2025 MAJOR STREET PLAN

City of Madison

Prepared by:

SKIPPER
CONSULTING INC.

September, 2001

2025 MAJOR STREET PLAN
City of Madison

Prepared for:
City of Madison
Madison, Alabama

Prepared by:
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Birmingham, Alabama

September, 2001

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INTRODUCTION

This report documents the major street plan element of the Comprehensive Plan prepared for the City of Madison, Alabama. Both land use and the roadway system were analyzed in this study effort. The purposes of the transportation component are to assess the effectiveness of the existing roadway system, considering the present land uses and transportation network, and to develop a major Street plan that will mitigate current and future roadway deficiencies, increase mobility, support the Comprehensive Plan, and create a safe and efficient roadway system for the future.

Sources of information for the major street plan included the City of Madison, the Alabama Department of Transportation and office files and field reconnaissance efforts of Skipper Consulting, Inc.

BACKGROUND

Madison has approximately 29,300 inhabitants and is located immediately west of Huntsville, Alabama. Over the past several decades, Madison has experienced significant growth in both population and employment, resulting in subsequent traffic growth on the City's roadway network and increasing traffic congestion throughout the area. Madison is located on and bounded by three major regional roadways: U. S. Highway 72, Madison Boulevard (Alabama Highway 20), and Interstate Highway 565. U. S. Highway 72 and Madison Boulevard are four lane median divided roadways. Interstate 565 is a four lane interstate highway. Madison's roadway network located between U. S. Highway 72 to the north and Madison Boulevard to the south forms a grid system.

EXISTING TRANSPORTATION SYSTEM

Roadway Classifications and Descriptions

All transportation networks have some form of classification to categorize the hierarchy of movement in the system. The roadway network developed for the Madison study area was based on the functional classification system prepared by the Alabama Department of Transportation. The components of this network are freeways, arterials, collectors and local streets. The distribution of mileage in these classifications for Madison is as follows:

Classification	Mileage
Interstate	4 miles
Arterials	12 miles
Collector Roads	28 miles
Local Streets	112 miles
TOTAL	156 miles

Each type roadway provides separate and distinct traffic service functions and is best suited for accommodating particular demands. Their designs also vary in accordance with the characteristics of traffic to be served by the roadway. The following is a brief description of each roadway type.

- *Interstates* are divided highways with full control of access and grade separation at all intersections. The controlled access character of freeways results in high-lane capacities, enabling these roadways to carry up to three times as much traffic per lane as arterials. Freeways move traffic at relatively high speeds.

- *Arterials* are important components of the total transportation system. They serve as feeders to the interstate system as well as major travelways between land use concentrations within the study area. Arterials are typically roadways with relatively high traffic volumes and traffic signals at major intersections. The primary function of arterials is moving traffic. Arterials provide a means for local travel and land access.

- *Collectors* provide both land service and traffic movement functions. Collectors serve as feeders between arterials as well as provide access to the local streets. Collectors are typically lower volume roadways that accommodate short distance trips.

- *Local Streets* sole function is to provide access to the land uses that are immediately adjacent to the roadways. These streets are not included in the computer network for this project.

The functional classifications of the study area roadways are illustrated in Figure 1.

Regional Access Routes

The Madison area is served by an interstate highway (I-565), a U. S. highway (U. S. Highway 72) and a state highway (Madison Boulevard). These highways provide east-west regional access. There are no north-south regional access routes provided within the City of Madison. North-south regional access is provided outside the study area. To the west of the study area I-65 provides north-south access and to the east of the study area north-south access is provided by U.S. Highway 231 and U.S. Highway 431.

Interstate Highway 565 traverses the City of Madison from east to west. It is a four-lane controlled access interstate highway located near the southern border of the study area. I-565 connects with I-65 to the west and downtown Huntsville to the east. I-565 has two interchanges located within the study area: Huntsville International Airport and Wall-Trina Highway. Just west of the study area there is a partial interchange between I-565 and Madison Boulevard.

Madison Boulevard (Alabama Highway 20) is a four median divided principal arterial roadway. It traverses the southern border of the study area and connects Decatur to Huntsville.

U. S. Highway 72 is a four lane divided principal arterial roadway that for the most part forms the northern boundary of the study area. It connects Athens to the west with Huntsville to the east.

With the exception of the regional access routes, all other roadways in the Madison network are either collector roadways or local roadways.

Planned Roadway Improvement Projects

The City of Madison's Capital Improvement Program was reviewed to determine any transportation projects that were currently planned for the City. Transportation projects that were included in the Capital Improvement Program are listed below:

- Extend Gillespie Road from Balch Road to County Line Road;
- Extend Balch Road from Browns Ferry Road to Madison Boulevard;
- Extend Eastview Drive from Hughes Road to Wall-Triana Highway;
- Construct a southbound right turn on Hughes Road at U.S. Highway 72; and
- Construct a southbound right turn on Shelton Road at Madison Boulevard.

Existing Traffic Volumes

Traffic volume, as indicated by traffic counts at various locations on the roadway network, reflect current travel patterns and how well the network is serving the travel demand. Traffic counts were collected throughout the study area by the City of Madison. Existing daily traffic counts, which were conducted in 2000, are shown in Figure 2. As shown in Figure 2, the following is a summary of the maximum daily traffic volumes that occur on major roadways in the study area:

Interstate 565	53,400 vehicle per day
Madison Boulevard	29,300 vehicle per day
U.S. Highway 72	36,700 vehicle per day
Wall-Triana Highway	28,700 vehicle per day
Hughes Road	16,300 vehicle per day
Madison Pike	11,600 vehicle per day
County Line Road	10,300 vehicle per day

