MIAMI URBAN AREA TRANSIT STUDY

LOG OF REPORTS

GOALS AND OBJECTIVES

MIAMI URBAN AREA TRANSPORTATION STUDY
METROPOLITAN DADE COUNTY, FLORIDA

transportation

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ABSTRACT:

This report presents general concepts of goals, objectives and policies as they apply generally to cities and specifically to the Miami urban area. The goals established for the preparation of the General Land Use Master Plan for Dade County are reviewed and analyzed, and the goals, objectives and policies for three broad areas of the plan are summarized. These areas are: economic, social and physical; housing commercial and industrial; and transportation. The section on transportation also includes a summarization of the standards developed for the Miami Urban Area Transportation Study.

GOALS AND OBJECTIVES FOR TRANSPORTATION PLANNING

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PREFACE

This is one of several background reports related to comprehensive transportation planning within the context of the Miami Urban Area Transportation Study. MUATS is a joint effort of Metropolitan Dade County and the State of Florida in cooperation with the U.S. Department of Transportation's Bureau of Public Roads, and the U.S. Department of Housing and Urban Development. Other reports in the series provide data on social and economic factors affecting development, population projections, land use activities and projections, regulatory measures, means of implementation, and continuing planning efforts. These background studies provide the basic inputs for the preparation of the principal elements of the MUATS program, which include metropolitan master plans for streets and highways, terminal facilities, airports, seaports and waterways, and mass transit.

The reports (1) present the findings of major study phases as they relate to the planning of all elements of transportation facilities in the Miami area and serve to advise the MUATS Technical Advisory and Policy Committees, and other concerned persons, of the technical details of the analysis being conducted in the urban area transportation study by Metropolitan Dade County and its consultants.

Goals for Transportation Planning reviews and analyzes the goals established for preparation of the General Land Use Master Plan adopted by Metropolitan Dade County in 1965, reviews and analyzes the objectives and policies for housing, commerce and industry and establishes new objectives and policies for the highway and transit elements in the transportation plan.

(1) See Appendix for a list of reports in this series

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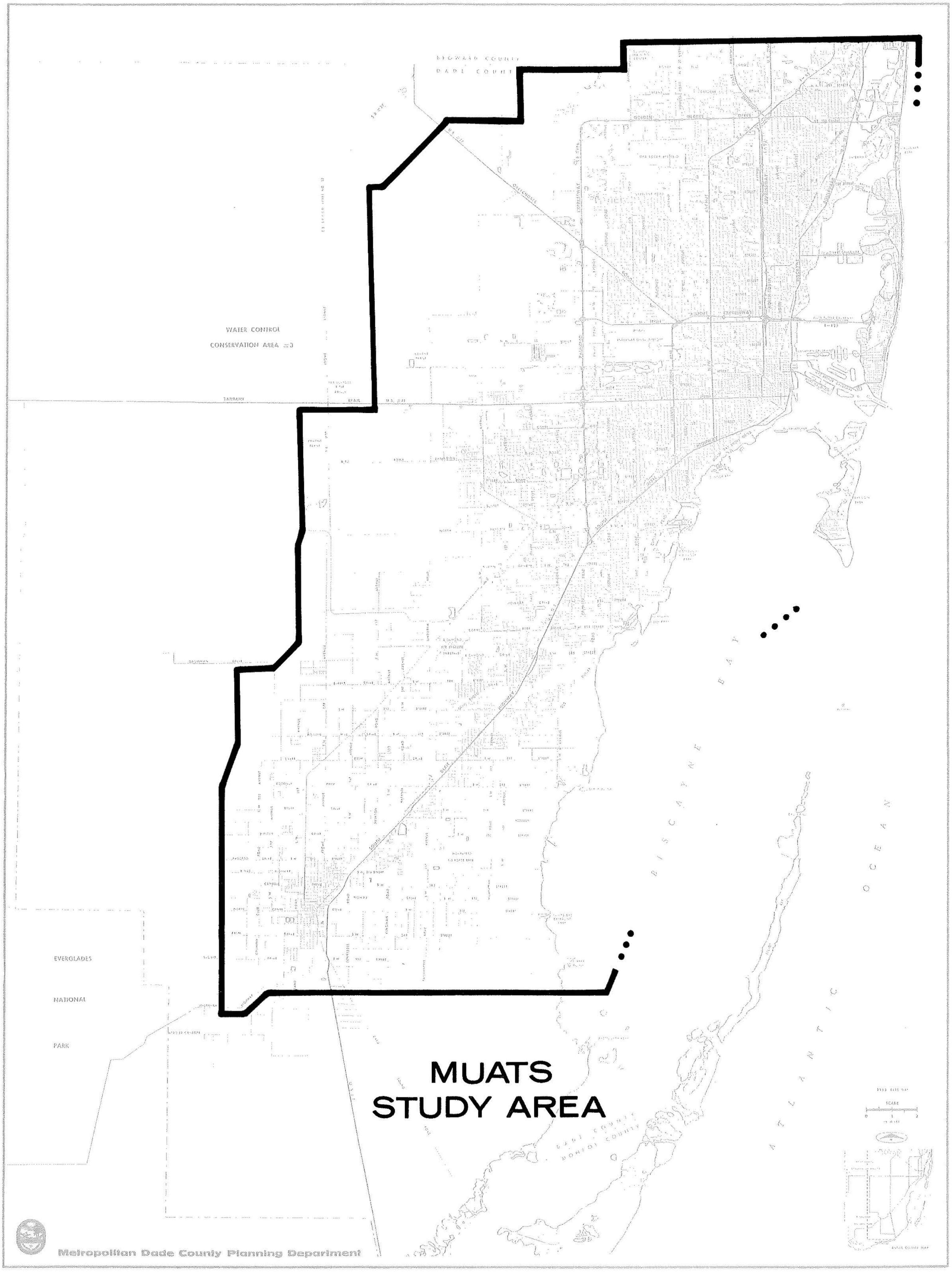

MUATS
STUDY AREA
WATER CONTROL
CONSERVATION AREA #3
EVERGLADES
NATIONAL
PARK
BROWARD COUNTY
DADE COUNTY
Metropolitan Dade County Planning Department

INTRODUCTION

> "If we could first know where we are, and whither we are tending, we could better judge what to do, and how to do it."
>
> — Abraham Lincoln

SCOPE

This report is divided into three sections with the first primarily discussing the economic, social, and physical goals of the Miami Urban Area. A summary of the economic and social goals developed by the General Land Use Master Plan is made, and physical goals are added to these goals.

The second section summarizes objectives and policies that have been developed in previous studies for housing and industry and commerce and relates these objectives and policies to the overall goals of the community. The third section develops objectives and policies for transportation in relation to the overall goals of the community.

DEFINITIONS

In the past, precision about goals has often not been sought. Much has been considered self-evident: the elimination of slums or the improvement of communications. Twenty years ago Abercrombie in his Greater London Plan (1944) could state as goals "...to locate population and industry more logically, to improve transport radically and to determine a proper use of land."

Delafons, in his study of land use controls in the United States, commented that it is rare to find a city which has tried to define the goals of its planning in anything but a cursory manner.(1) Attempts at definition (usually unclarified) include efficiency in communications, use of land, and so forth; utility in terms of production and distribution; economy in the provision of public serv-

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(1) J. Delafons Land Use Controls in the United States. Cambridge, Maryland: The Joint Center of Urban Studies of M.I.T. and Harvard University, 1962, p. 33.

ices; and convenience for living and working.

