential delays and re-routings that will be necessitated by the projected maintenance and preservation, improvement, and enhancement projects.

With regard to the congestion management system, it is imperative that the MPO continually monitor the output, conclusions, and results of the projects of that management system in

terms of their impact upon roads and streets which are adjacent to, parallel to, and otherwise serve the highway network being reviewed by the CMS.

10. Preservation of existing rights-of-way for construction of future transportation projects, including future transportation corridors;

Given the heavily built-up nature of most of Dade County, there are very limited opportunities for expansion of existing rights-of-way in the portion of the network serving most freight movement traffic. In the areas that are most congested, the opportunities for additional right-of-way are severely limited by factors which can be expected to compete effectively against transportation needs. Nevertheless, all currently held rights-of-way should be reviewed for continuity and for adequacy in terms of the 20-year projections of the travel demand model; the review should include the identification of future commercial and industrial sites and the access between those sites and the highway network as well as the impact of adding freight movement from those sites to the highway network. A review of the impact of changes in the status of the former Homestead AFB suggest that there will be little impact from this site upon freight movement for the next 5 to 10 years and future updates of this plan and the LRTP, must continue to look at the developments of that facility as they impact freight movement.

11. Enhancement of the efficient movement of freight;

Absent a prohibitively expensive large-scale origin-destination study, the available traffic counts and truck-vehicle percentages provide sufficient but generalized estimates of freight movement flow in major corridors and on major highway network links to permit the identification and assessment of possible enhancement measures. In fact, freight movement is actually undergoing restrictions on some segments of the roadway network. As an example, Dade County is considering restricting truck access to the HOV lane on I-95. The most effective enhancements identified thus far have been in the area of movements between intermodal facilities and the highway network over local streets and roads. These include the widening of some roads, altering the geometrics of some curves and intersections, and prohibiting parking within a specified distance of corners where large trucks must make difficult turns. The list of restrictions which might be mitigated by enhancement projects include weight restrictions, vertical and lateral clearance restrictions, turn radius limitations, noise pollution, hazardous cargo restrictions, and traffic conflicts. Most of these restrictions would apply to buses as well as to trucks.

For example, on the narrow corridor between the Port of Miami and the Buena Vista Intermodal Yard, a potential enhancement might be the modification of the existing, lightly used, rail right-of-way to accommodate semi-trailers. At the present time, this movement between the part of Miami and Buena Vista Rail Yard is very difficult and slow, sometimes taking as many as 45 minutes to move less than 5 miles. The existing railroad right-of-way includes signalization and gates at intersections. Trucks could move in convoy fashion, 10 to 20 trucks at a time, through this corridor at a relatively high rate of speed and cause no more disruption to local traffic than a train movement would cause. This particular enhancement warrants additional study.

12. The use of life-cycle costs in the design and engineering of bridges, tunnels, or pavement;

It is important to ensure that all life-cycle costs and cost-benefit analyses accurately incorporate and reflect the impact of trucks on the life-cycle costs of maintaining, preserving, and eventually replacing freight movement facilities as well as the economic benefits produced by more efficient freight movement.

13. The overall social, economic, energy, and environmental effects of transportation decisions, including consideration of the effects and impacts of the plan on the human, natural, and man-made environment;

There would be some social, economic, energy, and environmental (air quality and noise impacts) effects to any improvement in the flow of trucks throughout Dade County. Each of the recommendations made in the course of this study is designed to improve the flow of freight movement throughout Dade County and consequently would have positive effects upon the economy by lowering the cost of freight movement: energy costs would be lower from less time spent at slow speeds in idle; likewise environmental "costs", especially impacts upon air quality, would be reduced. This proposal would also move toward removing undesirable chronic truck traffic from residential neighborhoods, and retail commercial areas, except where absolutely required.

14. Expansion, enhancement, and increased use of transit services.

The recommendations from this study would not have a significant impact on general transit use. However, of significance will be the development of the multimodal transportation center at Miami International Airport. While the focus of the multimodal center will be passenger traffic, there will be capacity for trucks, small goods distribution, etc. In addition, as the Metrorail network expands in the County, opportunities can be explored for adding goods delivery capability to the system. It is understood that such activity may be totally infeasible today with, despite congestion, relatively cost effective capability to distribute goods by truck or van. However, as congestion worsens, innovative ways to use the existing transportation system, including Metrorail and Tri-Rail, should be explored.

15. Capital investments that would result in increased security in transit systems.

Apart from the vehicle travel demand reductions that would result from increased transit ridership, transit has little or no relevance to this study

4.2.2 The Twenty-three Statewide Factors

ISTEA requires that, at the statewide level, each state shall, at a minimum, explicitly consider, analyze as appropriate and reflect in the planning process products the following factors. Most of them have been considered as part of the fifteen MPO planning factors listed above.

1. **The transportation needs identified through the management systems;**

   See # 9 above.

2. **Consistency of transportation planning with applicable Federal, State, and local energy conservation programs, goals, and objectives**

   See # 2 above.

3. **Strategies for incorporating bicycle transportation facilities and pedestrian walkways in appropriate projects;**

   Beyond the potential for reduction of pedestrian/cyclist conflicts on local streets and roads with trucks, and the intended reduction in accident rates, this factor has little or no relevance to the present study.

4. **International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, recreation areas, monuments and historic sites, and military installations;**

   See # 7 above.

5. **The transportation needs of non-metropolitan areas through a process that includes consultation with local elected officials;**

   Metro Dade covers the entire county but there are many small jurisdictions which still have considerable autonomy and control of maintenance and improvement of traffic movements within their boundaries. These jurisdictions need to be involved, preferably at a separate committee or council level, which can then be represented at the MPO.

6. **Any metropolitan plan developed pursuant to the Federal Transit Act;**

   Apart from the demand reductions that would result from increased transit ridership transit has little or no relevance to this study.

7. **Connectivity between metropolitan areas within the state and with metropolitan planning areas in other states;**

   See # 7 above.

8. **Recreational travel and tourism;**

   Increases in travel or tourism add to the congestion of the community's roadway network. The planned expansion of any attractions for such travel should be brought to the attention of freight movers at the earliest possible date for their advice concerning economic impacts on freight movers and their customers as well as to give them time to plan alternate routes where necessary.

9. **Any State plan developed pursuant to the Federal Water Pollution Control Act;**

   Little or no relevance.

10. **Transportation system management and investment strategies designed to make the most efficient use of existing transportation facilities;**

    See # 1 above.

11. **The overall social, economic, energy, and environmental effects of transportation decisions, including consideration of the effects and impacts of the plan on the human, natural, and man-made environment;**

    See # 13 above.

12. **Methods to reduce traffic congestion and prevent congestion from occurring where it does not yet occur;**

    See # 3 above.

13. **Methods to expand and enhance appropriate transit services and to increase the use of such services;**

    Apart from the demand reductions that would result from increased transit ridership transit has little or no relevance to this study.

14. **The effect of transportation policy decisions on land use and land development and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans;**

    See # 4 above.

15. **Strategies for identifying and implementing transportation enhancement activities;**

    See # 11.

16. The use of innovative mechanisms for financing projects, including various capture pricing, tolls, and congestion pricing;

FDOT is already using reduced tolls on the H.E.F.T. as a way to increase its use by trucks, and hopefully attract them from more congested roadways, such as I-95. Congestion pricing and other innovative mechanisms could also have an effect on freight movement. As an example, congestion pricing might shift some truck movements to off-peak travel.

17. Preservation of existing rights-of-way for construction of future transportation projects, including future transportation corridors;

see # 1 above.

18. Long-range needs of the State transportation system for movement of persons and goods;

This is directly applicable, but it is not yet available on a statewide basis. Locally, needs of the State road system have been addressed in this study.

19. Methods to enhance the efficient movement of commercial motor vehicles;

See # 11.

20. The use of life-cycle costs in the design and engineering of bridges, tunnels, or pavement;

See # 12 above.

21. The coordination of transportation plans and programs developed for metropolitan planning areas with statewide transportation plans and programs, and the reconciliation of such plans and programs as necessary to ensure connectivity within transportation systems;

Statewide plan not yet available.

22. Investment strategies to improve adjoining State and local roads that support rural economic growth and tourism development;

The agricultural economy of South Florida places some demand on the highway network and the roadways where that demand conflict with other automobile and truck traffic should be identified and monitored for potential improvements.

23. The concerns of Indian tribal governments;

No relevance.