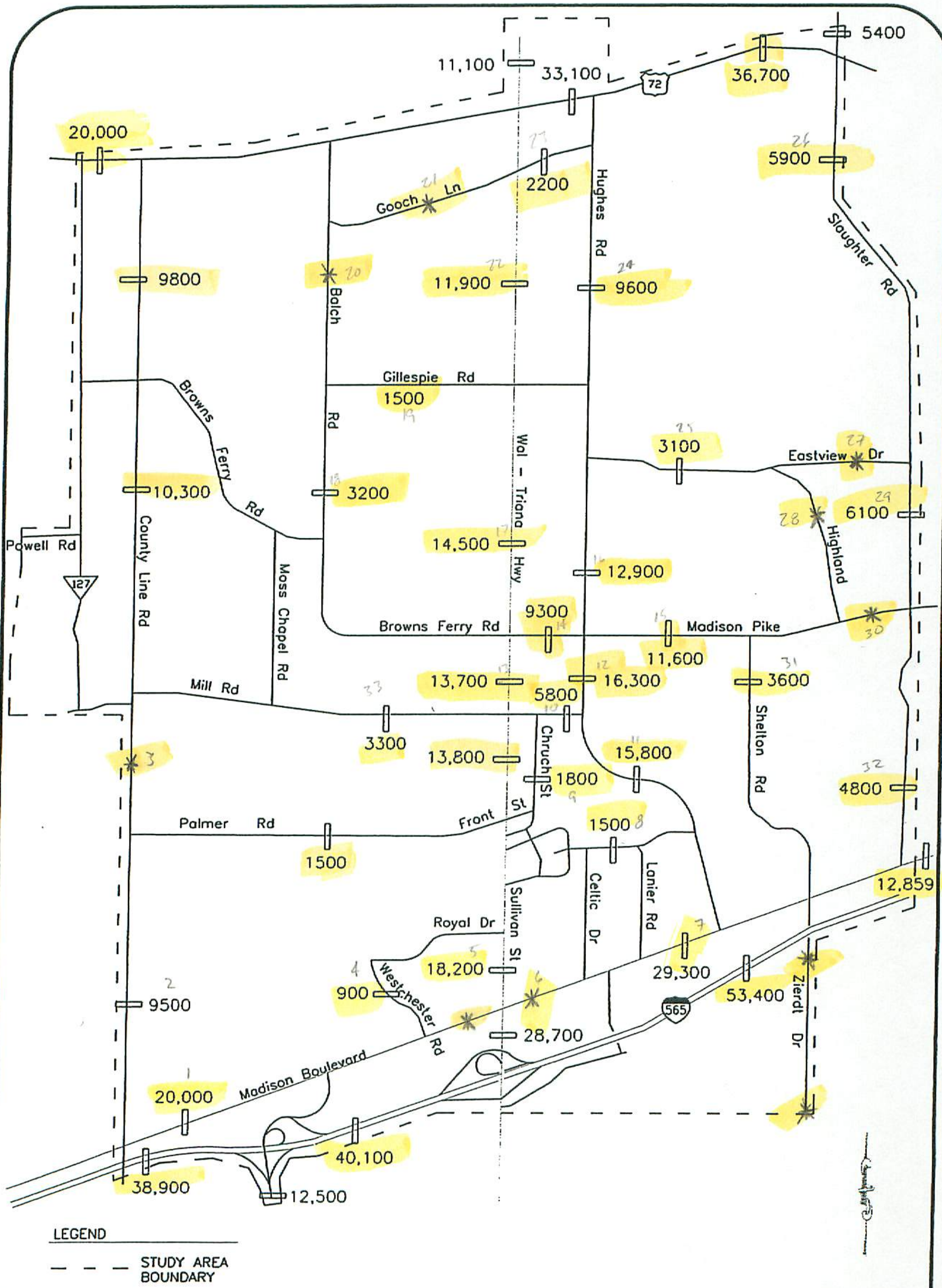

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FIGURE 2

EXISTING DAILY TRAFFIC VOLUMES

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MADISON, ALABAMA

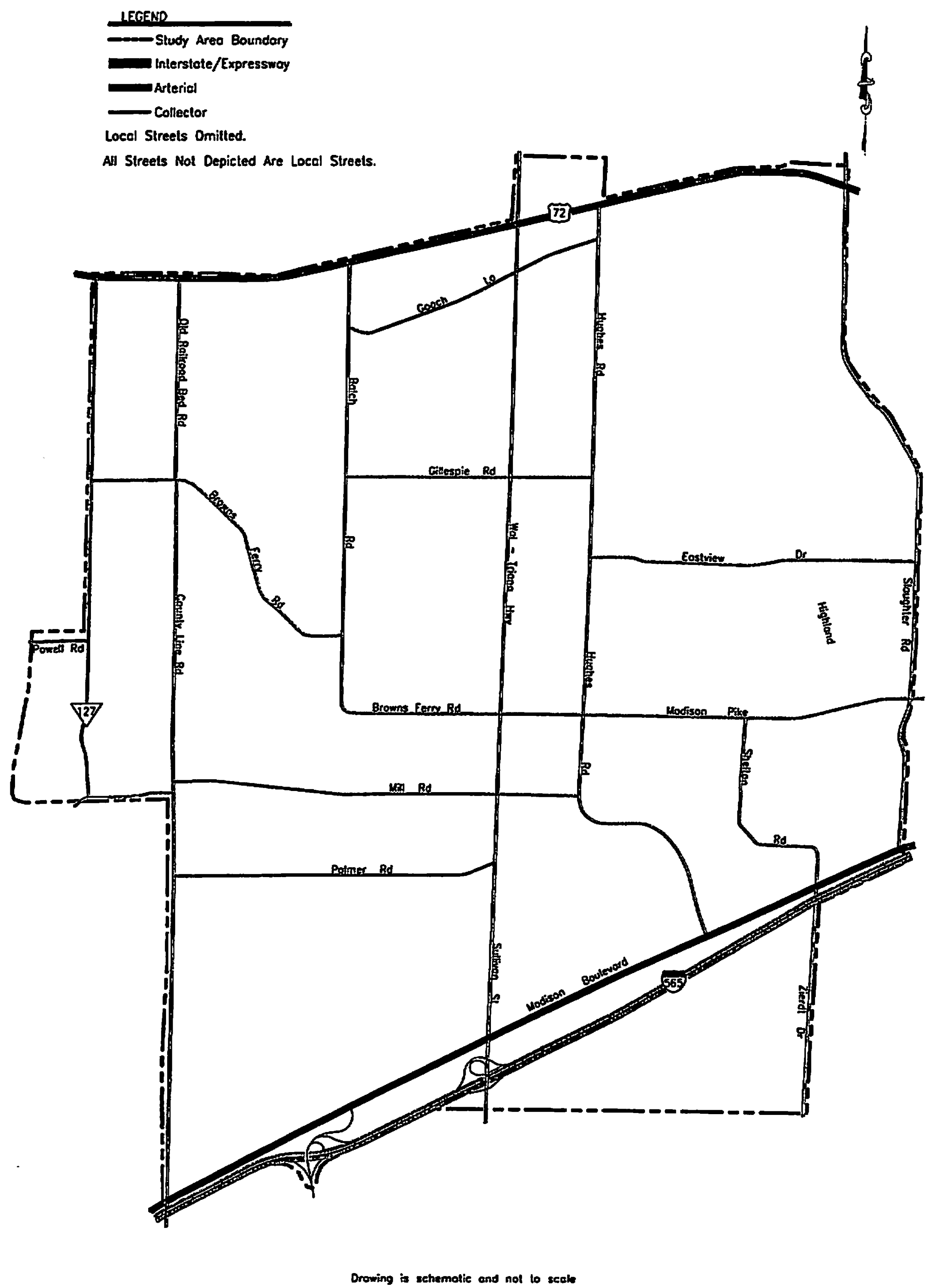

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FIGURE 1

FUNCTIONAL CLASSIFACATION

Major Street Plan

MADISON, ALABAMA

Roadway Capacity

Roadway networks are evaluated by comparing the traffic volumes along each facility to the facility's capacity. Roadway capacity is defined as the ability of the facility to accommodate traffic. Service flow volume is the level of traffic flow (vehicles per day) that can be accommodated at various levels of service. The current level of service scale, as developed by the Transportation Research Board in the *Highway Capacity Manual*, Sixth Edition, ranges from a level of service "A" to a level of service "F". Abbreviated definitions of each level of service are as follows:

Level of Service A	Free traffic flow (0% –35% of capacity)
Level of Service B	Stable traffic flow (35% –50% of capacity)
Level of Service C	Stable traffic flow (50% –62% of capacity)
Level of Service D	High-density stable traffic flow (62% –75% of capacity)
Level of Service E	Capacity level traffic flow (75% –100% of capacity)
Level of Service F	Forced or breakdown traffic flow (>100% of capacity)

As a general rule, the desired operation of a roadway should be no lower than level of service "C". Level of service "D" may be acceptable under certain circumstances. A level of service "E" or "F" is considered unacceptable.

The methodology used to evaluate roadway segment capacity in this project was a tabular analysis relating roadway classification, number of lanes, levels of service, and daily service volumes. The estimated 24-hour capacities of the facilities included in the area network are shown in Table 1. Figure 3 illustrates the roadway segment levels of service and Figure 4 summarizes the roadway segments that are deficient.

TABLE 1
CITY OF MADISON MAJOR STREET PLAN
ROADWAY CAPACITIES

FUNCTIONAL CLASSIFICATION	# OF LANES	CAPACITIES
Freeway	4	68,000
	6	102,000
	8	136,000
	10	170,000
Expressway	4	50,000
	6	75,000
	8	100,000
Divided Principal Arterial	2	22,000
	4	33,900
	6	50,000
	8	73,600
Undivided Principal Arterial	2	17,800
	4	31,000
	6	45,800
	8	63,100
Divided Minor Arterial	2	21,000
	4	31,900
	6	45,600
	8	N/A
Undivided Minor Arterial	2	17,800
	4	27,400
	6	N/A
	8	N/A
Divided Collector	2	20,800
	4	28,500
	6	42,000
Undivided Collector	2	16,600
	4	26,200
	6	38,700
One-way Principal Arterial	2	17,100
	3	25,600
	4	37,800
One-way Minor Arterial	2	14,100
	3	19,500
	4	26,000
One-way Collector	2	11,300
	3	15,600
	4	20,800
One-way Ramp	1	9,000
	2	18,000
	3	27,000