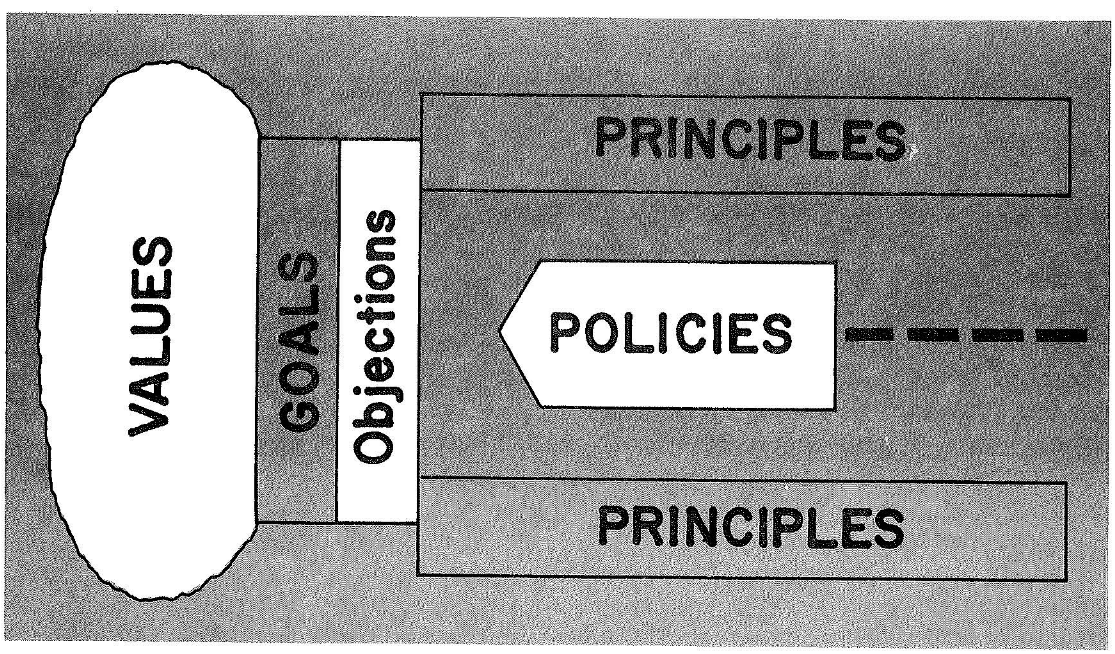
Any investigator into the subject of goals is at once confronted with semantic difficulties. Not only is the term "goal" used in a number of ways but a fair multitude of terms are used to denote the general idea of goal with no clear distinction in their several meanings. Thus, terms such as goals, objectives, aims, policies, purposes and alternatives seem to be used more or less interchangeably. It is interesting to note the frequent pairing of terms in published city or regional plans, usually without differentiation. Often these urban plans will include statements of "goals and objectives," "goals and alternatives," "aims and policies," or some other combination without indicating any difference between the pair. Goals and objectives are the key terms and a distinction is made between the two which is relevant to the urban planning process.

Webster defines "goal" as "the end of which a design trends: aim, purposes." This short definition gives important clues, and it is possible to define the term for our own purposes without straining general usage, which is always desirable. Note that Webster says "trends" not "reaches"; a goal provides the traveler a direction not a location.

Values should be converted to goals and goals should be converted to specific objectives obtained through the application of policies. Policies in turn are determined by standards and principles.

FIGURE 1

GOAL FORMULATION



Values and Goals

Goals are essentially concrete expressions of values. Values are highly elusive, complex and frequently inconsistent. They are seldom stated explicitly. For centuries, some of the finest minds in the world have struggled to determine what it is that people really do value. A goal is an ideal and should be expressed in abstract terms. It is a universal and lasting value to be sought after.

Objectives

Objectives, which change according to circumstance, are to be achieved, rather than sought after. An objective is specific and capable of attainment and measurement with an implicit rather than explicit inherent purpose. Webster defines "objective" as an "aim or end of action; point to be hit, reached..."

Policies

The policy itself is the settled course of action to achieve the goals and objectives. Once the metropolitan area identifies where it wants to go, policies, or decisions are made regarding the method to achieve these goals and objectives. The range of policies that would achieve these goals and objectives are set by certain rules of conduct or fundamental truths called standards or principles.

Principles and standards, as well as values limit the range of policies and actions which can be adopted. They suggest which policies can work and which can not. Or principles and standards say that while a certain policy or action can work, the rules of society would not permit it to work.

BACKGROUND

General

The physical design and organization of a city conforms to the values and goals of its people. The different values and goals emphasized by different groups of people account in part for the variety and diversity of the world's metropolises.

Many alternative patterns or policies are available. There is no one "best" way of building a metropolis. Indeed, the variety of practical choices available to the planner probably is greater today than ever before. Several of these choices already have been incorporated into the plans of America's and the world's greatest cities. The divergent directions in which cities can be developed depending on the values and goals of the developers is indicated by the proposals of two outstanding twentieth century architects, Frank Lloyd Wright and LeCorbusier. The two held nearly opposite views about urban life and developed startingly different designs for an "ideal" city.

Wright, an American who condemned the form of present U.S. cities, advocated that they be scrapped and that the people "return to the soil" in a decentralized "Broadacre City" with a density set at one acre per person and no important concentrations of activity. Each family would be economically independent through subsistence farming, home industries, and home crafts. Such a life was consistent with Wright's ideas of democracy, which he felt was being strangled in the present centralized cities.

The European, LeCorbusier, loved urban life and advocated maintaining the large city's high density. He strongly opposed the traditional "garden city" movement of the 1920's which would have spread the population of cities into satellite centers. He claimed that such a movement would drain away the people and vitality of the old centers. He advocated, instead, bringing space and greenery into the rebuilt, high-density city, a sort of "vertical garden city" approach. Thus he became the first advocate of massive clearance and rebuilding. He eventually produced a series of detailed models and drawings for what he named "La Ville Radieuse" (the Radiant City) using 16-story apartment buildings covering 12 per cent of the ground to house 400 people per acre.

Still other types of patterns reflect the values and goals of a community. Two of America's largest cities, Chicago and Los Angeles, have turned to the freeway - expressway gridiron after early development along transit lines.

Transit-oriented development put a permanent stamp on Chicago in its most significant development years. But recently it has shifted emphasis to automobile transportation and an auto-oriented development that is filling in the gaps between the fingers of the mass-transit-development star.

Los Angeles often is viewed as the classic example of an automobile-oriented city built on a continually expanding grid of freeways and expressways. Yet, it too once had hundreds of miles of electric transit lines which began to be abandoned in the 1920's as the city turned to highway construction. Los Angeles has since developed as a highly decentralized, low-density metropolitan area. The central business district is relatively less important than those of other metropolises because of competition from other centers that have been enveloped by the steady growth of the built-up area.

These examples illustrate that values and goals do and should have an effect on the form and structure of a metropolitan area. Knowledge of what these values and goals are in Dade County establishes a range of possibilities for design and organization. These possibilities provide the basis for choosing alternative plans and programs of policy.

Miami Urban Area

Dade County's growth began with two small clusters near the coast connected by a strong transit link. These clusters have developed into the Miami - Miami Beach complex, with tourist activities forming its economic base, and the Homestead complex, which is predominantly agriculturally-oriented. A third cluster, located between the two in the Cutler Ridge area, emerged in the early 1960's, and is the nucleus for a future community of 500,000 people. (1)

Historically, Dade County has grown outward from a core, and exhibited a strong northward influence in development. This influence is due to its geographic location at the "end of the line," having ties of trade and communication in an overwhelmingly northward direction. Reinforcing this north "pull" are the low-lying Everglades and a marsh south of Homestead, limiting movement in that direction.

Equally active in all clusters is the limiting influence of the Everglades to the west. Even with programs of water control and drainage, low-lying gladeland presents a severe limiting influence on westward growth. Reinforcing this eastward "push" is the attraction of the bay and ocean. This attraction has become more marked in the development of the Miami cluster and is tempered strongly by low-lying marsh east of Homestead. However, the attraction is still strongest toward the bay and its access to the beaches and Keys.

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(1) Metropolitan Dade County Planning Department, The General Land Use Master Plan, October, 1963

The growth of Dade County has approximated a series of concentric circles emanating from two cores (Miami and Homestead), and a new emerging South Dade core located in the Cutler Ridge area, equidistant from the two existing ones. (See Figure 2)

The prevailing influence upon future growth in Dade County is the continued concentric movement from the Miami, South Dade and Homestead cores. (The more valued sectors along the bay and ocean continue to be forerunners of development, encouraging the lesser valued sectors deeper inland to follow after them.) Recently, development outward from the Fort Lauderdale - Hollywood complex in Broward County has joined the north Dade development to provide a northern core which is affecting urban form in Dade County. The shape of Dade County's future urban pattern will depend upon the relative strength (or central influence) these four cores (Miami, Fort Lauderdale, South Dade and Homestead) exert upon the modified concentric growth that is moving out from each of them.

Everglades National Park and the Central and Southern Florida Flood Control and Water Conservation District combine to form a protected open space to the west of Dade County's rapidly expanding urban area. The bay and ocean waters provide open space to the east. These natural barriers will continue to have a pronounced effect on urban growth in Dade County as well as the entire Florida "Gold Coast" area.

A change in the attractiveness of these central influences might have a dramatic effect on Dade County's future development. To illustrate possible effects, three views of what Dade County might look like under different conditions of central influence by the year 1985 are presented.

The first view projects the present slow decline in the attraction of the Miami core with a small increase in the Homestead core and a substantial increase in the Broward County area. (See Figure 3) The second alternative reverses the decline and presumes a strong increase in the attraction of the Miami core, with little increase in either the Broward County or Homestead cores. (See Figure 4) The third alternative reinforces the trend toward a decline of the Miami core, and in turn, strongly reinforces the growing influence of the South Dade, Homestead and Broward County cores. (See Figure 5)

Each of these alternative growth patterns, when projected to 1985, produce a different pattern of total urbanization. These patterns, in turn, present different implications concerning the planning objectives and policies set forth in the next two sections.