4.3 FREIGHT PLANNING PROCESS

The overall objective of ISTEA is the improved performance of the national transportation system, largely by improving statewide and metropolitan transportation systems through preservation, operations, and capacity enhancements. This is accomplished through the utilization of six prescribed management systems which provide information concerning both the condition and performance of both the existing and future transportation system in terms of the six specific areas they address. Three of the systems (bridge, pavement and public transportation) tend to focus on the management of system assets. The other three focus more on the performance aspects of the system. All six, however, must produce strategies for ensuring that the performance of the current and the future systems is optimized, in terms of each individual system, the overall transportation system and the performance measures established for the metropolitan area.

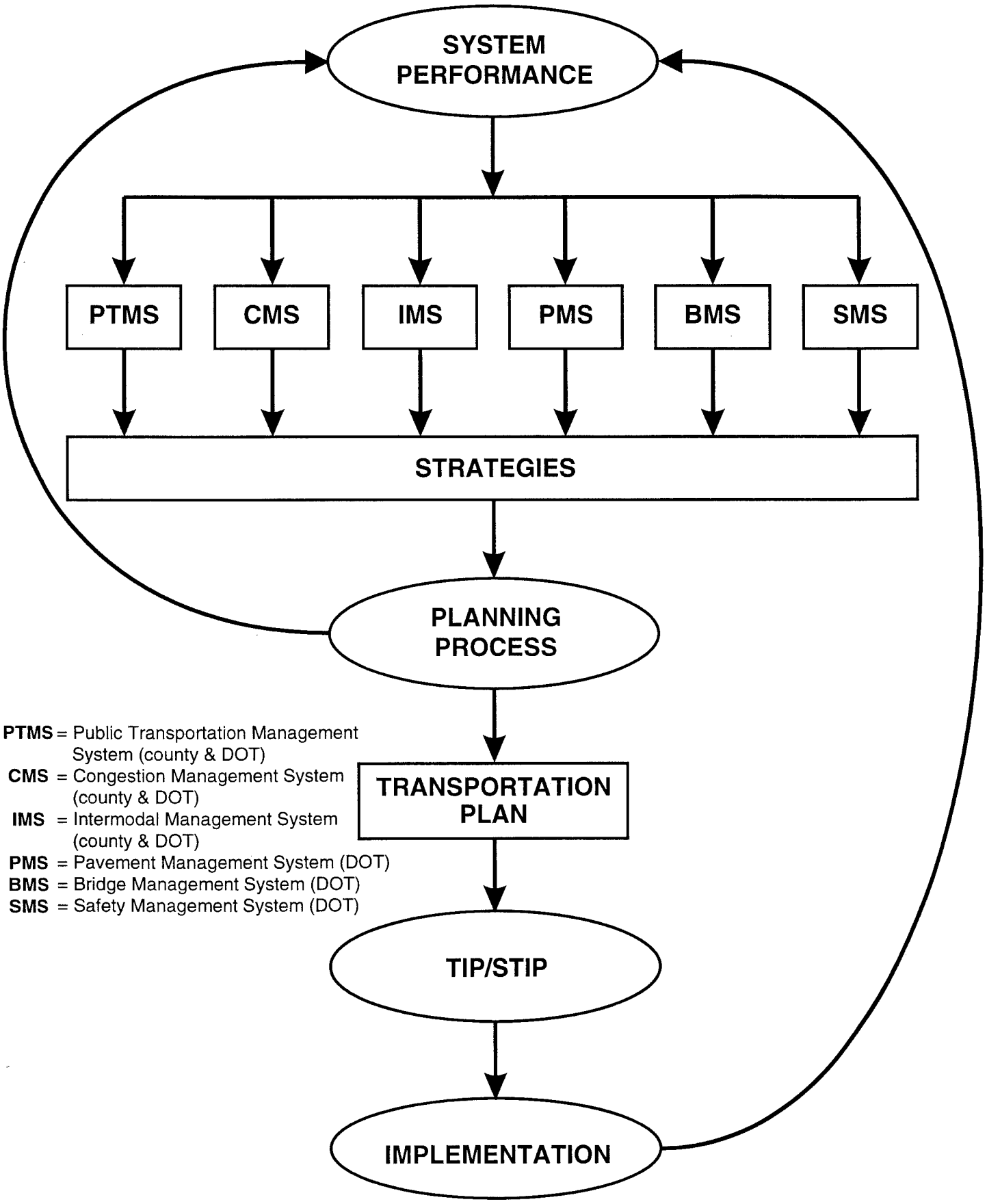
The ISTEA planning process provides a mechanism for linking the exiting human, natural and built environment with future development patterns. In meeting the demands of the current and future system users, the process must address not only the results of the management systems but the other factors specified by ISTEA. The planning process as envisioned in ISTEA is a dynamic activity which effectively integrates current operational and preservation considerations with longer term mobility, environmental, and development concerns. While the planning process must address the production of plan, it also must provide an ongoing context for metropolitan and statewide decisionmaking that supports integration of the multiple dimensions of the transportation decision process. Figure 4-1 illustrates the role of the planning process with respect to feeding into the Long-Range Transportation Plan and the Transportation Improvement Program and State Transportation Improvement Program while at the same time providing input regarding system performance measures which are then utilized by the six management systems to develop strategies which then feed back into the planning process. Within the metropolitan planning areas, the Congestion Management System (CMS), the Public Transportation Management System (PTMS), and the Intermodal Management System (IMS) shall, to the extent appropriate, be part of the metropolitan planning process.

Within this context proactive public involvement processes shall provide a two-way communication channel between interested public and the agencies and organizations responsible for the maintenance and improvement of the transportation system. It is important to note that a significant amount of the traffic on metropolitan highways, roads, and streets is commercial traffic and that its role in the vitality of the economy - which provides jobs for many of those persons carried by passenger vehicles on the same highways, roads, and streets - is critical. Consequently, it is deemed important that the MPO act affirmatively to obtain the involvement and participation of those organizations operating the freight movement vehicles on all transportation modes throughout the MPO.

It is the goal of this study and the particular topic of this section to describe the manner in which the ideas, concerns, and needs of the freight movement sector can be incorporated into the MPO planning process. Just as the planning process both receives information from management systems and feeds back advice to the measurement of system performance which is the foundation

Figure 4-1

ISTEA MPO Planning Process



of the management systems, so also the input of freight should be felt both at the level of identifying appropriate system performance measures, highway and bridge design standards, and intermodal facility operational standards) as well as in the development of strategies to ensure the preservation, maintenance and improvement of the entire transportation system.

This level of involvement requires the institutionalization of a role for the freight movement community within the planning process of the MPO. The planning process of the MPO must be a combination of professional input, public input including special interest groups, and the input of those private organizations which operate public transit systems and public freight movement systems. In view of the fact that the freight movement system is largely a privately owned and operated system it is important that the MPO solicit and permit participation by persons and organizations who validly represent significant shares of the freight movement community. Towards this end the MPO should work with the American Trucking Association, local Chambers of Commerce, and other organizations, to identify the best possible representation for freight movement interests within the MPO planning process.

The freight planning process at an MPO level today must adapt to a severe limitation of good data that is needed to monitor and manage MPO level responses. Several steps should be taken to provide the best available information regarding the present and future needs and impact of freight movement.

First, to the greatest extent possible, depending upon budgets and technology, all traffic counts should identify truck movements, the MPO should work with FDOT and others developing traffic counts to strongly encourage the inclusion of this mode. Absent such counts on a more universal basis, the best estimates of the percentage of highway traffic that consist of straight trucks and tractor-trailers should be maintained and updated through visual inspection and other currently employed methods.

Second, the establishment and maintenance of groups such as the American Trucking Association's (ATA) "Freight Stakeholders National Network" at the local level provides an opportunity to ensure that all applicable metropolitan Dade transportation planning activities have input from regional truckers and intermodal facility operators. The Freight Stakeholders include railroads, port authorities, manufacturers, air freight carriers, and terminal operators, among others. These networks have been established in a number of cities already; the MPO should initiate work with ATA to see that a Dade County group is established. The ATA reports that these groups intend to remain independent of any governmental organizations but they are willing to provide representation on MPO advisory groups. Such an arrangement should be institutionalized. The large number of private trucking operations (not reported as licensed for-hire carriers) makes it impossible to maintain a complete record of the volume of such activity or an inventory of materials carried in any other realistic manner.

Third, the intermodal transfer of freight which arrives or departs by air, water, or rail can be estimated more accurately than that for highway-only freight movements since these modes provide some regular reporting to state and federal offices concerning all or part of their activity.

These sources should be encouraged to provide additional data that would make it possible to identify origins and destinations of their freight in some geocodable manner.

Fourth, an effort should be made to obtain O-D data when freight movers are interviewed and to include freight movement when O-D studies are made of other modes.