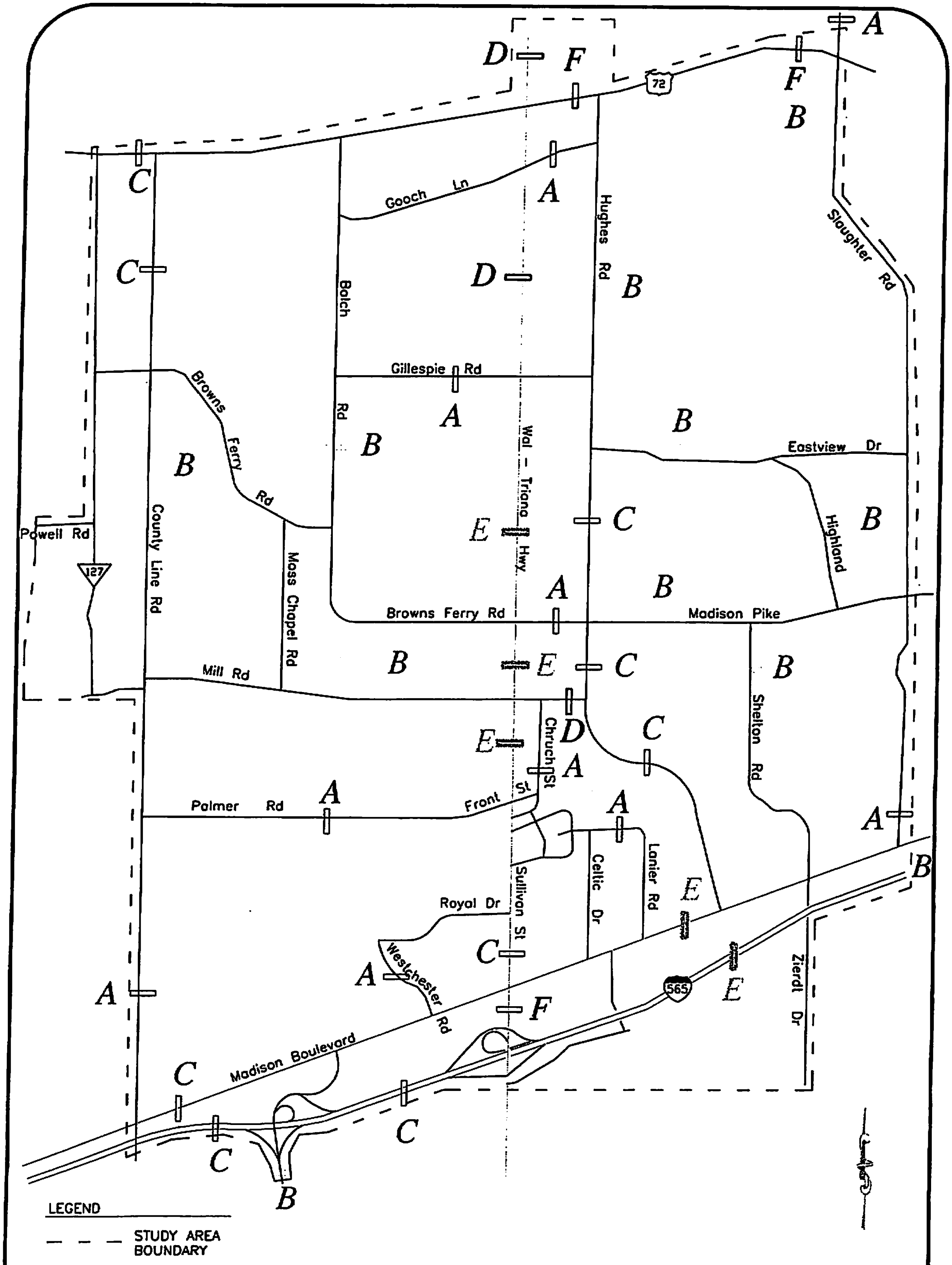

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FIGURE 3

EXISTING LEVELS OF SERVICE

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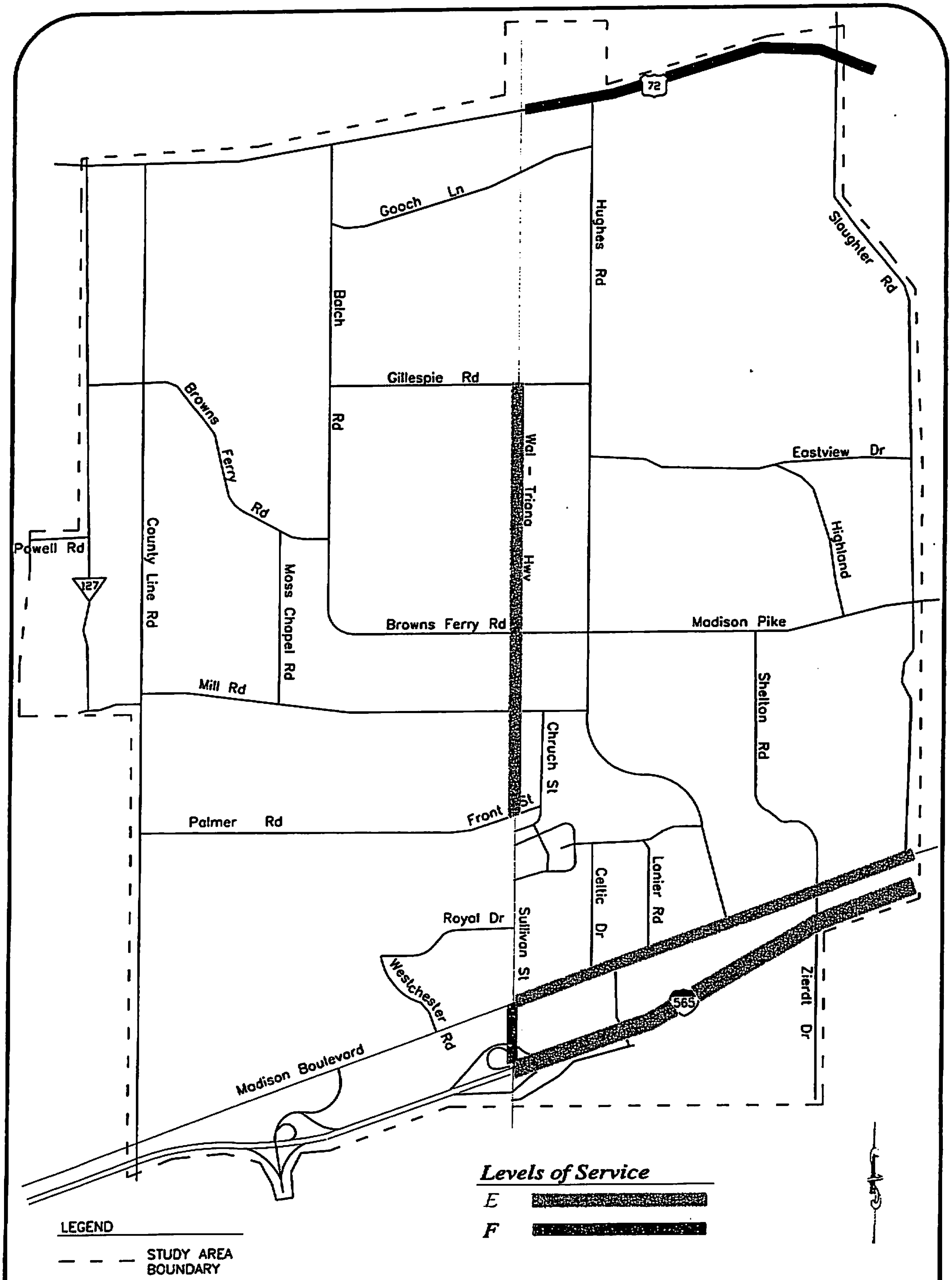

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FIGURE 4

EXISTING ROADWAY DEFICIENCIES

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LAND USE DATA

The relationship between land use and a transportation system is used to determine the demand for travel on a roadway network. Each land use (residential, commercial, industrial, etc.) generates and attracts traffic depending on the nature of the development and the amount of land developed. In order to identify this demand for travel, inventories of existing land uses must be made. This information is used in conjunction with the physical location of the adjacent land uses, constraints on the roadway network, and other related factors to develop the interrelationship between land use and the transportation system.

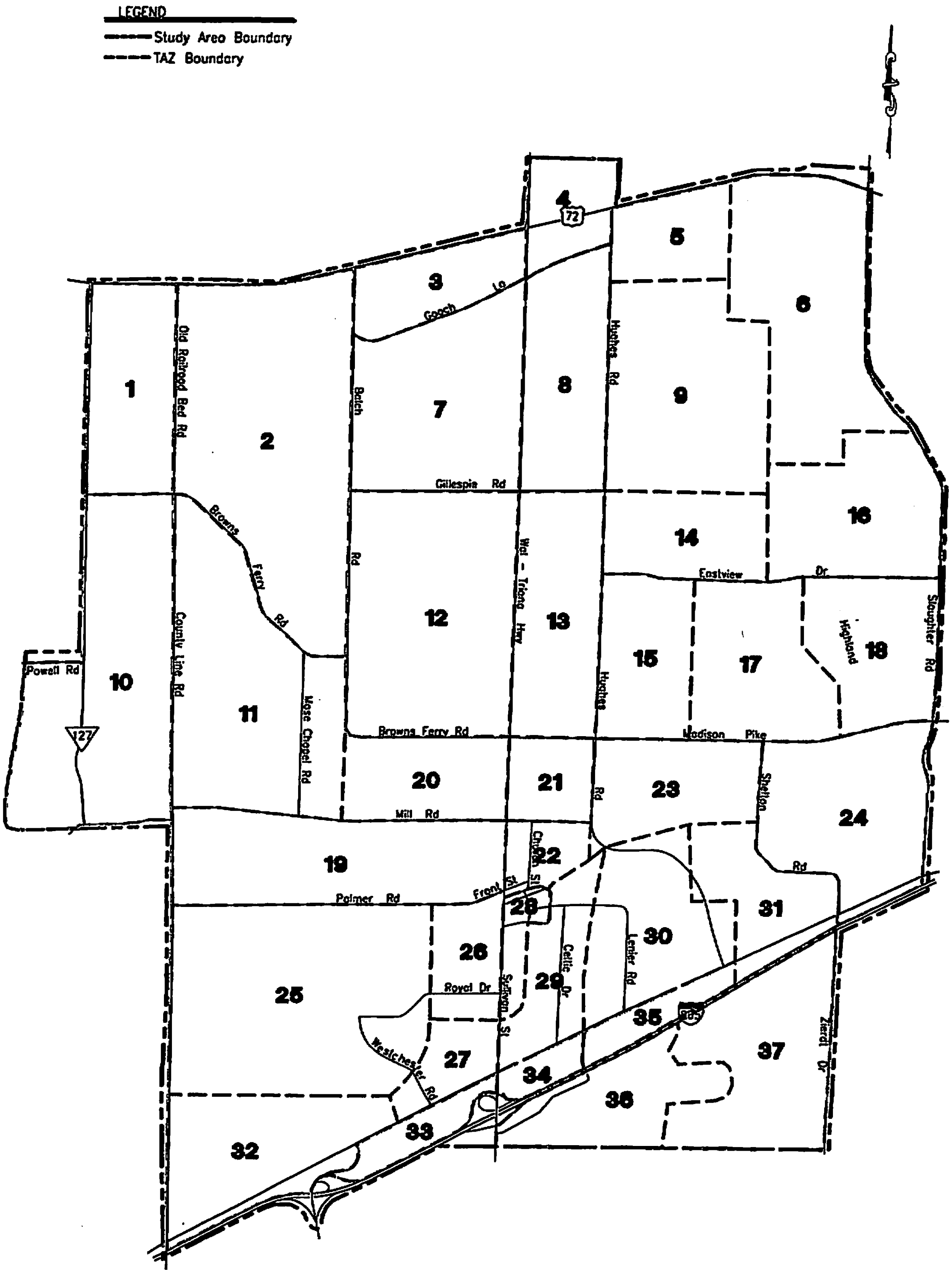
To catalog the land uses of the city and to provide a means of quantifying the relationship of land use to transportation demand, the study area was divided into individual cells called traffic analysis zones (TAZ). A traffic analysis zone is defined as a subdivision of a study area of homogeneous land use within a distinct border for the compilation of land use and traffic generation data. A total of 37 zones are included within the study area boundary. The TAZ system is illustrated in Figure 5.