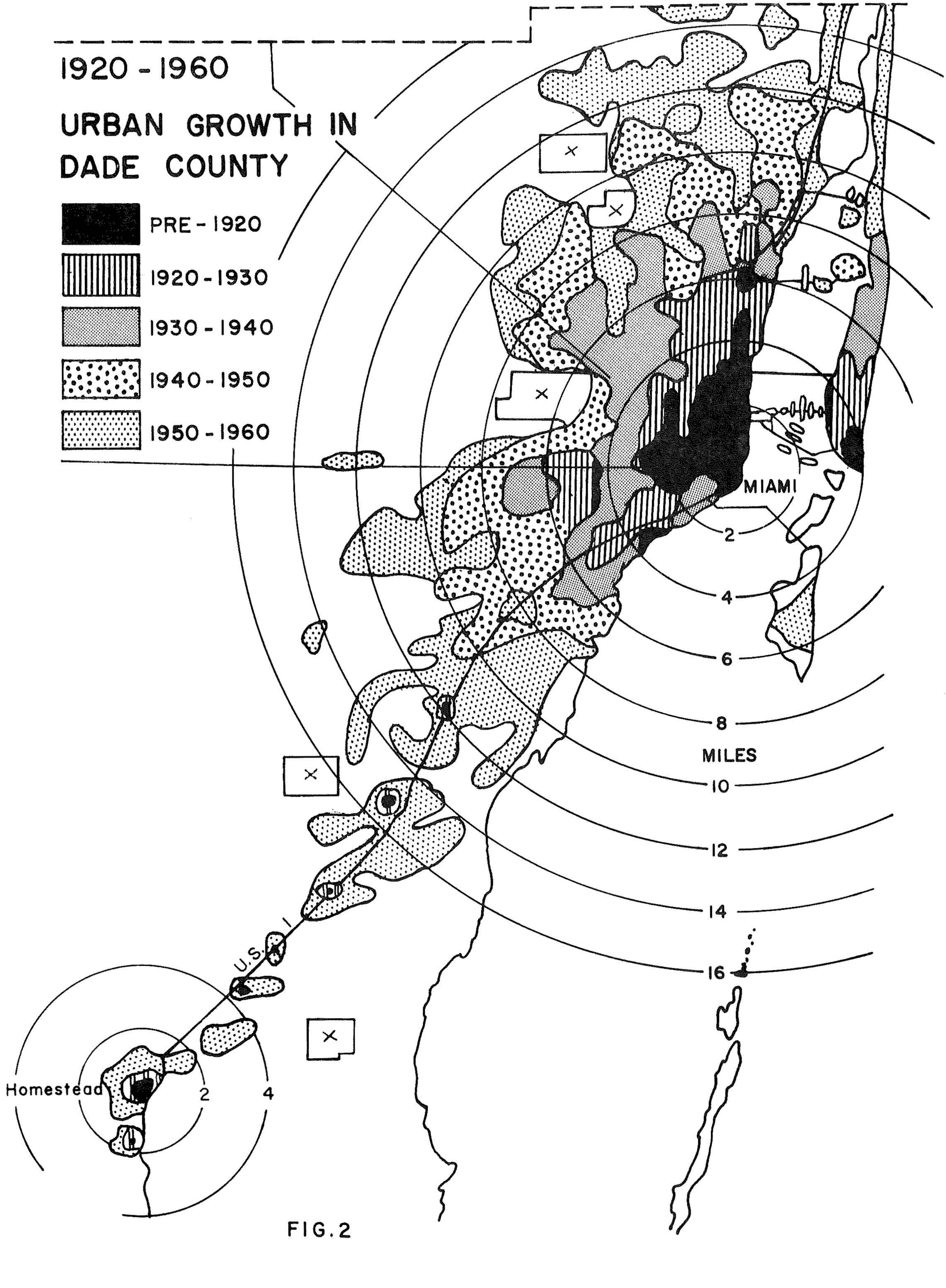
1920 - 1960
URBAN GROWTH IN
DADE COUNTY
PRE - 1920
1920 - 1930
1930 - 1940
1940 - 1950
1950 - 1960
MIAMI
2
4
6
8
MILES
10
12
14
16
U.S. 1
Homestead
2
4

FIG. 2

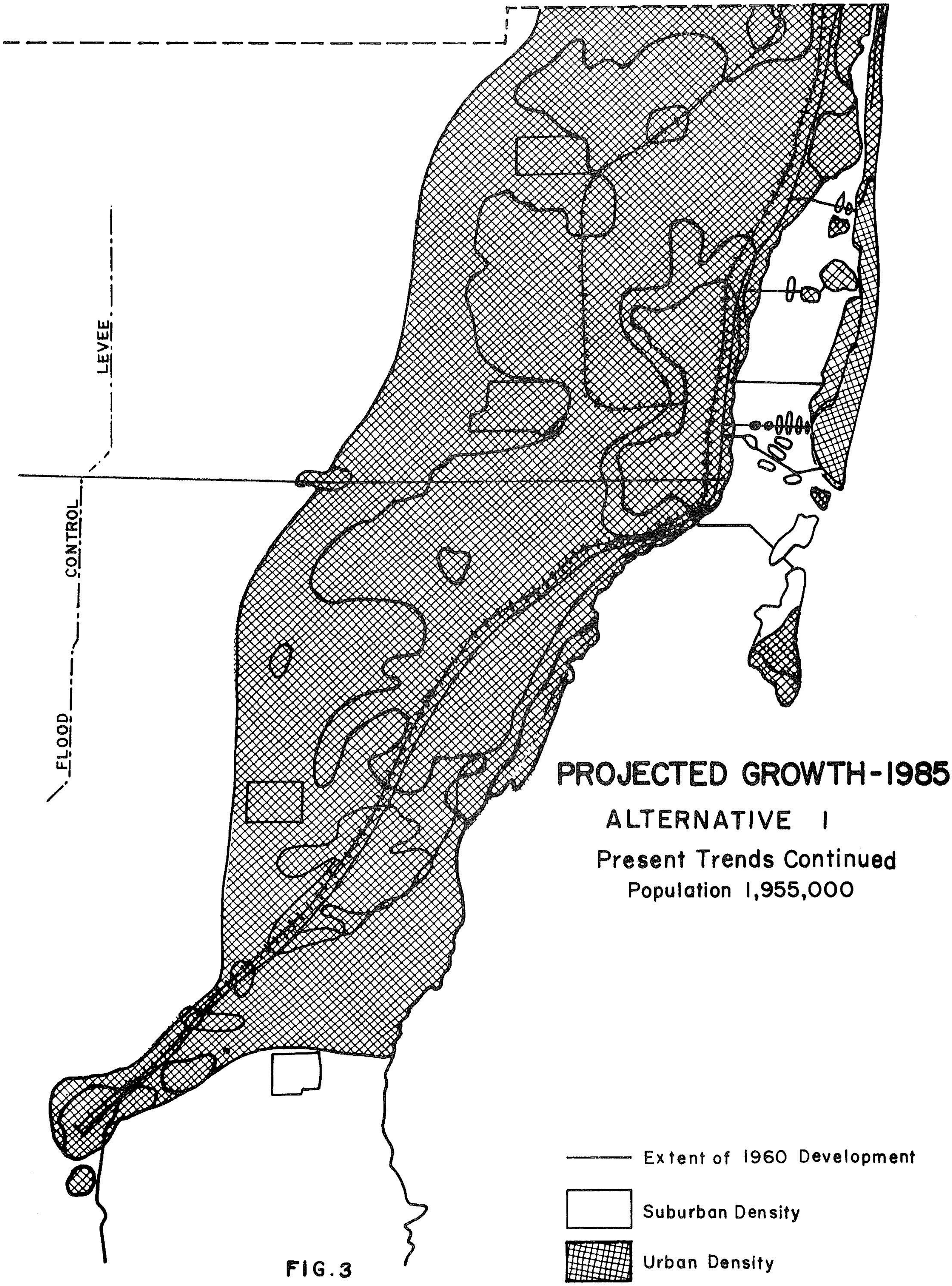
LEVEE
CONTROL
FLOOD
PROJECTED GROWTH-1985
ALTERNATIVE I
Present Trends Continued
Population 1,955,000
Extent of 1960 Development
Suburban Density
Urban Density