Fifth, a microanalysis of freight movement in, and around, intermodal transfer facilities should become part of a regular, periodic assessment of the transportation network. In most cases, the microanalysis will cover streets and roads where trucks and passenger vehicles contend for the same limited roadway space. Important gains often are possible in this area with less capital expenditure.

The Dade County Freight Movement Planning Process should be complementary to the management systems and Florida's Intermodal Planning Process. Figure 4-2 identifies conceptually how the process works. As can be seen in Figure 4-2, the planning process links to the Intermodal Data System. While the state system will not capture all the data needed in Florida's process, interaction with the state process is recommended so that data collected are complementary and original data collection needs are minimized, and local data can also help feed statewide information needs.

The major steps in the Dade County Freight Movement Planning Process are recommended to be the following:

1. Establish Freight and Truck Committees (structures within the overall MPO master organization as shown in Figure 4-3)
2. Establish Goals and Objectives
3. Establish Data Base on Truck and Freight Activity
4. Coordinate Data Base with Local and State Data Management Systems
5. Include Truck and Freight Movements in Dade County Travel Model
6. Include Freight considerations in TIP Needs Identification Process
7. Establish Funding Set-Asides for Freight Elements
8. Define Advanced Technologies and Innovative Techniques
9. Present candidate projects to Freight Advisory Task Force
10. Identify Strategies and Actions
11. Develop an Implementation Plan (projects included in TIP)

This process is based on Florida's Intermodal Planning Process and will allow for interaction and cooperation at key levels (i.e., data collection, demand forecasting, funding).

Figure 4-2

Dade County Freight Movement Planning Process

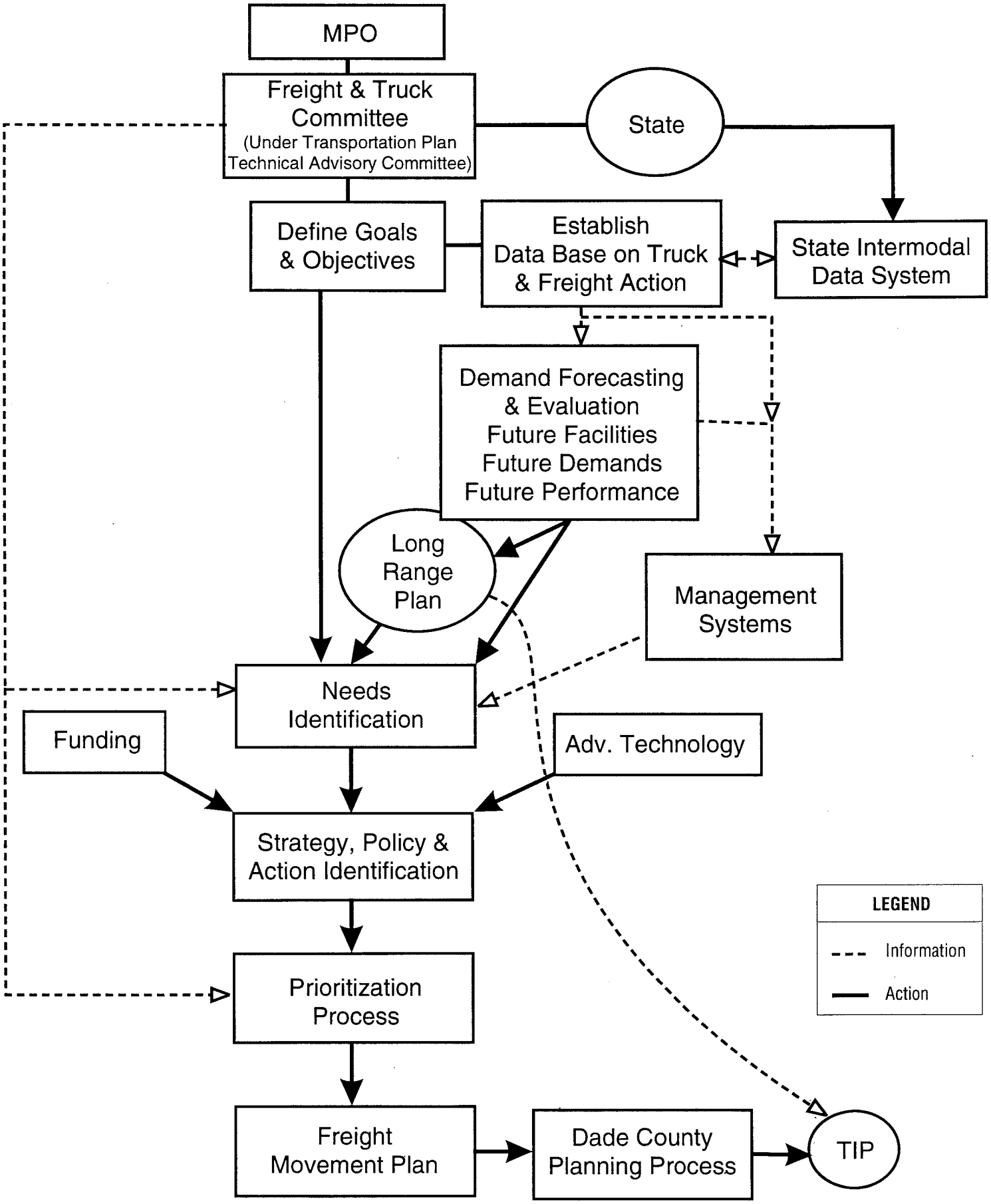
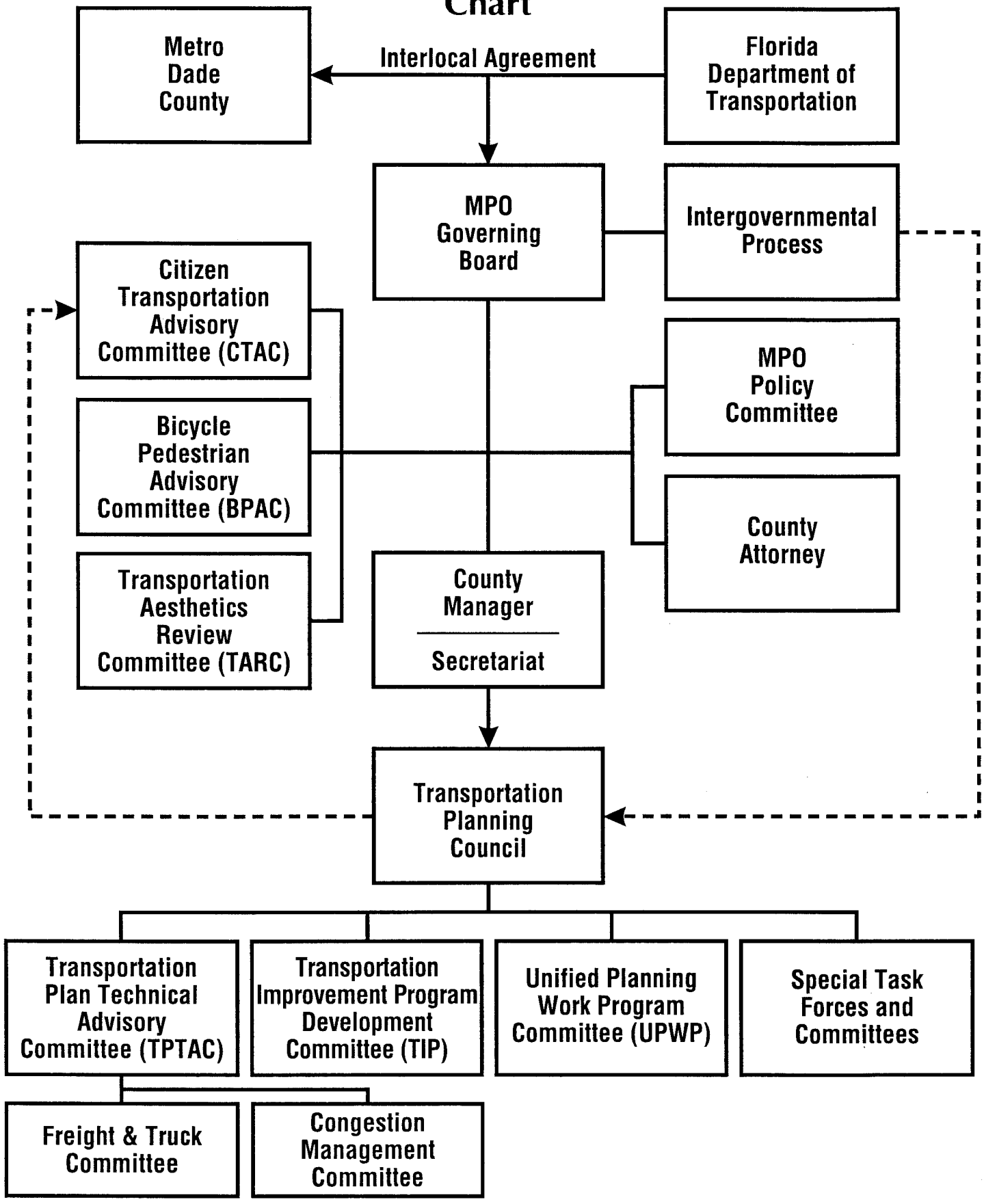