Base Year (2000) Land Use

Each traffic analysis zone within the study area was inventoried to determine the land uses within its boundary. The land use classifications used within each TAZ are listed below:

- Single Family Residential
- Multi-Family Residential
- Commercial
- Industrial
- Agricultural

Within the City of Madison, there were 8,655 single-family dwelling units and 4,465 multi-family dwelling units in 2000. Also, in 2000, there were approximately 700 acres of developed commercial property and 700 acres of developed industrial property in Madison. In addition to



Drawing is schematic and not to scale

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FIGURE 5

TRAFFIC ANALYSIS ZONES

Major Street Plan

MADISON, ALABAMA

residential, commercial and residential properties the study area contained approximately 480 acres of developed agricultural property. A summary of the existing land use data by traffic analysis zone is listed in Table 2.

Future Land Use

The generation of future traffic is based on the future land use of the area. This plan was developed assuming the City of Madison was built rather than using a particular horizon year to generate future traffic. The land use projections were prepared by the City of Madison. The base year and forecast year study area totals for each data variables are shown in the following:

	2000	Build-Out	% Change
Single Family Residential	8,655 units	17,703 units	104.5%
Multi-Family Residential	4,465 units	4,927 units	10.3%
Commercial	700 acres	1,265 acre	80.7%
Industrial	700 acres	2,155 acres	207.9%
Agricultural	480 acres	2,180 acres	354.2%

NOTE: Dwelling unit projections vary slightly (4%) from projections in Land Use element due to difference in methodologies

TRANSPORTATION MODELING PROCESS

Travel demand models are developed to predict future traffic on the street and highway system. The models are initially developed using existing land uses to duplicate travel for the base year, which for this study was 2000. How well the model duplicates base year conditions is considered as an indication of how well it will predict future travel. If the model cannot produce traffic volumes similar to those observed on existing streets and highways, then the model is reevaluated and adjustments are made. This adjustment or calibration process continues until the model is adequately simulating base year traffic conditions. The process of building and modifying the model to simulate base year travel is called calibration. After the model is calibrated, projections of future land uses are used as input into the model to predict future travel demand.

TABLE 2
CITY OF MADSION MAJOR STREET PLAN
EXISTING LAND USE DATA

TAZ	Single Family Residential Units	Multi-Family Residential Units	Developed Commercial Acres	Developed Industrial Acres	Developed Agricultural Acres
1	87	0	0.00	0.00	0.00
2	486	0	3.88	0.00	61.38
3	304	0	13.33	0.00	0.00
4	13	0	88.48	0.00	0.00
5	300	0	8.07	0.00	0.00
6	209	0	2.60	0.00	0.00
7	487	0	0.00	0.00	0.00
8	487	0	0.00	0.00	0.00
9	451	0	0.00	0.00	0.00
10	117	0	0.00	0.00	0.00
11	414	0	0.00	0.00	0.00
12	737	545	0.00	0.00	0.00
13	224	62	41.16	0.00	0.00
14	184	0	0.00	0.00	0.00
15	235	240	38.87	0.00	0.00
16	440	0	0.00	0.00	358.89
17	643	0	20.47	0.00	0.00
18	521	204	0.00	0.00	58.85
19	240	0	0.00	8.00	0.00
20	270	29	0.00	0.00	0.00
21	93	75	11.27	0.00	0.00
22	59	0	5.00	0.00	0.00
23	579	72	6.40	0.00	0.00
24	25	614	0.00	0.00	0.00
25	10	176	5.55	51.81	0.00
26	229	700	11.11	0.00	0.00
27	54	60	61.09	0.00	0.00
28	89	0	39.12	0.00	0.00
29	52	272	33.13	110.12	0.00
30	1	0	67.21	31.56	0.00
31	193	822	66.27	24.14	0.00
32	5	0	40.00	81.70	0.00
33	0	0	98.99	15.59	0.00
34	0	0	31.69	40.81	0.00
35	0	0	8.96	3.22	0.00
36	177	0	0.00	329.43	0.00
37	240	594	0.00	10.00	0.00
TOTAL	8655	4465	702.65	706.38	479.12

Roadway travel demand in the Madison area was analyzed using a standard travel demand modeling process. The standard modeling process is defined by a four-step analysis procedure:

Step 1	Trip Generation
Step 2	Trip Distribution
Step 3	Mode Split
Step 4	Assignment

As the standard transportation demand modeling process in the State of Alabama deals only with private transportation, (i.e., not public transit), Step #3, mode split, is ignored.

The Alabama Department of Transportation has adopted a transportation demand modeling package known as TRANPLAN, developed by the Urban Analysis Group, for use in modeling in the State of Alabama. TRANPLAN performs the various steps required in the modeling process. The following sections address the modeling process in more detail.

Roadway Network

The network file is an abstract, computerized representation of the actual roadway network. The network file is created by transferring a roadway map to a form that can be processed by the computer program. The roadway network includes all roadways that are classified as a collector or higher grade. At each intersection, node numbers are assigned. These node numbers are used to define individual links in the roadway network. The length, carrying capacity, and average speed of each link in the network is coded as part of the roadway network description. TAZ's are connected to the roadway network by imaginary lines through which the trips produced in or attracted to each TAZ may gain access to the roadway system. This entire abstract description of the actual roadway network is coded, entered into the computer, and becomes the network file for the study area.

Trip Generation

The trip generation model translates land use data into numbers of trips. Given the land uses for a TAZ, the trip generation model predicts the number of trips that will be produced by that TAZ and the number of trips that will be attracted to that TAZ from all other TAZ's in the study area.

To perform trip generation, the relationships between observed travel and land use are defined through the use of mathematical equations and ratios. To determine the total number of trips that a TAZ may produce or attract, the number of dwelling units, developed commercial acres and developed industrial acres within that TAZ are multiplied by the appropriate trip generation rate. Using this process productions and attractions are produced for each TAZ. The trip generation model produces production and attraction data files for six trip purposes. These six trip purposes are:

Trip Purpose 1	Home Base Work (HBW)
Trip Purpose 2	Home Base Other (HBO)
Trip Purpose 3	Non-Home-Based (NHB)
Trip Purpose 4	Truck-Taxi (T-T)
Trip Purpose 5	Internal-External (I-X)
Trip Purpose 6	External-External (X-X)

Trip Distribution

After trip generation has been completed, the productions and attractions for each TAZ are calculated. Trip distribution is the process by which the trips originating in one TAZ are distributed to other TAZ's throughout the study area. The output from trip distribution is a set of tables called trip tables that show travel flow between each pair of zones.

The method used to distribute trips throughout the Madison study area was the gravity model. In the gravity model, the number of trips between two areas is directly proportional to the amount of activity in the areas and inversely proportional to the separation between the areas (represented as a function of travel time). In other words, the areas farther from each other will tend to exchange fewer trips. The generalized formula for the gravity model relates the desire for travel to three factors: 1) trip productions; 2)trip attractions; and 3) friction factors. The formula is:

$$Trips_{ij} = \frac{Prods_i \times Attrs_j \times FF_{ij}}{\sum Attrs_j \times FF_{ij}}$$

where $Prods_i$ = productions at origin zone i

$Attrs_j$ = attractions at destination zone j

FF_{ij} = friction factor between origin zone i and destination zone j

The effect of travel time on the exchange of trips between two zones is represented by a friction factor. Simply stated, a friction factor represents the level of accessibility between each zone, with higher value meaning "greater accessibility" and lower travel time. Each trip purpose must have a set of friction factors. The maximum time value of friction factors used in the Madison model was 30 minutes.