FIG. 3

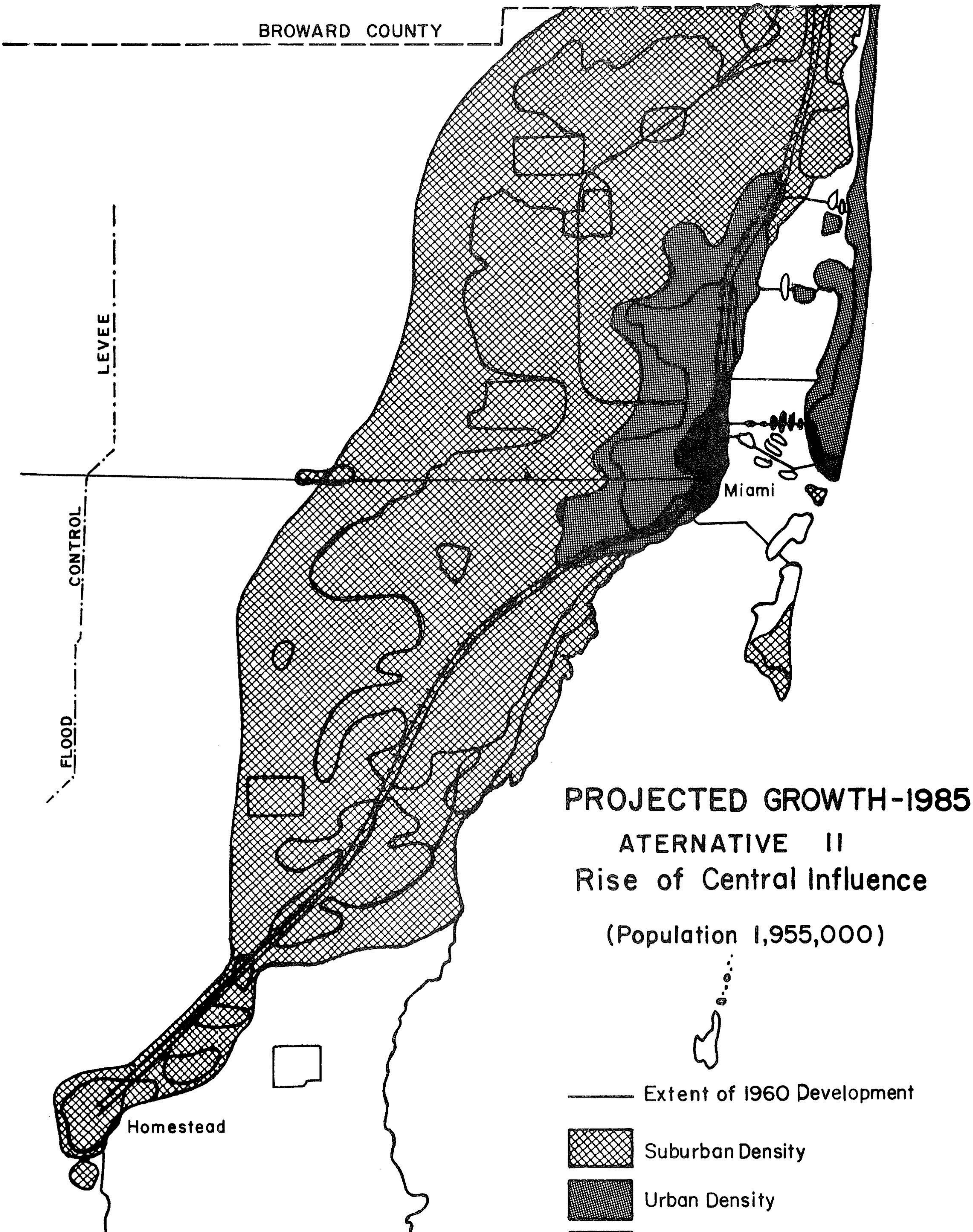
BROWARD COUNTY
LEVEE
CONTROL
FLOOD
Miami
Homestead
PROJECTED GROWTH-1985
ATERNATIVE II
Rise of Central Influence
(Population 1,955,000)
Extent of 1960 Development
Suburban Density
Urban Density
Superurban Density

FIG. 4

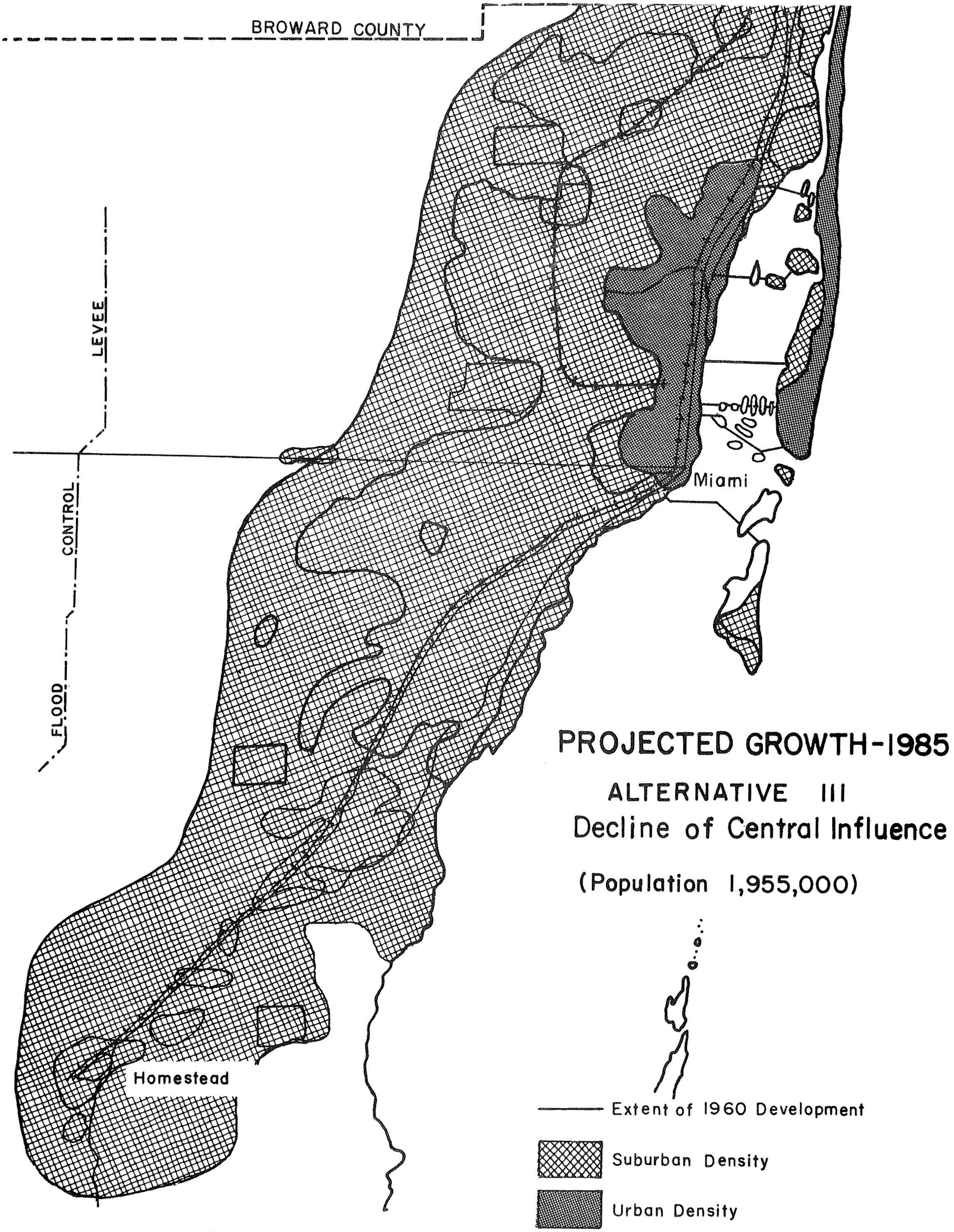
BROWARD COUNTY
LEVEE
CONTROL
FLOOD
Miami
Homestead
PROJECTED GROWTH-1985
ALTERNATIVE III
Decline of Central Influence
(Population 1,955,000)
Extent of 1960 Development
Suburban Density
Urban Density

FIG. 5

ECONOMIC, SOCIAL AND PHYSICAL GOALS

The General Land Use Master Plan, adopted in 1965, is the urban plan of the metropolitan area and reflects the goals of Dade County, which are summarized in this report. Formulation of an urban development plan is just the beginning. Carrying out the plan involves continuous change, adaptation, and improvement to achieve goals.

The comprehensive long-range metropolitan plan for the development of the county projected in map form present and proposed land use, population distribution, transportation network, and systems for public services and facilities, including schools, parks, playgrounds, and utilities.

The metropolitan plan began with an Economic Base Study and survey of existing land use development in June 1959, examining changing social, economic, and technological forces affecting the form and character of the community.

Goals, taking into consideration, economic, social, and physical aspects of the development of Dade County, were formulated based on a review of previous studies prepared by the Metropolitan Dade County Planning Department. These goals relate to health and safety, amenity and convenience, efficiency and economy, economic prosperity, social well-being, space for growth, and freedom of choice.