Figure 4-3

Metropolitan Planning Organization Master Organization Chart



APPENDIX A

SURVEY FORM: ON-SITE TRUCK ORIGIN-DESTINATION SURVEY

ORIGIN-DESTINATION SURVEY Form No._____
TODAY'S DATE:___9/15/95___

1. Interview Location: Free Trade Zone

2. Approximate Time of Interview:

   ☐ 8:00 - 9:00 AM ☐ 9:00 - 10:00 AM ☐ 10:00 - 11:00 AM ☐ 11:00 - 12:00 PM

3. Where were you before you arrived here:

   ☐ Free Trade Zone ☐ Port of Miami ☐ Miami Airport ☐ FEC Railyard ☐ Other (Zone)_____

4. Could you tell me the nearest intersection or zip code of your origin (where you started from):

   TAZ [ ]
   Street A:_____
   Street B:_____
   Zip Code:_____

5. Which major roads did you drive on to get here (check all applicable roads):

   ☐ I-95 Northbound
   ☐ I-95 Southbound
   ☐ Palmetto X-Way Northbound
   ☐ Palmetto X-Way Southbound
   ☐ Okeechobee Road Northbound
   ☐ Okeechobee Road Southbound
   ☐ SR 112 Eastbound
   ☐ SR 112 Westbound
   ☐ SR 836 Eastbound
   ☐ SR 836 Westbound
   ☐ Tamiami Tr. Eastbound
   ☐ Tamiami Tr. Westbound
   ☐ Turnpike Northbound
   ☐ Turnpike Southbound
   ☐ US 1 Northbound
   ☐ US 1 Southbound

   Other frequently traveled truck routes to get here:

   _____ _____ _____
   _____ _____ _____

6. What is your next destination (after leaving here):

   ☐ Free Trade Zone ☐ Port of Miami ☐ Miami Airport ☐ FEC Railyard ☐ Other (Zone)_____

7. Could you tell me the nearest intersection of zip code where your destination is:

   TAZ [ ]
   Street A:_____
   Street B:_____
   Zip Code:_____

8. Which major roads will you drive on to get to your next stop (check all applicable roads):

   ☐ I-95 Northbound
   ☐ I-95 Southbound
   ☐ Palmetto X-Way Northbound
   ☐ Palmetto X-Way Southbound
   ☐ Okeechobee Road Northbound
   ☐ Okeechobee Road Southbound
   ☐ SR 112 Eastbound
   ☐ SR 112 Westbound
   ☐ SR 836 Eastbound
   ☐ SR 836 Westbound
   ☐ Tamiami Tr. Eastbound
   ☐ Tamiami Tr. Westbound
   ☐ Turnpike Northbound
   ☐ Turnpike Southbound
   ☐ US 1 Northbound
   ☐ US 1 Southbound

Other frequently traveled truck routes to get to your destination:

_____ _____ _____
_____ _____ _____

APPENDIX B

O/D TAZ PAIRING ON-SITE TRUCK ORIGIN-DESTINATION SURVEY

ORIGIN AND DESTINATION OF TRUCK TRIPS

ORIGIN TAZ	DESTINATION TAZ	NO. OF TRIPS
2	2	5
2	81	5
2	111	5
2	147	5
2	167	5
2	179	5
2	183	10
2	185	5
2	190	15
2	191	5
2	192	5
2	193	20
2	194	5
2	212	5
2	213	5
2	232	5
2	259	10
2	268	5
2	269	15
2	270	5
2	318	10
2	336	5
2	377	5
2	379	5
2	383	5
2	391	10
2	400	5
2	414	10
2	420	10
2	421	5
2	422	5
2	423	20
2	424	10
2	426	10
2	427	5
2	433	10
2	444	5
2	446	5
2	447	5
2	451	157
2	452	10
2	453	35
2	454	25
2	455	10
2	457	25
2	479	20
2	481	5
2	482	13
2	488	30

ORIGIN AND DESTINATION OF TRUCK TRIPS

ORIGIN TAZ	DESTINATION TAZ	NO. OF TRIPS
2	489	5
2	491	20
2	492	5
2	493	15
2	494	5
2	497	5
2	512	10
2	513	5
2	518	25
2	527	5
2	555	5
2	559	5
2	563	5
2	568	5
2	572	5
2	585	5
2	589	5
2	598	5
2	601	5
2	1183	236
2	1197	10
2	1198	30
79	2	5
102	2	5
102	451	15
104	451	7
105	451	7
111	2	5
118	2	5
167	2	5
177	451	7
183	451	15
183	482	4
185	2	5
187	451	7
190	2	20
190	451	7
190	482	2
191	482	2
193	2	35
193	451	37
194	2	15
194	451	15
194	482	2
195	2	5
210	2	5
212	2	5
247	451	15
253	451	7

ORIGIN AND DESTINATION OF TRUCK TRIPS

ORIGIN TAZ	DESTINATION TAZ	NO. OF TRIPS
253	482	2
258	2	10
259	2	15
263	451	7
266	451	15
269	2	5
269	451	15
269	482	2
270	2	30
270	451	15
271	451	7
273	451	7
287	2	5
296	482	2
307	451	7
312	482	2
318	2	15
318	451	7
320	2	5
321	2	5
384	2	5
391	2	30
391	451	7
392	2	10
395	2	5
400	2	15
400	451	7
412	2	5
413	451	7
414	2	15
414	451	7
417	2	5
420	2	5
420	451	7
421	451	15
421	482	2
422	2	5
423	2	5
423	451	22
424	2	5
425	2	10
425	451	7
426	2	15
428	451	7
431	451	7
433	2	5
433	451	7
434	2	5
434	451	15

ORIGIN AND DESTINATION OF TRUCK TRIPS

ORIGIN TAZ	DESTINATION TAZ	NO. OF TRIPS
438	451	7
446	2	5
450	2	5
450	451	7
451	2	278
451	72	7
451	109	7
451	142	7
451	160	7
451	183	7
451	187	7
451	193	15
451	202	7
451	207	7
451	211	7
451	212	15
451	236	7
451	247	15
451	253	7
451	256	7
451	270	15
451	271	7
451	282	7
451	283	7
451	284	15
451	288	7
451	294	7
451	315	7
451	317	7
451	402	7
451	414	7
451	423	22
451	433	7
451	434	15
451	450	7
451	451	88
451	452	7
451	453	7
451	454	37
451	455	37
451	458	15
451	481	15
451	482	23
451	484	7
451	488	7
451	490	7
451	491	7
451	492	37
451	512	22

ORIGIN AND DESTINATION OF TRUCK TRIPS

ORIGIN TAZ	DESTINATION TAZ	NO. OF TRIPS
451	514	7
451	518	15
451	534	15
451	536	7
451	555	7
451	575	7
451	1183	7
453	2	15
453	451	29
453	482	6
454	2	30
454	451	22
455	2	10
455	451	22
455	482	4
456	2	5
457	2	10
457	451	7
457	482	2
458	451	7
459	2	5
461	482	2
478	482	2
479	2	15
479	451	7
480	2	10
480	482	10
481	2	5
481	451	7
482	2	23
482	156	2
482	183	2
482	193	2
482	293	2
482	296	2
482	451	29
482	453	2
482	457	2
482	459	2
482	464	2
482	478	2
482	479	4
482	480	12
482	482	10
482	488	8
482	489	2
482	490	2
482	492	6
482	496	2

ORIGIN AND DESTINATION OF TRUCK TRIPS

ORIGIN TAZ	DESTINATION TAZ	NO. OF TRIPS
482	510	2
482	518	12
482	533	2
482	535	2
482	568	2
482	732	2
482	1183	6
483	451	15
487	2	5
488	2	25
488	451	7
488	482	2
490	451	7
490	482	2
491	2	10
492	2	20
492	451	15
492	482	6
493	2	25
493	451	7
493	482	2
494	482	2
497	2	5
509	2	10
510	451	15
511	482	2
512	2	10
512	451	22
512	482	6
513	2	5
513	482	2
514	2	5
518	2	25
518	482	4
519	2	5
528	2	5
529	2	5
532	2	5
534	451	15
535	2	5
535	482	2
536	2	5
536	451	7
537	2	5
538	2	5
543	2	5
563	2	5
564	2	5
567	451	15