Traffic Assignment

In trip generation, the number of trips by zone were forecast. Those forecast trips were then given destinations by trip distribution. Assigning these trips to specific routes and establishing traffic volumes is the last phase of the forecasting process. In the assignment process the existing trip tables that are produced in the trip distribution step of the modeling process is used to assign base year trips to the base year network. Trips between any two zones will generally follow the path (roadway links) between zones that require the least amount of travel time. In determining time to go from one zone to another, delays due to congestion are taken into consideration.

The equilibrium assignment process, which was used in this study, considers demand in relation to capacity. The equilibrium assignment technique consists of a series of all or nothing loadings with an adjustment of travel time according to delays encountered in the associated iteration. The assignment from each iteration is combined with the assignment for the previous iteration in such a way as to minimize the travel time of each trip. As a result of these time adjustments, the loadings of different iterations may be assigned to different paths. By combining information from various iterations, the number of iterations required to reach equilibrium is reduced. Equilibrium occurs when no trip can be made by an alternate path without increasing the total travel time of all trips on the network.

Model Calibration

Trips cannot be merely assigned to the roadway network. The model has to be calibrated to assure that it is replicating existing traffic volumes. Travel demand models are run to predict link volumes, which are then compared to actual traffic counts at selected locations along screenlines and cutlines. Screenlines are imaginary lines established to intercept traffic flows through a study area and are usually located along physical barriers such as rivers or railroads. Cutlines are shorter than screenlines; they measure traffic volumes in a corridor. The base year model assignment was compared to actual traffic volumes crossing the screenlines, and adjustments were made to the input model data set until assigned traffic volumes approximated actual screenline traffic volumes. When all of the reasonable adjustments and factors were included in the model, a final assignment was made. The final assignment was compared to performance measures based on national averages from studies of other urbanized areas. The total of the ground counts compared to the total of the model assignments for all of the screenlines should not be more than five percent. The percent error for the Madison model was less than three percent.

TRAVEL DEMAND FORECASTS

Future Productions and Attractions

The trip generation model was used to calculate future productions and attractions in the same manner as base year productions and attractions were calculated. The future land use data, presented in an earlier section of this report, was used to calculate the future year productions and attractions. Internal-external productions and external-external productions and attractions were calculated using historical traffic growth patterns at the external boundaries of the study area.

Future Year Trip Table

Future productions and attractions were distributed using the gravity model according to the methodology used to distribute the existing year productions and attractions. Resultant trip tables for each of the six trip purposes for the future were produced. These trip tables were then added and then converted to origin-destination format.

Future No Build Assignment

Before any roadway improvements are added to the network, the future trip table is assigned to the existing roadway network using the assignment methodology and criteria cited previously. This assignment process is referred to as a "no build" assignment. The purpose of this step is to identify where future year deficiencies might occur if no roadway improvements are undertaken. The results of the no-build assignment are shown in Figure 6.

Projected Levels of Service and Deficiencies

As was discussed in the Existing Conditions section, the future no-build forecast traffic volumes were compared with the roadway capacities to determine roadway segment levels of service. Levels of service for the no-build condition are illustrated in Figure 7. Roadways which show a projected volume/capacity (v/c) ratio of greater than 0.75 (Level of Service "E") should be considered deficient. Emphasis should be placed on those areas where the v/c ratio is greater than 1.00 (Level of Service "F"). Based on those ratios, the roadways estimated to be deficient with the City of Madison Built-out are shown in Figure 8.

MAJOR STEET PLAN DEVELOPMENT

The Major Street Plan was developed to attempt to alleviate existing traffic congestion, mitigate anticipated future year capacity deficiencies that were identified in the no-build model, improve mobility, increase safety, and support the Comprehensive Plan. The Major Street Plan was developed as a result of public meetings, meetings with Madison officials and outputs from the travel demand model.