The General Land Use Master Plan provided goals for economic and social development, but physical goals have been added to the Plan as part of this study.

HEALTH AND SAFETY

This reflects freedom from hazards in Dade County's environment; a healthful urban environment. Slums, air pollution, and sewage-laden rivers and canals would be things of the past.

AMENITY AND CONVENIENCE

Attractiveness, pleasantness, variety, diversity and convenience in the urban environment characterize this goal. The environment should be visually attractive and combine harmoniously the best examples of contemporary style with those of a rich and valuable heritage. Good design should be an ingredient of every new development and should represent the architectural inheritance from earlier generations.

The living environment should offer a clear sense of individuality to each section of the metropolis. Urban design should strive to foster feelings of identity with and responsibility for each neighborhood.

EFFICIENCY AND ECONOMY

This refers to development and operation of services and facilities in both the public and private sectors. The land areas of Dade County are largely fixed. This land should be used efficiently to meet the increasing demands being placed on the area, and conflicting land uses should be avoided

There should be efficiency in the transportation of goods and people. Land uses should be arranged to minimize the need for travel and transportation facilities should be capable of economically serving mounting travel volumes.

ECONOMIC PROSPERITY

This goal refers to the growth and diversification of economic activities in Dade County. Optimum use should be made of economic resources, and characteristics unique to Dade County.

SOCIAL WELL-BEING

This goal provides a broad range of choices to satisfy envirnomental needs. Every resident of the area should have adequate housing. A variety of housing types should be available in each section of the county. The range of choices available to all people should be extended so that all, and not just the fortunate, can have access to decent homes and schools, and recreational and cultural facilities.

SPACE FOR GROWTH

Indiscriminate metropolitan growth should be contained; new growth should be selected with attention to the total pattern of land uses and the evolving distribution of population, activities, and transportation. Cultural institutions should be located to reinforce other forms of recreation, present and contemplated. Areas for agricultural production should be set aside, not only for economic reasons but also to provide a richer visual and environmental experience to the inhabitants.

If the Metropolitan Dade County area is to be developed as a meaningful environment for living, it is essential that its manifold uses do not encroach upon each other and in the process destroy the most valuable assets: open space, scenic attractiveness, and historical tradition.

FREEDOM OF CHOICE

This would provide a wider choice of living environments both for resident and non-resident use and more frequent interchange among environments. The metropolitan county area offers a heterogeneous landscape, consisting of urban cores, small towns, and varied open spaces. Within it, a wide variety of living environments may be sought and created, corresponding to the preferences of the population. Alternatives include country and in-town living, perhaps combined through a steep increase in the frequency of second homes for year-round use; single family dwellings and apartment towers; dense urban clusters and open countryside; new towns and villages with an historical tradition; and functionally specialized communities.

HOUSING, COMMERCIAL AND INDUSTRIAL GOALS

The goals created for Metropolitan Dade County as a whole are developed by establishing objectives for specific land use categories. This section discusses housing, commerce, and industry objectives and policies in relation to county goals.(1)

HOUSING

Goals

General goals reflected in residential land use include space for growth...convenience and amenity...health and safety... efficiency...residential quality.

Objectives

Housing objectives include: To provide 130 additional square miles of space for residential development to meet the needs of the 1,955,000 population forecast for 1985; to preserve, promote and maintain maximum amenity and convenience in residential development; to preserve and maintain the health and safety of the resident population; to insure the efficiency of services and facilities in residential development; to establish, preserve and maintain high quality development to enhance property values by dividing residental areas into four density categories: estate density (0 to 1.9 dwelling units per net residential acre); low density (2.0-12.9 dwelling units per net residential acre); medium density (13.0-35.9 dwelling units per net residential acre); and high density (36.0 or more dwelling units per net residential acre).

Policies

To obtain the housing objectives stated above, the following policies should be observed: allocate land for future population in a manner consistent with projected planning needs; locate residential areas in close proximity to work, recreation, and shopping; promote development of planned residential areas in a manner that will enhance physical and social identity; encourage adequate open space in and between planned residential areas and promote pleasing site

(1) Metropolitan Dade County Planning Department, Planning Objectives, 1960, pp. 5-12

arrangements in all residential areas.

Encourage orderly variety of dwelling types and density patterns within planned residential areas to achieve visual interest and provide for a maximum choice of residential development types. Preserve and enhance natural beauty of landscape and topographical features in residential development.

Plan safe, sanitary and decent housing for every individual in Dade County. Control building types and density of structures to insure adequate living space, light and air, and avoid congestion and overcrowding

Control the layout of streets and highways in residential areas to provide maximum safety to drivers and pedistrians. Provide the proper level of services (drainage, sewerage, fire and police protection, etc.) which is necessary to serve the potential needs of planned residential areas.

Prevent development of land use activities within and adjacent to residential areas which are potential nuisances and hazards in regard to smoke, noise, traffic generation, dust, air pollution, fire hazards, etc.

Promote and establish development of residential areas in functional units of size which may efficiently provide a full complement of services and facilities required by residents. Encourage proper physical relationships and organization of various land uses having similar requirement levels for utility and service facilities.

Encourage residential densities which will insure efficient use of planned transportation systems, and properly serve and stabilize such densities.

Promote timing of residential development in accordance with local housing demand as well as sound fiscal capital improvements programming. Develop coordinated programs for the preservation, rehabilitation and redevelopment of residential areas by public or private means. Take full advantage of Federal assistance needed for urban renewal programs for relocation, and for housing.

COMMERCE

Goals

General goals reflected in industrial land use include sufficient space, economic prosperity, amenity and health, and efficiency and economy.

Objectives

Commercial objectives are to provide proper amounts of space for the conduct of varied commercial activities; preserve and enhance economic stability and desirability of areas designated for commercial activities; provide for a maximum of amenity, health, and safety in the development of commercial areas; provide and maintain efficiency and economy in the development of land for commercial use.

Policies

To obtain the commerce objectives stated above, the following policies should be pursued: Allocate land for commercial activities sufficient to support and serve the projected population; encourage distribution of commercial centers throughout the county in a pattern which offers maximum convenience from standpoint of accessibility to areas served; properly relate commercial functions of various centers to areas served with respect to price, choice, and variety of goods offered by grouping commercial uses in four categories: regional service centers, community service centers, neighborhood shopping centers and roadside services; properly relate commercial centers to those land use activities, services, and facilities that will complement and enhance the economic stability of the centers.

Locate commercial centers in close proximity to other types of employment centers to enhance a wide and varied range of employment choice to every individual. Provide a distribution of commerce throughout the county which will avoid unnecessary traffic congestion and minimize nuisances.

Provide sites for commercial centers with attractive environment and encourage pleasing site arrangements of building and landscape features to harmonize with surrounding developments. Encourage proper timing of commercial development of a size and scale to insure economy and efficiency in providing needed improvements and services, both public and private.

Locate commercial areas in close proximity to other land uses which have similar utility and service facility requirements to obtain a more economically workable pattern of development. Designate sites for commercial areas whose physical characteristics are appropriate to size, scale, and intensity of the commercial area.

INDUSTRY

Goals

General goals reflected in industrial use include space for growth...economic prosperity...efficiency and economy...amenity and health.

Objectives

Industrial objectives include providing sufficient space to accomodate future industrial growth; preserving and promoting and enhancing the economic stability and desirability of industrial areas; providing and maintaining efficiency and economy in the development of land for industrial use; providing for a maximum of amenity, health and safety in an industrial development.

Policies

To obtain the industrial objectives stated above, the following policies should be observed: allocate land for industrial use in excess of projected needs to insure good choice of sites and permit low density industrial development;approximately 34 square miles are designated industrial including eight square miles in use; provide industrial locations in proximity to labor resources, market, and especially appropriate transportation facilities; locate industrial sites which will provide different combinations of labor, resources, transportation orientation to encourage diversification of sites and insure better relationship between industry and varied location requirements.

Protect and preserve industrial sites not yet ripe for development until such time when there is a need for these sites; provide industrial sites which have attractive environs and whose physical site characteristics are appropriate; protect industrial sites from encroachment by non-industrial urban uses, especially residential.

Encourage planned expansion and consolidation of existing industrial areas in manner to permit maximum economy and efficiency in utilization of existing and proposed utility and service facilities. Insure development of planned new industrial areas of a size and scale and in density of development which allows for orderly advance planning and provision of utilities and services.

Encourage proper timing of industrial development which reflects community needs and is in accordance with schedule for providing necessary improvements in service; locate industry in close proximity to other land uses which have similar levels of utility and service requirements.