ORIGIN AND DESTINATION OF TRUCK TRIPS

ORIGIN TAZ	DESTINATION TAZ	NO. OF TRIPS
568	2	15
568	482	2
576	2	5
576	451	7
585	2	10
590	482	2
598	2	25
598	451	7
606	2	5
607	2	5
607	451	7
617	2	5
691	451	7
769	2	5
801	2	5
811	2	5
820	2	5
828	451	7
829	451	7
833	2	5
1183	2	151
1183	451	15
1183	482	20
1198	2	30

TRIP END SUMMARY

TAZ	ORIGIN	DESTINATION	TOTAL
2	1041	1247	2288
451	932	905	1837
482	146	146	292

APPENDIX C

TAZ DATA RESPONSE
ON-SITE TRUCK ORIGIN-DESTINATION SURVEY

APPENDIX C

DADE COUNTY MPO
FREIGHT MOVEMENT STUDY
TRAFFIC ANALYSIS ZONE DATA RESPONSES
SORTED BY MOST FREQUENT TAZ

ORIGIN	SURVEY LOCATION					DESTINATION	SURVEY LOCATION						TOTAL	PERCENT TOTAL
TAZ	FEC	PORT	TRADE	TOT	%	TAZ	FEC	PORT	TRADE	TOT	%	TAZ	O & D	O & D
451	10	23	4	37	9.7	2	22	1	9	32	8.4	451	62	8.2
2001	2	11	5	18	4.7	451	2	23	0	25	6.6	2	42	5.5
2000	0	14	0	14	3.7	2000	0	14	3	17	4.5	2000	31	4.1
193	5	7	0	12	3.2	518	2	5	6	13	3.4	2001	30	3.9
453	4	3	3	10	2.6	2007	5	0	8	13	3.4	193	22	2.9
2	5	1	4	10	2.6	2001	1	11	0	12	3.2	492	21	2.8
492	2	4	3	9	2.4	492	5	4	3	12	3.2	518	20	2.6
454	3	6	0	9	2.4	454	5	6	0	11	2.9	454	20	2.6
270	2	6	0	8	2.1	488	1	5	4	10	2.6	488	17	2.2
482	4	1	3	8	2.1	193	2	7	1	10	2.6	270	16	2.1
512	3	2	3	8	2.1	480	0	2	6	8	2.1	480	15	2.0
391	1	6	0	7	1.8	270	2	6	0	8	2.1	453	15	2.0
455	3	2	2	7	1.8	455	5	2	0	7	1.8	455	14	1.8
480	0	2	5	7	1.8	2002	0	6	0	6	1.6	391	13	1.7
493	1	5	1	7	1.8	391	0	6	0	6	1.6	512	13	1.7
518	0	5	2	7	1.8	453	1	3	1	5	1.3	2007	13	1.7
488	1	5	1	7	1.8	479	0	3	2	5	1.3	482	13	1.7
190	1	4	1	6	1.6	493	0	5	0	5	1.3	493	12	1.6
2002	0	6	0	6	1.6	512	3	2	0	5	1.3	2002	12	1.6
194	2	3	1	6	1.6	482	2	1	2	5	1.3	598	11	1.4
598	1	5	0	6	1.6	598	0	5	0	5	1.3	190	10	1.3
2003	0	2	3	5	1.3	423	3	1	0	4	1.1	479	9	1.2
414	1	3	0	4	1.1	568	0	3	1	4	1.1	194	9	1.2
423	3	1	0	4	1.1	414	1	3	0	4	1.1	423	8	1.1
318	1	3	0	4	1.1	190	0	4	0	4	1.1	568	8	1.1
400	1	3	0	4	1.1	400	0	3	0	3	0.8	414	8	1.1
269	2	1	1	4	1.1	318	0	3	0	3	0.8	318	7	0.9
457	1	2	1	4	1.1	259	0	3	0	3	0.8	400	7	0.9
183	2	0	2	4	1.1	481	2	1	0	3	0.8	457	7	0.9
568	0	3	1	4	1.1	457	0	2	1	3	0.8	2003	7	0.9
479	1	3	0	4	1.1	491	1	2	0	3	0.8	259	6	0.8
425	1	2	0	3	0.8	426	0	3	0	3	0.8	426	6	0.8
259	0	3	0	3	0.8	434	2	1	0	3	0.8	434	6	0.8
421	2	0	1	3	0.8	212	2	1	0	3	0.8	183	6	0.8
434	2	1	0	3	0.8	194	0	3	0	3	0.8	491	5	0.7
426	0	3	0	3	0.8	585	0	2	0	2	0.5	481	5	0.7
102	2	1	0	3	0.8	490	1	0	1	2	0.5	269	5	0.7
585	0	2	0	2	0.5	433	1	1	0	2	0.5	425	5	0.7
576	1	1	0	2	0.5	514	1	1	0	2	0.5	585	4	0.5
567	2	0	0	2	0.5	284	2	0	0	2	0.5	433	4	0.5
607	1	1	0	2	0.5	425	0	2	0	2	0.5	534	4	0.5
490	1	0	1	2	0.5	534	2	0	0	2	0.5	535	4	0.5
433	1	1	0	2	0.5	509	0	2	0	2	0.5	536	4	0.5
491	0	2	0	2	0.5	535	0	1	1	2	0.5	450	4	0.5
534	2	0	0	2	0.5	392	0	2	0	2	0.5	392	4	0.5
535	0	1	1	2	0.5	536	1	1	0	2	0.5	258	4	0.5
420	1	1	0	2	0.5	258	0	2	0	2	0.5	509	4	0.5
513	0	1	1	2	0.5	2004	0	2	0	2	0.5	247	4	0.5
510	2	0	0	2	0.5	183	1	0	1	2	0.5	2004	4	0.5
509	0	2	0	2	0.5	458	2	0	0	2	0.5	102	4	0.5
536	1	1	0	2	0.5	2003	0	2	0	2	0.5	212	4	0.5
392	0	2	0	2	0.5	459	0	1	1	2	0.5	490	4	0.5
2005	0	1	1	2	0.5	247	2	0	0	2	0.5	420	3	0.4
253	1	0	1	2	0.5	450	1	1	0	2	0.5	576	3	0.4
266	2	0	0	2	0.5	497	0	1	0	1	0.3	607	3	0.4
247	2	0	0	2	0.5	456	0	1	0	1	0.3	514	3	0.4
2004	0	2	0	2	0.5	513	0	1	0	1	0.3	513	3	0.4
258	0	2	0	2	0.5	111	0	1	0	1	0.3	510	3	0.4
481	1	1	0	2	0.5	510	0	0	1	1	0.3	421	3	0.4
483	2	0	0	2	0.5	496	0	0	1	1	0.3	458	3	0.4
450	1	1	0	2	0.5	478	0	0	1	1	0.3	459	3	0.4
511	0	0	1	1	0.3	487	0	1	0	1	0.3	2005	3	0.4
177	1	0	0	1	0.3	167	0	1	0	1	0.3	253	3	0.4
514	0	1	0	1	0.3	484	1	0	0	1	0.3	456	2	0.3
111	0	1	0	1	0.3	160	1	0	0	1	0.3	284	2	0.3
118	0	1	0	1	0.3	142	1	0	0	1	0.3	185	2	0.3
478	0	0	1	1	0.3	118	0	1	0	1	0.3	532	2	0.3
487	0	1	0	1	0.3	464	0	0	1	1	0.3	478	2	0.3
167	0	1	0	1	0.3	156	0	0	1	1	0.3	833	2	0.3
461	0	0	1	1	0.3	489	0	0	1	1	0.3	537	2	0.3
497	0	1	0	1	0.3	109	1	0	0	1	0.3	446	2	0.3
458	1	0	0	1	0.3	732	0	0	1	1	0.3	538	2	0.3
494	0	0	1	1	0.3	769	0	1	0	1	0.3	187	2	0.3
459	0	1	0	1	0.3	801	0	1	0	1	0.3	287	2	0.3
519	0	1	0	1	0.3	606	0	1	0	1	0.3	820	2	0.3
801	0	1	0	1	0.3	607	0	1	0	1	0.3	79	2	0.3
811	0	1	0	1	0.3	617	0	1	0	1	0.3	111	2	0.3
769	0	1	0	1	0.3	811	0	1	0	1	0.3	487	2	0.3
617	0	1	0	1	0.3	79	0	1	0	1	0.3	497	2	0.3
691	1	0	0	1	0.3	2005	0	1	0	1	0.3	118	2	0.3
820	0	1	0	1	0.3	72	1	0	0	1	0.3	266	2	0.3
79	0	1	0	1	0.3	820	0	1	0	1	0.3	271	2	0.3
2006	0	0	1	1	0.3	833	0	1	0	1	0.3	167	2	0.3
833	0	1	0	1	0.3	102	0	1	0	1	0.3	529	2	0.3
828	1	0	0	1	0.3	532	0	1	0	1	0.3	519	2	0.3
829	1	0	0	1	0.3	533	0	0	1	1	0.3	483	2	0.3
606	0	1	0	1	0.3	537	0	1	0	1	0.3	528	2	0.3
537	0	1	0	1	0.3	519	0	1	0	1	0.3	543	2	0.3
538	0	1	0	1	0.3	528	0	1	0	1	0.3	412	2	0.3
532	0	1	0	1	0.3	529	0	1	0	1	0.3	210	2	0.3
528	0	1	0	1	0.3	538	0	1	0	1	0.3	417	2	0.3
529	0	1	0	1	0.3	564	0	1	0	1	0.3	801	2	0.3
543	0	1	0	1	0.3	575	1	0	0	1	0.3	769	2	0.3
590	0	0	1	1	0.3	576	0	1	0	1	0.3	395	2	0.3