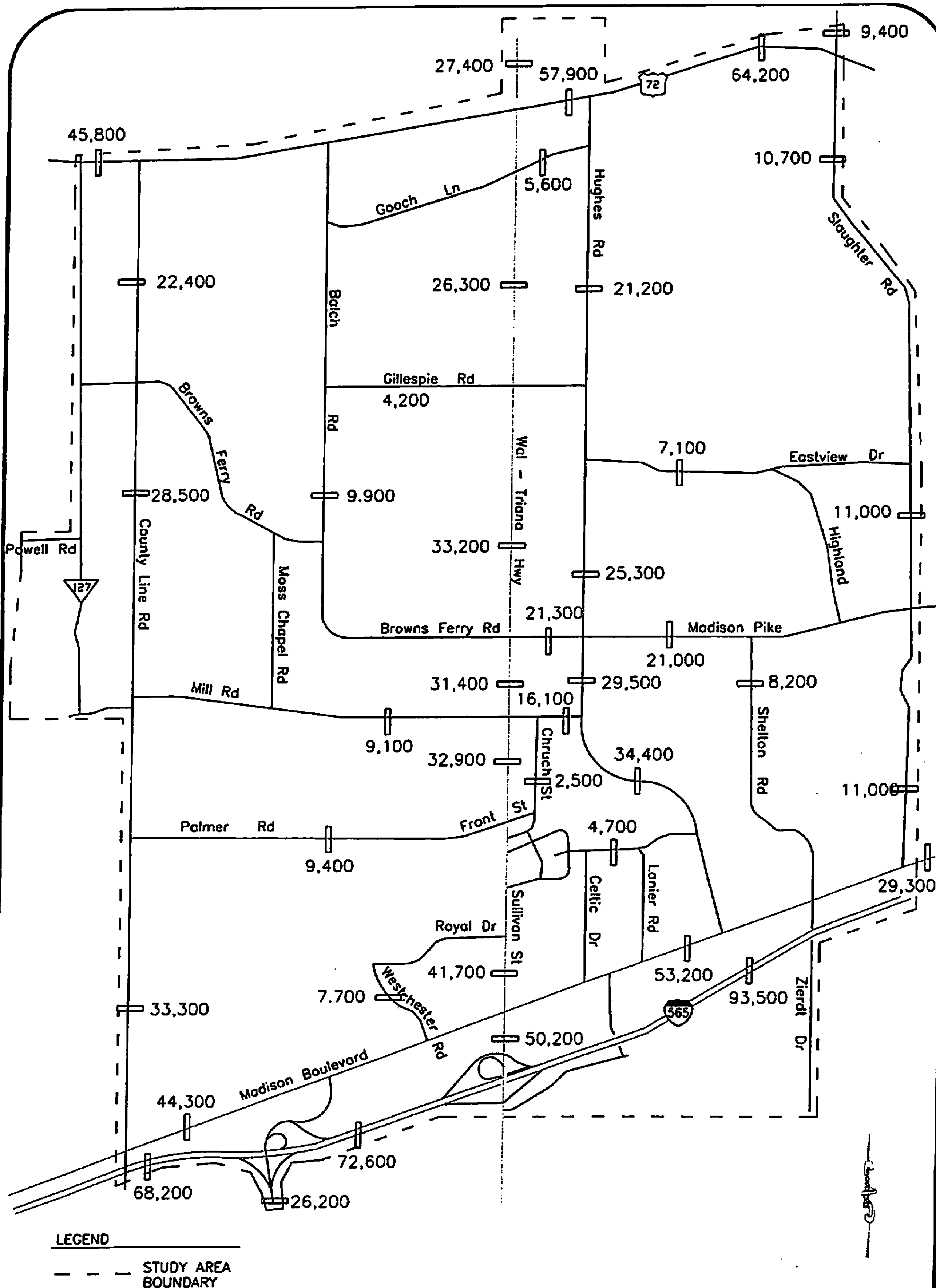

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FIGURE 6

NO-BUILD DAILY TRAFFIC VOLUMES

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MADISON, ALABAMA

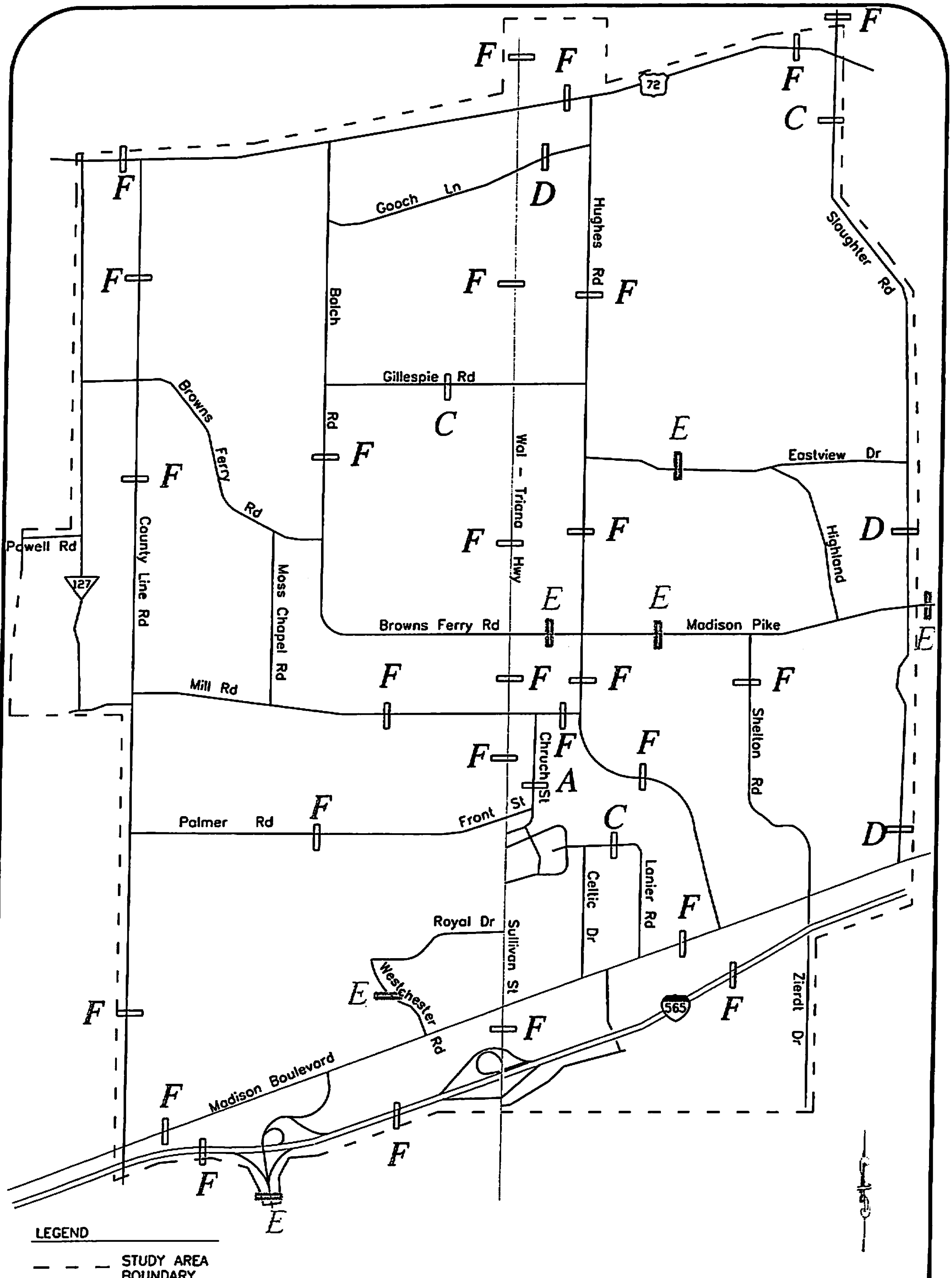

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FIGURE 7

NO BUILD LEVELS OF SERVICE

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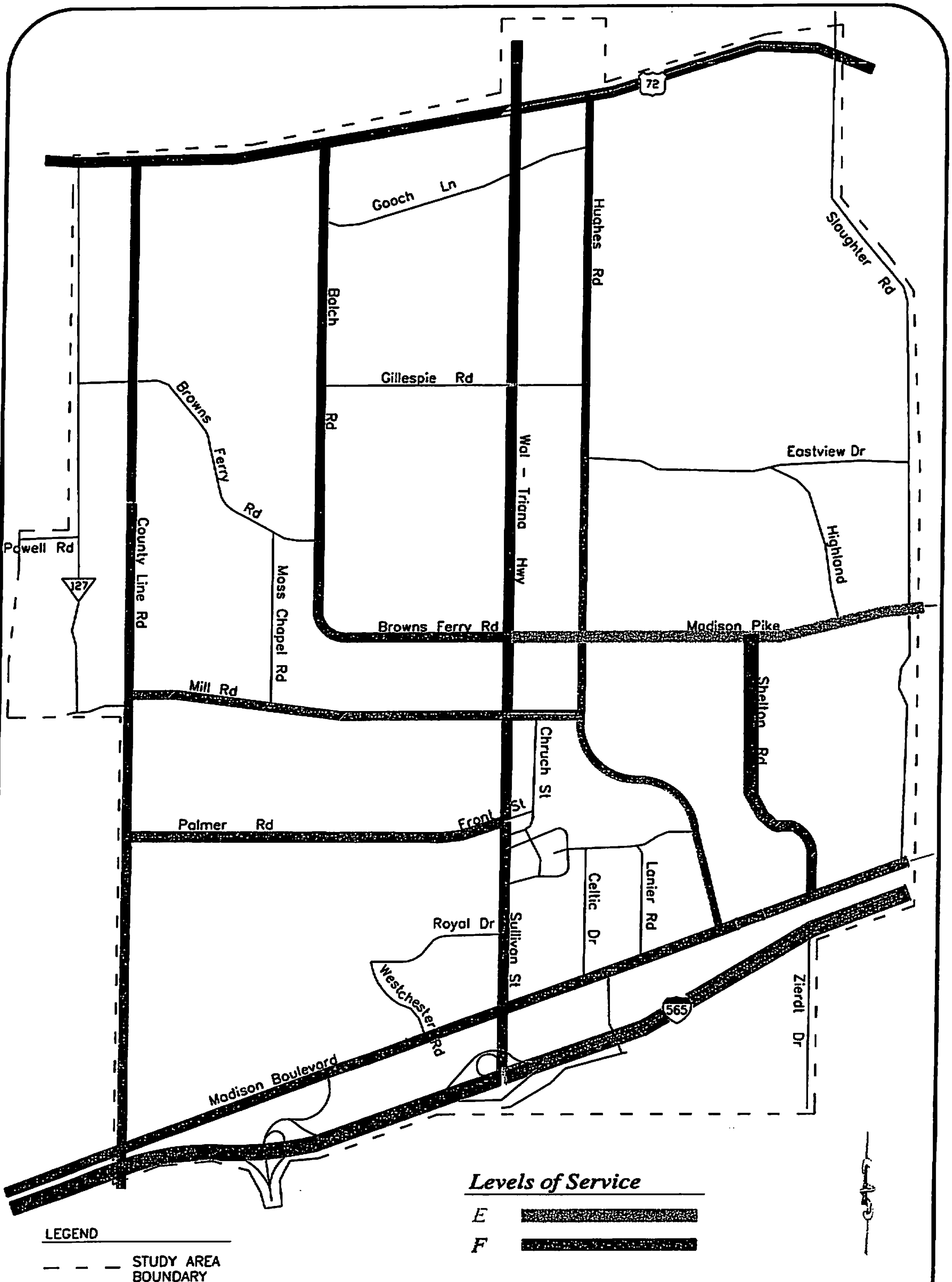

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FIGURE 8

NO BUILD ROADWAY DEFICIENCIES

Major Street Plan

MADISON, ALABAMA

Access Management

The success of the Major Street Plan relies on the City's ability to protect current and future capacities of the roadway network. Access management can benefit roadside properties throughout the City of Madison by promoting safety and improving roadway capacities. If approached properly, access management can enhance property values while safeguarding past and future public investments in the infrastructure. Access management techniques developed for Madison should incorporate the following strategies to retrofit current roadway corridors and in planning new projects.

- Separate conflict points – distance between major intersections and driveways should be regulated. As a general rule, driveways should not be located within the area of influence of intersections.
- Restrict turning movements at unsignalized driveways and intersections – the use of full directional unsignalized streets and driveways should be limited. Full movement intersections should serve multiple developments through joint use driveways or cross access easements. If frontage roads area available, all driveways should access the frontage roads. Access to the main line should only be permitted at intersections of public roadways.
- Establish design standards – design standards that address access spacing, the length of turn lanes and tapers and driveway dimensions should be developed for application throughout the corridor.
- Traffic signal spacing – signals should only be installed when appropriate studies indicate their spacing and interconnection can be accomplished without significant impacts on the corridor capacity.
- Turn lanes – left and right turn lanes should be required for all public streets and major access points to adjacent land uses.
- Shared driveways/inter-parcel access – joint use driveways should be required to reduce the proliferation of driveways and to preserve the capacity of the corridor.
- Pedestrian/bicycle planning – specific needs of pedestrian and bicyclist movements should be addressed. Traffic signals should be designed and timed to accommodate pedestrians in those areas of significant activity.

Roadway Improvement Projects

Various types of roadway improvements have been included in Madison's Major Street Plan. The roadway improvements include constructing new roadways as well as widening existing roadways. The projects that have been identified for inclusion in the Major Street Plan are summarized in Table 3 and keyed to Figure 9. The projects are prioritized as high, medium or low. High priority projects should be constructed in a 0-5 year period, medium priority projects should be constructed in a 5-8 year period and low priority projects should be constructed in an 8-10 year period. Preparation to begin work on projects should start prior to their recommended time period. Construction should be completed within the recommended time period in order to divert any future traffic problems.