Encourage development of well-defined industrial areas with proper landscaping and architecturally pleasing site arrangement. Encourage planned distribution of industry throughout county to control nuisances and hazards often associated with concentration of industry in one area; that is, noise, smoke, air pollution, traffic generation. Encourage a pattern of industrial land use activities throughout the county which provide industrial areas within 30 minutes travel time of labor force whose skills match the need of the industrial type designated for an industrial area. Locate industrial areas in proximity to other types of employment centers to enhance a wide and varied range of employment choice of every individual.

TRANSPORTATION

The transportation planning process is aimed at projecting the characteristics of the community to be served and to the design of a transportation system that will serve efficiently the future needs of this community. The design must be flexible to accommodate the unprojected changes and should be detailed enough to facilitate the construction and development of the entire system step by step.

In Dade County, the metropolitan government adopted a General Land Use Master Plan (GLUMP) as the official guide to the future development of the metropolitan area. The transportation study uses the GLUMP as a guide for a detailed programming of transportation facilities and services.

Land use data was detailed and refined, population projections were broken down by districts and traffic zones, employment, automobile ownerships and many other economic and social data were developed, resulting in a complete review and total detailing of the approved plan.

In the process of testing the transportation networks for the county some changes have been introduced in land uses, population and in the design of the transportation network, but the goals, objectives and policies of the plan have remained the same.

GOALS

The goals of the Miami Urban Area Transportation Study are based on the overall goals of the General Land Use Master Plan calling for efficiency and economy, convenience and amenities, safety, and choice; or, provision of a well-balanced, integrated transportation system for the future movement of people and goods within Dade County.

OBJECTIVES

The goals of the Miami Urban Area Transportation Study will be promoted by both the public and private sectors working together to achieve the following objectives:

1. Develop a transportation system for Dade County that will offer the best possible level of service to all the residents of Dade County.

2. Prepare a transportation plan that will offer a balanced transportation system for Dade County providing a choice of travel modes.

3. Provide maximum safety with the design and operations of the transportation system.

4. Design and operate the transportation system to contribute to the amenities of the metropolitan environment.

5. Within the framework of the above objectives, reccommend the most efficient plan in terms of minimum cost, considering capital investments, operation costs, and user costs.

POLICIES

The following policies have been formulated to guide the development of the recommended transportation plan.

1. Highways, expressways, public transit facilities, terminals and parking facilities are all vital parts of the metropolitan transportation system. The metropolitan interest must be emphasized in the programming of all transportation facilities and services.

2. The transportation system must promote as well as serve the metropolitan development as defined in the General Land Use Master Plan for Dade County.

3. Rights-of-way and access requirements must be based on the evaluation of transportation and land use needs ten to twenty years in advance of actual need.

4. Public transit must be eligible to receive economic assistance from Federal, State or county governments in order to expand and improve service.

5. Right-of-way for public transit must be acquired in conjunction with highway acquisition if the plan shows the need for both.

6. Existing facilities must be operated at the most efficient level of service. The use of advanced technology for this purpose must be encouraged.

7. The design of new facilities or the improvement of existing ones must take into consideration land uses in the vicinity or adjacent to the facilities and the impact of transportation rights-of-way on the metropolitan environment.

STANDARDS

Certain standards for the design and operation of transportation facilities have been established. These are necessary to insure the development of adequately designed facilities.

Streets and Highways

Early in the development of the study it was decided by the participating agencies and by the MUATS Technical Advisory Committee that the level of service planned for the highway system in 1975 and 1985 should be the "level of service C" as described by the Highway Capacity Manual, 1965, prepared by the Highway Research Board of the Division of Engineering and Industrial Research of the National Academy of Sciences, National Research Council.

In general, the requirements for "level of service C" on expressways are an operating speed of at least 50 m.p.h. and a service flow rate on two lanes in one direction not exceeding 75 percent of the capacity rate. Further, under ideal conditions for two lanes in one direction, the peak five minute flow rate cannot exceed 3,000 passanger cars per hour for one direction (an average of 1,500 passanger cars per lane per hour).

"Level of service C" for arterials extends to service volumes of about 80 percent of capacity. For typical uninterupted flow of non-signalized streets with commercial development, and for good progressively-signaled operation, average over-all travel speeds have dropped to below 80 percent of free-flow speeds, but are at least 20 m.p.h. On streets with typical non-perfect progression, the frequency and duration of loaded signal cycles encountered along the street reaches what is considered a reasonable limit by most drivers. The peak-hour factor is likely to be about 0.80.[(1)]

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(1) Peak hour factor is the ratio of the whole-hour volume to the highest rate of flow occurring during a five minute interval within the peak hour.

Expressways: Design speed should be 60 m.p.h. with four to eight moving lanes each 12 feet wide and with a 10 foot emergency lane on each side. Medians should be 60 to 80 feet wide to separate the directional flow of traffic.

The additional cost of right-of-way for the median strip, when considered over the 50-year or more service live span of the expressway, is negligible in comparison to the potential saving in traffic accidents, increase in amenities brought about by landscaping, and deadening of noise because of wider expressways.

When medians are less than 30 feet wide, barriers should be provided. Design and construction of the barriers should follow Federal recommendations for highway safety. (1)

Express Streets: This type of facility, with a design speed of 40 m.p.h., was developed as a solution to the problem of high traffic demand in some areas with high population density and high intensity of land use. In these areas, the right-of-way for an expressway would destroy land uses that should be served.

The solution is to improve existing arterials within the existing rights-of-way by prohibiting intersecting and left turn traffic by construction of medians through existing "minor" intersections and construction of overpasses at major intersections.

The express streets will be used in a limited number of corridors, and in each case the impact of this solution must be evaluated in terms of land uses, accessibility to properties affected, and over-all impact on the traffic pattern of the area.

Major Arterials: A major arterial has some type of access control, and serves mainly through traffic. The adjoining properties are generally served by service roads or side streets.

Major arterials will have at least four moving lanes of 12 foot width, tow breakdown lanes of 10 feet, and a divider of 20 feet to accomodate left turns.

Arterials: Arterials should have the dual function of serving commercial or industrial development in adjoining properties and through traffic. Arterials should have two to four traffic lanes each 12 feet wide. When there are four lanes, there should be a central divider of 20 feet.

---

(1) Highway Design and Operational Procedures Related to Highway Safety, AASHO Traffic Safety Committee, February, 1967

Service Streets: Average daily traffic volume on service streets should not exceed 10,000 vehicles. If volume exceeds this figure, the facility should be considered an arterial. This class of street carries traffic, but serves adjacent land use and can be developed for residential or commercial areas. The following types of service streets are a part of the transportation system:

Major collectors serve more than 150 dwelling units. The traffic volume should be between 2,000 and 10,000 vehicles a day.

Minor collectors serve less than 150 dwelling units. They should carry less than 2,000 trips a day.

Loop streets have outlets connecting single streets or adjoining streets, any portion of which does not serve more than 25 dwelling units.

Cul-de-sacs provide an outlet at one end only, with special provisions for a turn-around, and serves less than 25 dwelling units.

Connectors do not serve adjacent land uses, but connect land development with traffic or service streets and can be of two types: local or special connectors, which serve less than 150 dwelling units, but do not serve adjoining land development, and special connectors, which do not have any adjacent land development, but provide direct access to a parking area.

Public Transit

Public transit service should be designed and operated on the following standards: (1)

Availability: Transit service should be available within one-quarter mile in areas with population density between 6 and 25 dwelling units per net residential acre. In areas where densities are higher than 25 dwelling units per net residential acre, service can be provided at distances closer than one-quarter mile. This standard does not apply to areas with densities lower than 6 dwelling units per net residential acre.

Direct Service: Within economic limitations, the largest possible proportion of riders should be provided with no-transfer service.

(1) Simpson & Curtin, Public Transit Master Plan, MUATS Technical Memo No. 2, Philadelphia, Pa., 1968, pp. 2-3

Dependability: Buses should not be more than one minute early or five minutes late from the approved schedule.

Speed of Operation: The scheduled speed for bus operations should fall within the 10-12 miles per hour range.

Accommodation Service: Routes which do not cover basic out-of-pocket costs should be carefully evaluated for their over-all value to the community.

Rate of Fare: Fares should be kept as low as possible consistent with costs of operation.

Frequency of Service: For routes with a high volume of passangers, service should be provided at least every 20 minutes. Potential riders of the system should be kept well informed of scheduled routes with spacing greater than every 20 minutes.

Loading Standards: Industry standards and practices developed over the years have established 150 percent of bus seating capacity as a reasonable rush hour load. Schedules should be designed in relation to passanger demand so that the average maximum-loaded bus will carry no more than 50 percent more passangers than its seating capacity.