DADE COUNTY MPO
FREIGHT MOVEMENT STUDY
TRAFFIC ANALYSIS ZONE DATA RESPONSES
SORTED BY MOST FREQUENT TAZ

ORIGIN	SURVEY LOCATION					DESTINATION	SURVEY LOCATION					TOTAL	% TOTAL
TAZ	FEC	PORT	TRADE	TOT	%	TAZ	FEC	PORT	TRADE	TOT	%	TAZ O & D	O & D
104	1	0	0.0	1	0.26316	543	0	1	0.0	1	0.26316	321	2	0.3
105	1	0	0.0	1	0.26316	555	1	0	0.0	1	0.26316	617	2	0.3
563	0	1	0.0	1	0.26316	563	0	1	0.0	1	0.26316	606	2	0.3
564	0	1	0.0	1	0.26316	402	1	0	0.0	1	0.26316	320	2	0.3
412	0	1	0.0	1	0.26316	412	0	1	0.0	1	0.26316	384	2	0.3
413	1	0	0.0	1	0.26316	210	0	1	0.0	1	0.26316	422	2	0.3
395	0	1	0.0	1	0.26316	395	0	1	0.0	1	0.26316	567	2	0.3
212	0	1	0.0	1	0.26316	283	1	0	0.0	1	0.26316	195	2	0.3
417	0	1	0.0	1	0.26316	420	0	1	0.0	1	0.26316	296	2	0.3
424	0	1	0.0	1	0.26316	422	0	1	0.0	1	0.26316	811	2	0.3
195	0	1	0.0	1	0.26316	417	0	1	0.0	1	0.26316	563	2	0.3
210	0	1	0.0	1	0.26316	207	1	0	0.0	1	0.26316	564	2	0.3
422	0	1	0.0	1	0.26316	282	1	0	0.0	1	0.26316	424	2	0.3
384	0	1	0.0	1	0.26316	211	1	0	0.0	1	0.26316	533	1	0.1
273	1	0	0.0	1	0.26316	315	1	0	0.0	1	0.26316	2006	1	0.1
287	0	1	0.0	1	0.26316	317	1	0	0.0	1	0.26316	105	1	0.1
263	1	0	0.0	1	0.26316	293	0	0	1.0	1	0.26316	511	1	0.1
271	1	0	0.0	1	0.26316	296	0	0	1.0	1	0.26316	555	1	0.1
296	0	0	1.0	1	0.26316	294	1	0	0.0	1	0.26316	104	1	0.1
320	0	1	0.0	1	0.26316	287	0	1	0.0	1	0.26316	72	1	0.1
321	0	1	0.0	1	0.26316	384	0	1	0.0	1	0.26316	691	1	0.1
307	1	0	0.0	1	0.26316	288	1	0	0.0	1	0.26316	575	1	0.1
312	0	0	1.0	1	0.26316	320	0	1	0.0	1	0.26316	732	1	0.1
428	1	0	0.0	1	0.26316	321	0	1	0.0	1	0.26316	109	1	0.1
185	0	1	0.0	1	0.26316	253	1	0	0.0	1	0.26316	829	1	0.1
438	1	0	0.0	1	0.26316	256	1	0	0.0	1	0.26316	590	1	0.1
187	1	0	0.0	1	0.26316	446	0	1	0.0	1	0.26316	828	1	0.1
191	0	0	1.0	1	0.26316	452	1	0	0.0	1	0.26316	211	1	0.1
446	0	1	0.0	1	0.26316	185	0	1	0.0	1	0.26316	402	1	0.1
431	1	0	0.0	1	0.26316	187	1	0	0.0	1	0.26316	317	1	0.1
456	0	1	0.0	1	0.26316	236	1	0	0.0	1	0.26316	312	1	0.1
732	0	0	0.0	0	0	269	0	1	0.0	1	0.26316	315	1	0.1
2007	0	0	0.0	0	0	202	1	0	0.0	1	0.26316	428	1	0.1
452	0	0	0.0	0	0	424	0	1	0.0	1	0.26316	431	1	0.1
464	0	0	0.0	0	0	271	1	0	0.0	1	0.26316	202	1	0.1
294	0	0	0.0	0	0	195	0	1	0.0	1	0.26316	413	1	0.1
589	0	0	0.0	0	0	2006	0	0	0.0	0	0	207	1	0.1
232	0	0	0.0	0	0	213	0	0	0.0	0	0	273	1	0.1
160	0	0	0.0	0	0	273	0	0	0.0	0	0	282	1	0.1
601	0	0	0.0	0	0	589	0	0	0.0	0	0	263	1	0.1
315	0	0	0.0	0	0	590	0	0	0.0	0	0	236	1	0.1
317	0	0	0.0	0	0	104	0	0	0.0	0	0	256	1	0.1
81	0	0	0.0	0	0	268	0	0	0.0	0	0	294	1	0.1
179	0	0	0.0	0	0	266	0	0	0.0	0	0	307	1	0.1
268	0	0	0.0	0	0	828	0	0	0.0	0	0	293	1	0.1
72	0	0	0.0	0	0	829	0	0	0.0	0	0	283	1	0.1
236	0	0	0.0	0	0	81	0	0	0.0	0	0	288	1	0.1
282	0	0	0.0	0	0	232	0	0	0.0	0	0	156	1	0.1
293	0	0	0.0	0	0	601	0	0	0.0	0	0	484	1	0.1
256	0	0	0.0	0	0	691	0	0	0.0	0	0	452	1	0.1
288	0	0	0.0	0	0	263	0	0	0.0	0	0	489	1	0.1
283	0	0	0.0	0	0	572	0	0	0.0	0	0	464	1	0.1
284	0	0	0.0	0	0	431	0	0	0.0	0	0	177	1	0.1
211	0	0	0.0	0	0	438	0	0	0.0	0	0	160	1	0.1
527	0	0	0.0	0	0	483	0	0	0.0	0	0	461	1	0.1
489	0	0	0.0	0	0	147	0	0	0.0	0	0	438	1	0.1
533	0	0	0.0	0	0	427	0	0	0.0	0	0	142	1	0.1
444	0	0	0.0	0	0	428	0	0	0.0	0	0	496	1	0.1
147	0	0	0.0	0	0	444	0	0	0.0	0	0	494	1	0.1
109	0	0	0.0	0	0	192	0	0	0.0	0	0	191	1	0.1
202	0	0	0.0	0	0	461	0	0	0.0	0	0	232	0	0.0
427	0	0	0.0	0	0	191	0	0	0.0	0	0	213	0	0.0
496	0	0	0.0	0	0	177	0	0	0.0	0	0	147	0	0.0
192	0	0	0.0	0	0	179	0	0	0.0	0	0	268	0	0.0
207	0	0	0.0	0	0	447	0	0	0.0	0	0	81	0	0.0
142	0	0	0.0	0	0	494	0	0	0.0	0	0	527	0	0.0
336	0	0	0.0	0	0	312	0	0	0.0	0	0	572	0	0.0
377	0	0	0.0	0	0	559	0	0	0.0	0	0	444	0	0.0
379	0	0	0.0	0	0	336	0	0	0.0	0	0	447	0	0.0
575	0	0	0.0	0	0	105	0	0	0.0	0	0	559	0	0.0
572	0	0	0.0	0	0	567	0	0	0.0	0	0	192	0	0.0
447	0	0	0.0	0	0	307	0	0	0.0	0	0	427	0	0.0
559	0	0	0.0	0	0	377	0	0	0.0	0	0	589	0	0.0
213	0	0	0.0	0	0	413	0	0	0.0	0	0	377	0	0.0
484	0	0	0.0	0	0	511	0	0	0.0	0	0	336	0	0.0
402	0	0	0.0	0	0	421	0	0	0.0	0	0	179	0	0.0
555	0	0	0.0	0	0	379	0	0	0.0	0	0	383	0	0.0
383	0	0	0.0	0	0	383	0	0	0.0	0	0	601	0	0.0
156	0	0	0.0	0	0	527	0	0	0.0	0	0	379	0	0.0