TABLE 3
CITY OF MADISON MAJOR STREET PLAN
ROADWAY IMPROVEMENT PROJECTS

PROJECT NUMBER	ROADWAY	ACTION	FROM	TO	PRIORITY
1	Balch Road	Extend	Browns Ferry Road	Madison Boulevard	High
2	Balch Road	Widen	U.S. Highway 72	Balch Road Extension	Low
3	Gillespie Road	Extend	Balch Road	County Line Road	High
4	Royal Drive	Extend	Westchester Road	Balch Road Extension	Medium
5	Eastview Drive	Extend	Hughes Road	Wall-Triana Highway	High
6	Mill Road	Widen	County Line Road	Hughes Road	Medium
7	Zierdt Road	Extend	Shelton Road	Madison Pike	Low
8	Wall-Triana Highway	Widen	Royal Drive	Front Street	Medium
9	Wall-Triana Highway	Widen	Mill Road	U.S. Highway 72	Low
10	County Line Road	Widen	The Railroad	Madison Boulevard	High
11	Portal Lane	Extend	Shelton Road	Zierdt Road	Low
12	Hughes Road	Widen	Madison Pike	U.S. Highway 72	Low
13	Interstate 65 Interchange	Modify	Airport Interchange	----------------	Medium
14	U.S. Highway 72	Widen	Study Area Boundary	Study Area Boundary	N/A*

*This project should not be assigned a priority instead should be constructed by the Alabama Department of Transportation.

Future Year Daily Traffic Volumes

Future year trips were assigned to the Street Plan network using the TRANPLAN model to determine the benefit of the plan. The results of the assignment are illustrated in Figure 10.

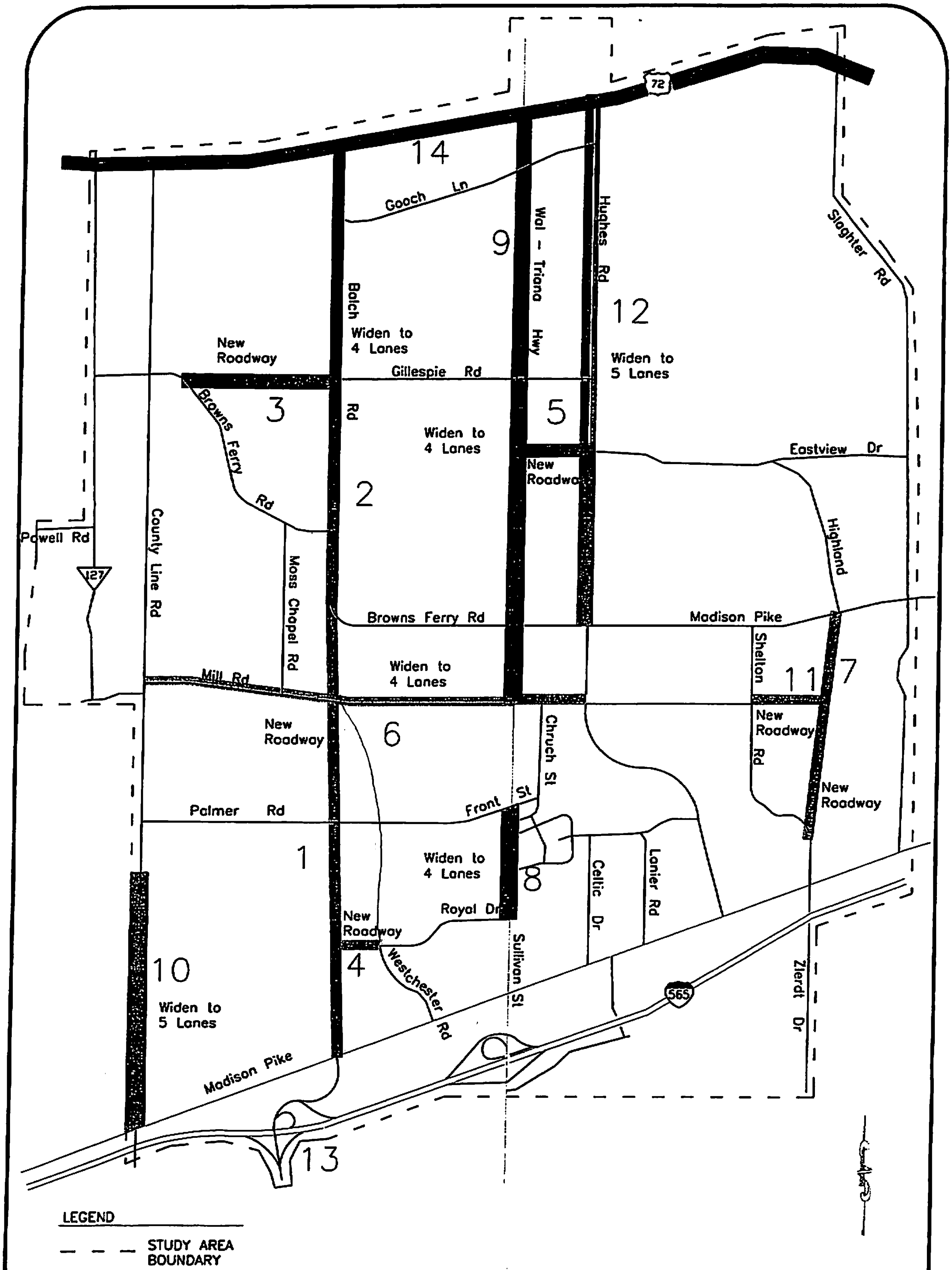

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FIGURE 9

MAJOR STREET PLAN

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1103.001

Future Year Levels of Service and Deficiencies

To determine roadway segment levels of service, forecast traffic volumes illustrated in Figure 10 were compared with proposed roadway capacities. The levels of service for the Street Plan are illustrated in Figure 11. The Street Plan was reviewed to determine which facilities showed a projected volume/capacity (v/c) ratio of greater than 0.75 (Level of Service "E"). As was the case in the review of the no-build network, roadways with a volume/capacity (v/c) ratio of greater than 0.75 (Level of Service "E") should be considered deficient. Based on those ratios, the facilities estimated to be deficient with the roadway plan in place are shown in Figure 12.

CONCLUSIONS

This report summarized the results of a study performed for the major street system of the City of Madison. The conditions summarized included both land use analysis and traffic analysis for existing, future conditions and recommendations for roadway improvements that would help correct current and future transportation deficiencies. It is virtually impossible to eliminate all transportation deficiencies that may occur in a city but the recommendations in this report will help relieve existing and future traffic congestion, improve mobility, improve traffic safety and support the City of Madison's Comprehensive Plan.