APPENDIX - MUATS REPORTS

The following is a list of background reports to be published as part of the Miami Urban Area Transportation Study:

Study Design for Miami Urban Area Transportation Study

Economic, Population and Land Use Projections

Community Attitudes for Transportation Planning

Laws and Ordinances

Goals for Transportation

Implementation of the Plan

Continuing Program for Transportation Planning

Commercial Model Development

Transit Cost Allocation Model Development

Present Transit Service

Corridors for Transit Improvement

Route, System, Design and Cost Estimates

Forms of Mass Transportation

Evaluation of Alternate Transit Plans

Street and Highway Master Plan

Transit Master Plan

Airport Master Plan

Terminal Facilities Master Plan

Seaports and Waterways Master Plan

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COST AND REVENUE FOR HIGHWAYS AND MASS TRANSPORTATION

MIAMI URBAN AREA TRANSPORTATION STUDY
METROPOLITAN DADE COUNTY, FLORIDA

transportation

TITLE:	Miami Urban Area Transportation Study: Cost and Revenue Estimates for the Proposed Highway and Mass Transportation Systems.
AUTHOR:	Metropolitan Dade County Planning Department
SUBJECT:	Feasibility of Implementation
DATE:	May, 1968
LOCAL PLANNING AGENCY:	Metropolitan Dade County Planning Department
HUD PROJECT NO:	Florida P-30
SERIES NO:	n.a.
NO. OF PAGES:	81

ABSTRACT:

Highway expenditures in past years are examined and rejected as a possible basis for estimating future highway expenditures. Neither the Florida State Road Department annual budgets nor the Dade County Public Works Department data on revenues and expenditures provide a workable basis for estimating future costs and expenditures. Expressway and arterial cost estimates used in this report were developed by the State Road Department's consultant, Mel Conner and Associates. Costs of future roadway construction were escalated to take into account projected construction cost increases. Highway revenues were estimated on the basis of projected gasoline sales for Florida and Dade County, using existing federal and state formulas for allocation of secondary gasoline tax revenues to Florida counties. Since no formula exists for allocation of primary tax revenues, and because no trend could be established for Dade's share of primary money, it was assumed that Dade County would actually receive the 18% of statewide allocable monies as recommended

in the State Road Department's 1968 Highway Needs Study.

In general, only existing sources of revenue are projected. The assumption with regard to the use of Interstate Funds after 1972 or 1973 is an important exception. It is assumed that the present federal tax will be retained and that a large part of these funds will be used to meet urban roadway needs after the Interstate System is completed. The feasibility of the proposed MUATS highway network hangs heavily on this assumption.

An estimate of local expenditures for local roads, traffic control, traffic safety, and the like was also made, but it was not included in the summation of costs and revenues.

Cost estimates for the proposed mass transportation program were derived from studies made by the County's transit consultant, Simpson and Curtin—as were estimated future fare-box revenues. These latter are practically the only existing source of revenue for mass transport improvements. Costs were escalated in accordance with present practice for transit projects (5% per year, compounded).

As projected highway and mass transportation revenues are both insufficient, additional possible sources of revenue are suggested and the use of expressway tolls and a county gasoline tax is recommended to provide some, but not all, of the additional revenue needed. Both programs are dependent upon very substantial increases in federal aid — especially for mass transportation, which currently receives practically none.

A number of conclusions are drawn with regard to difficulties and fallacies in determining economic feasibility, modal interdependence, the importance of methods of financing in the determination of transportation balance, the relevance of business cycle fluctuations and consequent possibilities for compensatory public spending at the local level, the need to develop transportation options, the sort of "balance" that emerges from modal split procedures, and the misuse of the concept of economic demand in urban area transportation studies.

COST AND REVENUE ESTIMATES
For The
PROPOSED HIGHWAY AND MASS TRANSPORTATION PROGRAM

Prepared By

The Metropolitan Dade County Planning Department for
the Miami Urban Area Transportation Study
702 Justice Building
1351 N. W. 12 Street
Miami, Florida 33125

December 1968

The preparation of this report was financed in part through an urban planning grant from the Department of Housing and Urban Development, under the provisions of Section 701 of the Housing Act of 1954, as amended.

PREFACE

This is one of several background reports related to the inventory and projection of socio-economic characteristics within the context of the Miami Urban Area Transportation Study. MUATS is a joint effort of Metropolitan Dade County and the State of Florida in cooperation with the U.S. Department of Transportation's Bureau of Public Roads and the U.S. Department of Housing and Urban Development. Other reports(1) in the series provide forecasts of economic factors affecting development, population projections, and land use activities and projections which are based upon a survey conducted during the spring of 1964 on the origin and destination of travelers, quality of mass transit, and socio-economic characteristics related to such factors as population, employment, income, school enrollment and automobile registration. The metropolitan area was divided into 550 traffic zones and information was obtained for each. The background studies thus provide the basic data inputs for the preparation of the principal elements of the MUATS program, which include metropolitan master plans for streets and highways, terminal facilities, airports, waterports, and waterways, and mass transit.

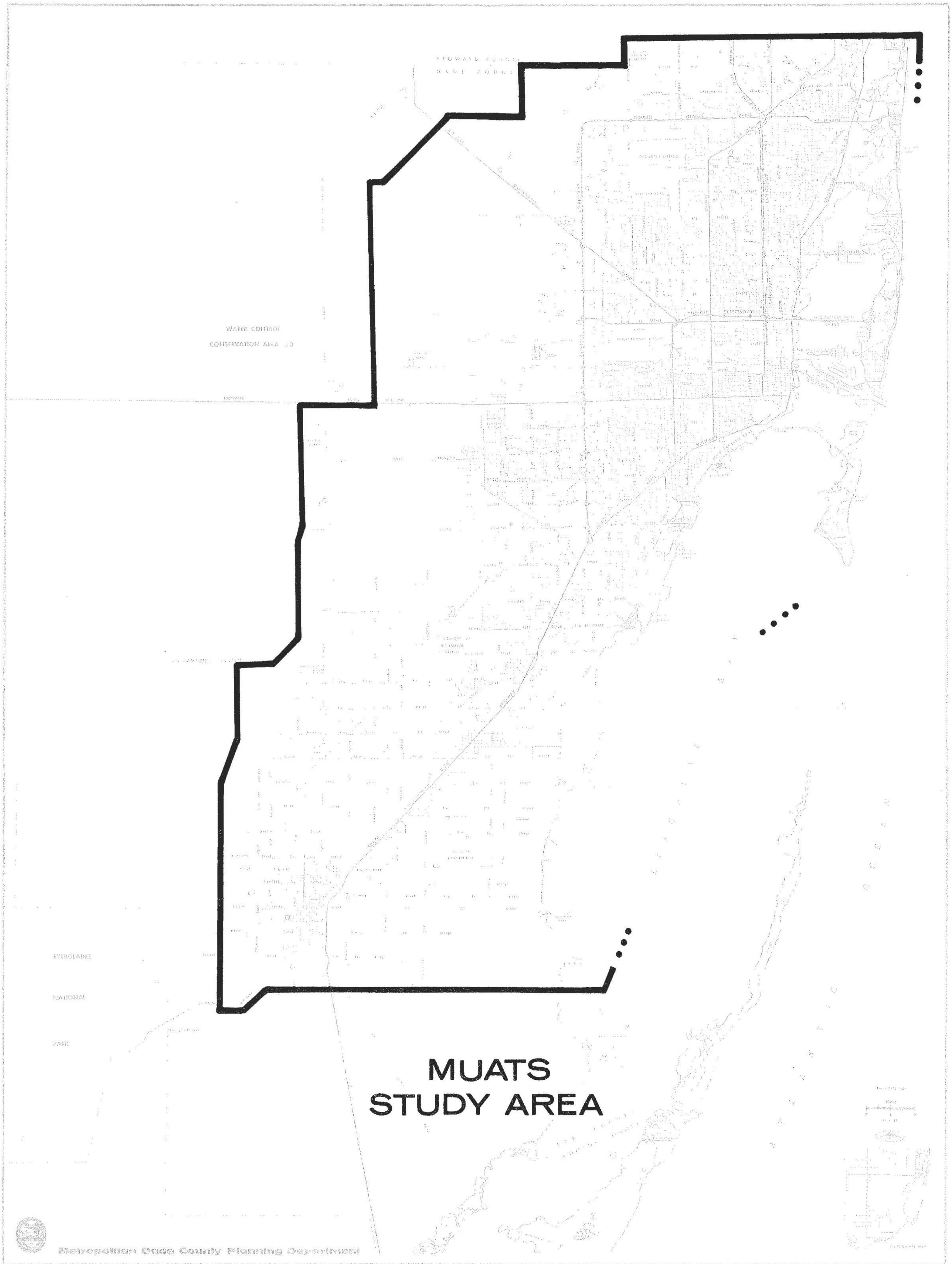
The background series, therefore, presents the findings of major study phases as they relate to the planning of all elements of transportation facilities in the Miami area and serve to advise the MUATS Technical Advisory and Policy Committees and other concerned persons of the technical details of the analysis being conducted in the urban area transportation study by the MUATS organization and its consultants.