2000 PORT EVERGLADES
2001 BROWARD COUNTY
2002 FLA WEST COAST
2003 OUT OF STATE
2004 CENTRAL FLORIDA
2005 PALM BEACH COUNTY
2006 NORTH FLORIDA
2007 BOBTAILING

[1] This table presents the TAZ origins of trucks coming to each of the three survey locations and the TAZ destination of trucks leaving each of the three locations.

APPENDIX D

ISTEA MANDATE 23 STATE FACTORS AND 15 METROPOLITAN TRANSPORTATION PROCESS FACTORS FOR CONSIDERATION IN TRANSPORTATION PLAN DEVELOPMENT

§ 450.206 Statewide transportation planning process: General requirements.

(a) The statewide transportation planning process shall include, as a minimum:

(1) Data collection and analysis;

(2) Consideration of factors contained in § 450.208;

(3) Coordination of activities as noted in § 450.210;

(4) Development of a statewide transportation plan that considers a range of transportation options designed to meet the transportation needs (both passenger and freight) of the state including all modes and their connections; and

(5) Development of a statewide transportation improvement program (STIP).

(b) The statewide transportation planning process shall be carried out in coordination with the metropolitan planning process required by subpart C of this part.

§ 450.208 Statewide transportation planning process: Factors.

(a) Each State shall, at a minimum, explicitly consider, analyze as appropriate and reflect in planning process products the following factors in conducting its continuing statewide transportation planning process:

(1) The transportation needs (strategies and other results) identified through the management systems required by 23 U.S.C. 303;

(2) Any Federal, State, or local energy use goals, objectives, programs, or requirements;

(3) Strategies for incorporating bicycle transportation facilities and pedestrian walkways in appropriate projects throughout the State;

(4) International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, recreation and scenic areas, monuments and historic sites, and military installations;

(5) The transportation needs of nonmetropolitan areas (areas outside of MPO planning boundaries) through a process that includes consultation with local elected officials with jurisdiction over transportation;

(6) Any metropolitan area plan developed pursuant to 23 U.S.C. 134 and section 8 of the Federal Transit Act, 49 U.S.C. app. 1607;

(7) Connectivity between metropolitan planning areas within the State and with metropolitan planning areas in other States;

(8) Recreational travel and tourism;

(9) Any State plan developed pursuant to the Federal Water Pollution Control Act, 33 U.S.C. 1251 et seq. (and in addition to plans pursuant to the Coastal Zone Management Act);

(10) Transportation system management and investment strategies designed to make the most efficient use of existing transportation facilities (including consideration of all transportation modes);

(11) The overall social, economic, energy, and environmental effects of transportation decisions (including housing and community development effects and effects on the human, natural and manmade environments);

(12) Methods to reduce traffic congestion and to prevent traffic congestion from developing in areas where it does not yet occur, including methods which reduce motor vehicle travel, particularly single-occupant motor vehicle travel;

(13) Methods to expand and enhance appropriate transit services and to increase the use of such services (including commuter rail);

(14) The effect of transportation decisions on land use and land development, including the need for consistency between transportation decisionmaking and the provisions of all applicable short-range and long-range land use and development plans (analyses should include projections of economic, demographic, environmental protection, growth management and land use activities consistent with development goals and transportation demand projections);

(15) Strategies for identifying and implementing transportation enhancements where appropriate throughout the State;

(16) The use of innovative mechanisms for financing projects, including value capture pricing, tolls, and congestion pricing;

(17) Preservation of rights-of-way for construction of future transportation projects, including identification of unused rights-of-way which may be needed for future transportation corridors, identification of those corridors for which action is most needed to prevent destruction or loss (including strategies for preventing loss of rights-of-way);

(18) Long-range needs of the State transportation system for movement of persons and goods;

(19) Methods to enhance the efficient movement of commercial motor vehicles;

(20) The use of life-cycle costs in the design and engineering of bridges, tunnels, or pavements;

(21) The coordination of transportation plans and programs developed for metropolitan planning areas of the State under 23 U.S.C. 134 and section 8 of the Federal Transit Act with the statewide transportation plans and programs developed under this subpart, and the reconciliation of such plans and programs as necessary to ensure connectivity within transportation systems;

(22) Investment strategies to improve adjoining State and local roads that support rural economic growth and tourism development, Federal agency renewable resources management, and multipurpose land management practices, including recreation development; and

(23) The concerns of Indian tribal governments having jurisdiction over lands within the boundaries of the State.

(b) The degree of consideration and analysis of the factors should be based on the scale and complexity of many issues, including transportation problems, land use, employment, economic development, environmental and housing and community development objectives, the extent of overlap between factors and other circumstances statewide or in subareas within the State.

§ 450.210 Coordination.

(a) In addition to the coordination required under § 450.208(a)(21), in carrying out the requirements of this subpart, each State, in cooperation with participating organizations (such as MPOs, Indian tribal governments, environmental, resource and permit agencies, public transit operators) shall, to the extent appropriate, provide for a fully coordinated process including coordination of the following:

(1) Data collection, data analysis and evaluation of alternatives for a transit, highway, bikeway, scenic byway, recreational trail, or pedestrian program with any such activities for the other programs;

(2) Plans, such as the statewide transportation plan required under § 450.214, with programs and priorities for transportation projects, such as the STIP;

(3) Data analysis used in development of plans and programs, (for example, information resulting from traffic data analysis, data and plans regarding employment and housing availability, data and plans regarding land use control and community development) with land use projections, with data analysis on issues that are part of public involvement relating to project implementation, and with data analysis done as part of the establishment and maintenance of management systems developed in response to 23 U.S.C. 303;

(6) The effects of all transportation projects to be undertaken within the metropolitan planning area, without regard to the source of funding (the analysis shall consider the effectiveness, cost effectiveness, and financing of alternative investments in meeting transportation demand and supporting the overall efficiency and effectiveness of transportation system performance and related impacts on community/central city goals regarding social and economic development, housing, and employment);

(7) International border crossings and access to ports, airports, intermodal transportation facilities, major freight distribution routes, national parks, recreation areas, monuments and historic sites, and military installations (supporting technical efforts should provide an analysis of goods and services movement problem areas, as determined in cooperation with appropriate private sector involvement, including, but not limited to, addressing interconnected transportation access and service needs of intermodal facilities);

(8) Connectivity of roads within metropolitan planning areas with roads outside of those areas;

(9) Transportation needs identified through the use of the management systems required under 23 U.S.C. 303 (strategies identified under each management system will be analyzed during the development of the transportation plan, including its financial component, for possible inclusion in the metropolitan plan and TIP);

(10) Preservation of rights-of-way for construction of future transportation projects, including future transportation corridors;

(11) Enhancement of the efficient movement of freight;

(12) The use of life-cycle costs in the design and engineering of bridges, tunnels, or pavement (operating and maintenance costs must be considered in analyzing transportation alternatives);

(13) The overall social, economic, energy, and environmental effects of transportation decisions (including consideration of the effects and impacts of the plan on the human, natural and man-made environment such as housing, employment and community development, consultation with appropriate resource and permit agencies to ensure early and continued coordination with environmental resource protection and management plans, and appropriate emphasis on transportation-related air quality problems in support of the requirements of 23 U.S.C. 109(h), and section 14 of the Federal Transit Act (49 U.S.C. 1610), section 4(f) of the DOT Act (49 U.S.C. 303) and section 174(b) of the Clean Air Act (42 U.S.C. 7504(b)));

(14) Expansion, enhancement, and increased use of transit services; and

(15) Capital investments that would result in increased security in transit systems.