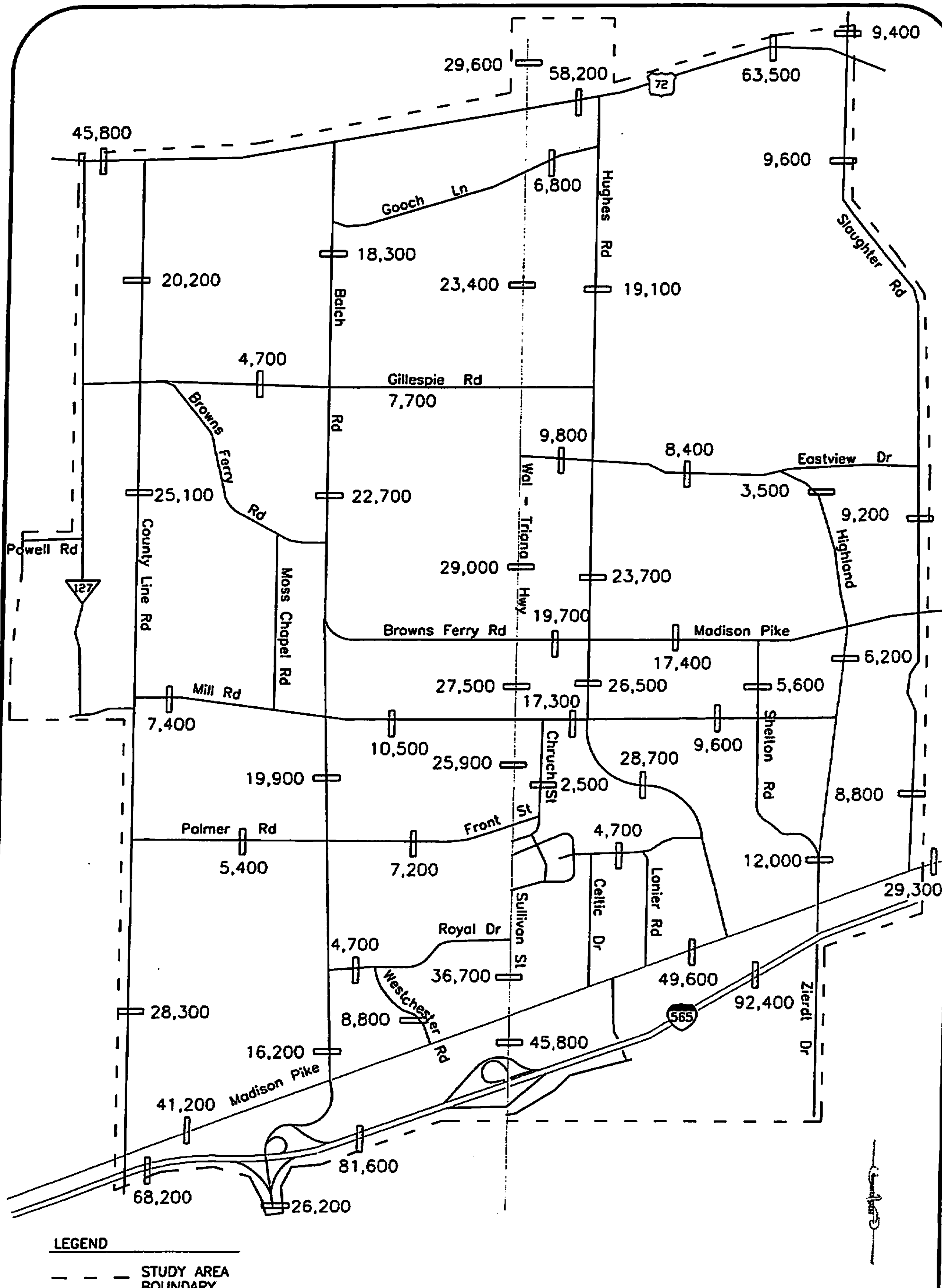

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FIGURE 10

MAJOR STREET PLAN TRAFFIC VOLUMES

Major Street Plan

MADISON, ALABAMA

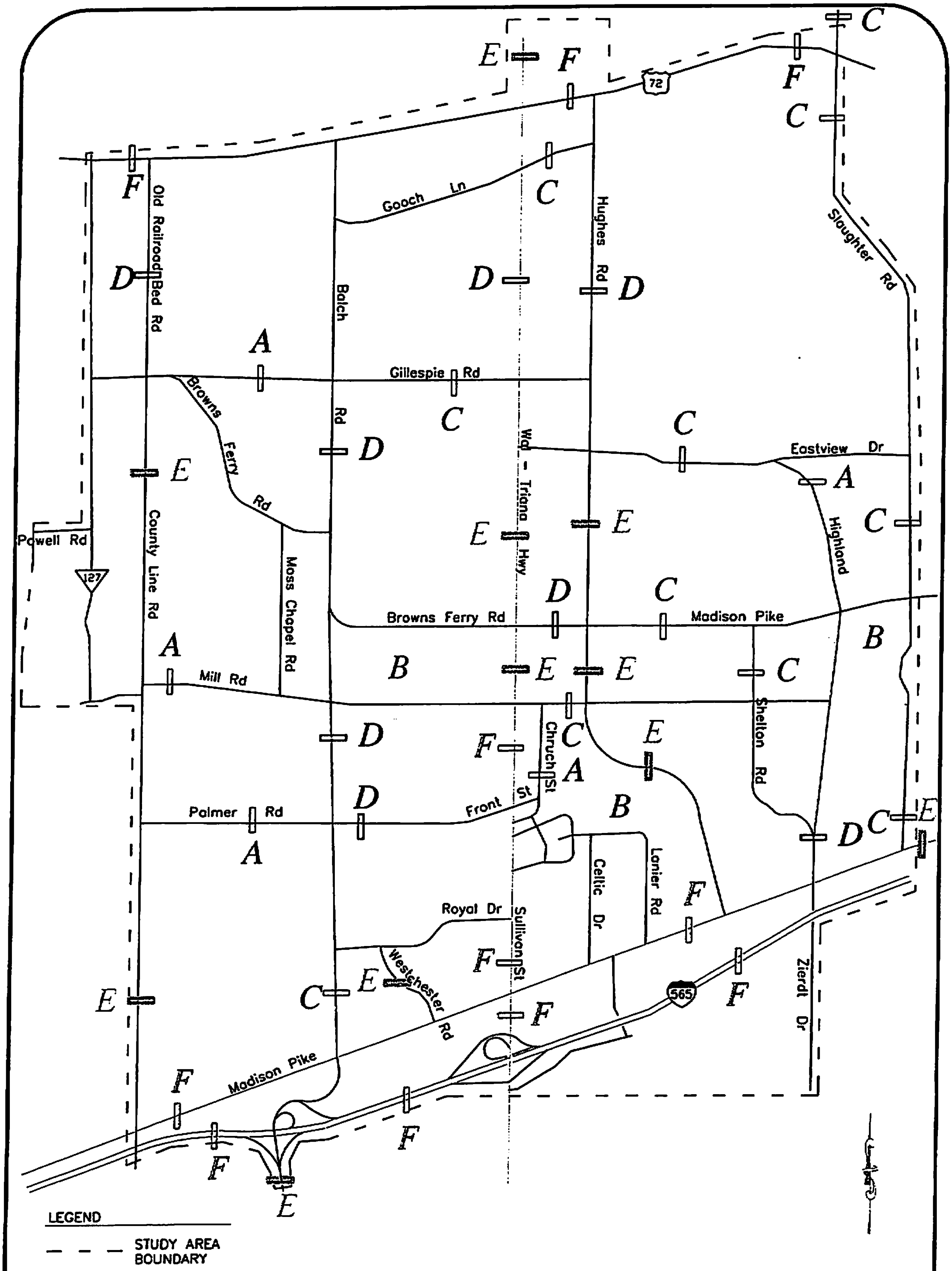

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FIGURE 11

MAJOR STREET PLAN LEVELS OF SERVICE

Major Street Plan

MADISON, ALABAMA

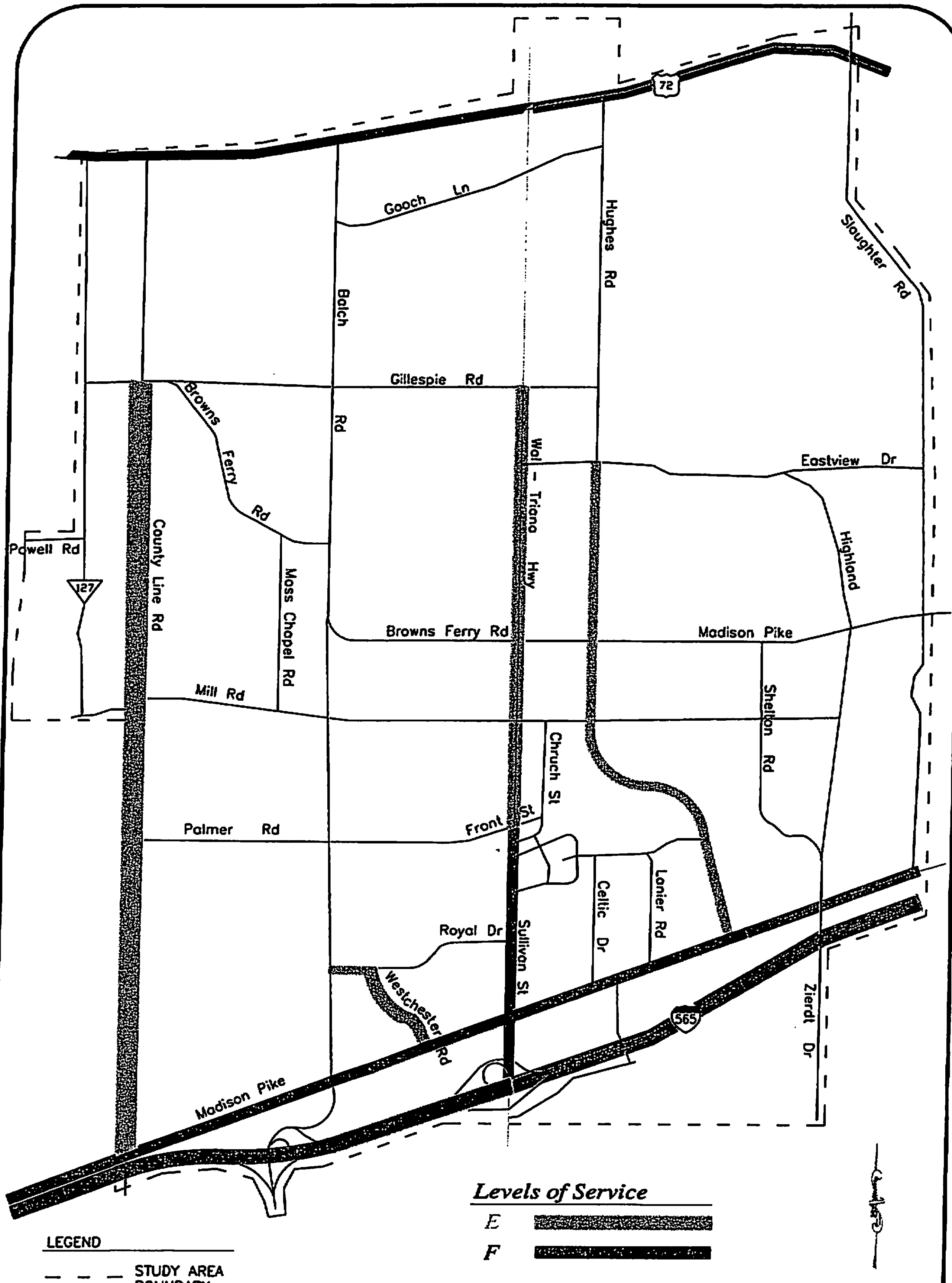

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FIGURE 12

MAJOR STREET PLAN ROADWAY DEFICIENCIES

Major Street Plan

MADISON, ALABAMA