(b) In addition, the metropolitan transportation planning process shall:

(1) Include a proactive public involvement process that provides complete information, timely public notice, full public access to key decisions, and supports early and continuing involvement of the public in developing plans and TIPs and meets the requirements and criteria specified as follows:

(i) Require a minimum public comment period of 45 days before the public involvement process is initially adopted or revised;

(ii) Provide timely information about transportation issues and processes to citizens, affected public agencies, representatives of transportation agency employees, private providers of transportation, other interested parties and segments of the community affected by transportation plans, programs and projects (including but not limited to central city and other local jurisdiction concerns);

(iii) Provide reasonable public access to technical and policy information used in the development of plans and TIPs and open public meetings where matters related to the Federal-aid highway and transit programs are being considered;

(iv) Require adequate public notice of public involvement activities and time for public review and comment at key decision points, including, but not limited to, approval of plans and TIPs (in nonattainment areas, classified as serious and above, the comment period shall be at least 30 days for the plan, TIP and major amendment(s));

(v) Demonstrate explicit consideration and response to public input received during the planning and program development processes;

(vi) Seek out and consider the needs of those traditionally underserved by existing transportation systems, including but not limited to low-income and minority households;

(vii) When significant written and oral comments are received on the draft transportation plan or TIP (including the financial plan) as a result of the public involvement process or the interagency consultation process required under the U.S. EPA's conformity regulations, a summary, analysis, and report on the disposition of comments shall be made part of the final plan and TIP;

(viii) If the final transportation plan or TIP differs significantly from the one which was made available for public comment by the MPO and raises new material issues which interested parties could not reasonably have foreseen from the public involvement efforts, an additional opportunity for public comment on the revised plan or TIP shall be made available;

(ix) Public involvement processes shall be periodically reviewed by the MPO in terms of their effectiveness in assuring that the process provides full and open access to all;

(x) These procedures will be reviewed by the FHWA and the FTA during certification reviews for TMAs, and as otherwise necessary for all MPOs, to assure that full and open access is provided to MPO decisionmaking processes;

(xi) Metropolitan public involvement processes shall be coordinated with statewide public involvement processes wherever possible to enhance public consideration of the issues, plans, and programs and reduce redundancies and costs;

(2) Be consistent with Title VI of the Civil Rights Act of 1964 and the Title VI assurance executed by each State under 23 U.S.C. 324 and 29 U.S.C. 794, which ensure that no person shall, on the grounds of race, color, sex, national origin, or physical handicap, be excluded from participation in, be denied benefits of, or be otherwise subjected to discrimination under any program receiving Federal assistance from the United States Department of Transportation;

(3) Identify actions necessary to comply with the Americans With Disabilities Act of 1990 (Pub. L. 101-336, 104 Stat. 327, as amended) and U.S. DOT regulations "Transportation for Individuals With Disabilities" (49 CFR parts 27, 37, and 38);

(4) Provide for the involvement of traffic, ridesharing, parking, transportation safety and enforcement agencies; commuter rail operators; airport and port authorities; toll authorities; appropriate private transportation providers, and where appropriate city officials; and

(5) Provide for the involvement of local, State, and Federal environment resource and permit agencies as appropriate.

(c) In attainment areas not designated as TMAs simplified procedures for the development of plans and programs, if considered appropriate, shall be proposed by the MPO in cooperation with the State and transit operator, and

developing the transportation control measures.

(d) In nonattainment or maintenance areas for transportation related pollutants, the MPO shall not approve any transportation plan or program which does not conform with the SIP, as determined in accordance with the U.S. EPA conformity regulation (40 CFR Part 51).

(e) If more than one MPO has authority in a metropolitan planning area (including multi-State metropolitan planning areas) or in an area which is designated as nonattainment or maintenance for transportation related pollutants, the MPOs and the Governor(s) shall cooperatively establish the boundaries of the metropolitan planning area (including the twenty year planning horizon and relationship to the nonattainment or maintenance areas) and the respective jurisdictional responsibilities of each MPO. The MPOs shall consult with each other and the State(s) to assure the preparation of integrated plans and transportation improvement programs for the entire metropolitan planning area. An individual MPO plan and program may be developed separately. However, each plan and program must be consistent with the plans and programs of other MPOs in the metropolitan planning area. For the overall metropolitan planning area, the individual MPO planning process shall reflect coordinated data collection, analysis and development. In those areas where this provision is applicable, coordination efforts shall be initiated and the process and outcomes documented in subsequent transmittals of the UPWP and various planning products (the plan, TIP, etc.) to the State, the FHWA, and the FTA.

(f) The Secretary must designate as transportation management areas all UZAs over 200,000 population as determined by the most recent decennial census. The Secretary designated TMAs by publishing a notice in the Federal Register. Copies of this notice may be obtained from the FHWA Metropolitan Planning Division or Office of Planning FTA. The TMAs so designated and those designated subsequently by the FHWA and the FTA (including those designated upon request of the MPO and the Governor) must comply with the special requirements applicable to such areas regarding congestion management systems, project selection, and certification. The TMA designation applies to the entire metropolitan planning area boundary. If a metropolitan planning area encompasses a TMA and other UZA(s), the designation applies to the entire metropolitan planning area regardless of the population of constituent UZAs.

(g) As required by 23 CFR part 500, the required management systems shall be developed cooperatively by the State, the MPOs and transit operators for each metropolitan planning area. In TMAs, the congestion management system will be developed as part of the metropolitan transportation planning process.

(h) The State shall cooperatively participate in the development of metropolitan transportation plans. The relationship of the statewide transportation plan and the metropolitan plan is specified in subpart B of this part.

(i) Where a metropolitan planning area includes Federal public lands and/or Indian tribal lands, the affected Federal agencies and Indian tribal governments shall be involved appropriately in the development of transportation plans and programs.

§ 450.314 Metropolitan transportation planning process: Unified planning work programs.

(a) In TMAs, the MPO(s) in cooperation with the State and operators of publicly owned transit shall develop unified planning work programs (UPWPs) that meet the requirements of 23 CFR part 420, subpart A, and:

(1) Discuss the planning priorities facing the metropolitan planning area and describe all metropolitan transportation and transportation-related air quality planning activities (including the corridor and subarea studies discussed in § 450.318) anticipated within the area during the next one or two year period, regardless of funding sources or agencies conducting activities, in sufficient detail to indicate who will perform the work, the schedule for completing it and the products that will be produced;

(2) Document planning activities to be performed with funds provided under title 23, U.S.C., and the Federal Transit Act.

(b) Arrangements may be made with the FHWA and the FTA to combine the UPWP requirements with the work program for other Federal sources of planning funds.

(c) The metropolitan transportation planning process may include the development of a prospectus that establishes a multiyear framework within which the UPWP is accomplished. The prospectus may be used to satisfy the requirements of § 450.310 and paragraph (a)(1) of this section.

(d) In areas not designated as TMAs, the MPO in cooperation with the State and transit operators, with the approval of the FHWA and the FTA, may prepare a simplified statement of work, in lieu of a UPWP, that describes who will perform the work and the work that will be accomplished using Federal funds. If a simplified statement of work is used, it may be submitted as part of the Statewide planning work program, in accordance with 23 CFR part 420.

§ 450.316 Metropolitan transportation planning process: Elements.

(a) Section 134(f) of title 23, U.S.C., and Federal Transit Act section 8(f) (49 U.S.C. app. 1607(f)) list 15 factors that must be considered as part of the planning process for all metropolitan areas. The following factors shall be explicitly considered, analyzed as appropriate, and reflected in the planning process products:

(1) Preservation of existing transportation facilities and, where practical, ways to meet transportation needs by using existing transportation facilities more efficiently;

(2) Consistency of transportation planning with applicable Federal, State, and local energy conservation programs, goals, and objectives;

(3) The need to relieve congestion and prevent congestion from occurring where it does not yet occur including:

(i) The consideration of congestion management strategies or actions which improve the mobility of people and goods in all phases of the planning process; and

(ii) In TMAs, a congestion management system that provides for effective management of new and existing transportation facilities through the use of travel demand reduction and operation management strategies (e.g., various elements of IVHS) shall be developed in accordance with § 450.320;

(4) The likely effect of transportation policy decisions on land use and development and the consistency of transportation plans and programs with the provisions of all applicable short- and long-term land use and development plans (the analysis should include projections of metropolitan planning area economic, demographic, environmental protection, growth management, and land use activities consistent with metropolitan and local/central city development goals (community, economic, housing, etc.), and projections of potential transportation demands based on the interrelated level of activity in these areas);

(5) Programming of expenditures for transportation enhancement activities as required under 23 U.S.C. 133;