In the present report, Costs and Revenues for Transportation Planning, empirical costs and revenues for Dade County's existing street and highway system and bus system are collected and analyzed. After making some rather critical assumptions with regard to changes in the magnitude and sources of future revenues, projections of anticipated future revenues were made. Costs of implementation of the proposed MUATS highway network were estimated by the Florida State Road Department's consultant, Mel Conner and Associates. These constant dollar cost estimates were accepted without question in the present report. However, we do not have a constant dollar, and the present report seeks to take this fact into account by projecting increasing highway construction costs and applying a cost escalation factor to the constant-dollar costs.

(1) See Appendix C for a list of reports in this series.

Estimates of future highway revenues in the present study differ substantially from those of the State Road Department's consultant. These differences are explained in detail in Appendix B.

The estimates of future costs and revenues provide a basis for assessing the feasibility of implementing both the proposed highway and mass transportation programs. In both cases, new sources of revenue will be required.



WATER CONTROL
CONSERVATION AREA 3
EVERGLADES
NATIONAL
PARK
MUATS
STUDY AREA
Metropolitan Dade County Planning Department

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APPENDIX B

SUMMARY

This report presents an analysis of how Dade County's transportation needs up to 1985 will be financed and the assumptions attached to the cost and revenue figures used. Various analyses of these assumptions are also presented.

Generally, only existing sources of revenue are considered for meeting the cost of Dade County's transportation needs as outlined in other MUATS reports. An important exception to this is the assumption made regarding federal Interstate Highway funds, which are scheduled to cease after 1972 or 1973, when the Interstate Highway system is to be completed. It is assumed that the present 4¢ tax on every gallon of gasoline will be retained to meet urban highway needs beyond this date. The feasibility of the proposed MUATS transportation system is very dependent on these funds. Even with federal assistance, there will still be an estimated deficit of $855 million, excluding financing costs.

Expressways and arterials as called for in MUATS reports will have a basic cost of $791.9 million. When construction cost increases are added, the total figure rises to $896.4 million. Mass transit - a combination of fixed-rail facilities from Miami International Airport through downtown Miami and over to Miami Beach, then north to the Interama site, plus a system of grade-separated busways on the mainland running from the Broward County line south to Homestead - has a basic cost of $378 million. When construction cost increases and contingency allowances are added, the figure rises to $637.5 million, for a total transportation system cost of $1.554 billion.

Total revenues add up to $678.9 million. This is derived from gasoline taxes and federal funds already committed for Interstate Highways in this area. A deficit of $855 million remains, and various means of raising this money are presented. These include expressway tolls, a county gasoline tax, and diversion or increases of other sources of revenue. Also, the case for more local control of locally-generated sources of funds is presented, as this will be necessary if these revenue sources are to reach their full potential of making up this deficit.

On the basis of the cost and revenue figures, and in line with assumptions and analyses presented in the report, the following general recommendations are made:

- The proposed highway and mass transit system should be financed by means of a combination of expressway tolls and a county sales tax on gasoline.

- These additional sources of revenue should be controlled by Dade County officials.

- The deficit for the proposed expressways and arterials should be financed from tolls on expressways and the revenue from the county sales tax on gasoline should be spent on mass transportation.

- Certain rigidities in state highway classification criteria should be removed so that Dade and other counties will be able to use all of the gasoline tax money that will be returned to them in future years.

- Expenditures for roadways and mass transit facilities should be made in such a manner as to take advantage of the benefits to be obtained from following accepted principles of compensatory public spending.

- The development of a fixed rapid transit system should be contingent upon the availability of at least 50 percent federal aid for capital costs.

- The self-sustaining and self-liquidating limitations placed on the Metropolitan Transit Authority should be removed.

- A revolving fund for advance right-of-way acquisition, funded by general tax monies and part of the fifth, sixth and seventh cents of the gasoline tax, should be established as an integral part of the Dade County budget.

COST-REVENUE SUMMARY
(Millions of Dollars)

<u>Summary of Costs</u>[1]

Expressways and Arterials		
Basic Cost	791.9	
Construction Cost Increases	104.5	
Subtotal		896.4
Mass Transport		
Basic Cost	378.0	
Construction Cost Increases	183.9	
Contingency Allowance(20%)	75.6	
Subtotal		637.5
TOTAL COST		1,533.9

<u>Summary of Revenue</u>[2]

Gasoline Tax Revenue		
Primary Tax (4¢)	226.9	
Secondary Taxes (7¢)[3]	191.7	
Federal Aid[4]	240.7	
TOTAL COST	659.3	
Applicable to MUATS (97%)		639.5
Revenue from Mass Transport Operations		39.4
TOTAL REVENUE		678.9
TOTAL DEFICIT		855.0

(1) Does not include interest and other costs of financing.
(2) Federal aid to Interstate highways is excluded.
(3) Does not include $49.7 million that is returned to Dade County.
(4) Assumes that 4¢ federal tax will not be decreased in 1972, or when the Interstate system is complete, and that urban areas will receive much more than they currently receive.

INTRODUCTION

The central purpose of the Miami Urban Area Transportation Study (MUATS) is to estimate the magnitude of the urban transportation facilities that will be necessary to accommodate an expected urban population of about two million at a level of service comparable with or better than the present. If current population projections are correct, the anticipated population of two million will materialize around 1985.

The objectives of the present study are, first, to estimate the costs of building and operating the proposed transportation system; second, to project existing sources of revenue over the planning time period; and, third, to suggest additional, potential sources of revenue if existing revenue sources are found to be inadequate. Comparisons of costs and revenues and considerations of additional sources of revenue may then be helpful to decision-makers who must make judgments with respect to the feasibility of the recommended system.

Considerable effort has been made in the report which follows to explain critical estimating procedures and assumptions in detail, and to cite important sources of data. "Technical" estimates and forecasts frequently involve large uncertainties and the analyst's judgment with regard to these uncertainties may be equivalent to an important policy decision. It is the analyst's duty to call attention to these uncertainties rather than to bury them. Nevertheless, for the sake of brevity and continuity in the text of this report, detailed estimating procedures and assumptions have been relegated to the two appendices.

CHAPTER I

COSTS OF THE PROPOSED TRANSPORTATION SYSTEM

THE HIGHWAY PROGRAM

Cost of Expressways and Arterials

A detailed and careful estimate of the right-of-way and construction costs of the proposed MUATS Network No. 6 has been made by Mel Conner and Associates. This estimate arrives at the following figures:

Expressways	494,132,000
Arterials	297,768,000
Total Cost	$791,900,000

The methods and assumptions involved in this estimate are described in detail in MUATS Technical Report No. 7, The Highway Program: Cost and Financing. The cost estimates have been reviewed by members of the State Road Department and are considered to be reasonable. They have also been reviewed by members of the Dade County Public Works Department who are involved in highway planning. These latter officials think that some of the construction cost estimates are low. Public Works has made an independent estimate of total costs as follows:

State primary roads	$207,700,000
Other roads	824,500,000
Total Cost	$1,032,200,000

The difference between these two estimates ($241 million) is substantial, indicating the difficulties and uncertainties involved in estimating highway costs. The Mel Conner and Associates estimate will be used in the present report because the more refined cost estimating procedures used in this estimate should have produced a more accurate estimate than the more generalized cost-estimating factors used in the Public Works estimate. (1)

Local Streets and Support System Costs

The proposed MUATS plan does not include all of the street improvements that will be made between now and 1985. Local street improvements will also be required, and the construction of expressways often requires extensive changes in local streets and collectors near interchanges. These costs have not been estimated; they will presumably be paid for with some part of that portion of the secondary tax that is returned to Dade County.

The costs of improvements to local streets and collectors are minor in comparison with the cost of expressways and arterials. However, when the costs of other supporting activities are added, the total is hardly insignificant. In addition to its 20 percent surplus tax money, Dade County has budgeted the following amounts for fiscal year 1968-69: (2)

Provision of roadbed	$3,040,854
Traffic control	1,693,588
Traffic safety	3,441,041
Total	$8,175,483

Tables A-1 and A-2 in Appendix A show detailed breakdowns of local expenditure categories; in Table A-3, they are projected to 1985. This projection indicates that the county government will

---

(1) For limited access facilities:
$2,000,000 per mile and cost of structures
For major and secondary arterials:

Urban	$1,200,000 per mile
Suburban	850,000 per mile
Urban-suburban	1,000,000 per mile

(2) Prototype for a Program Budget for Metropolitan Dade County, Florida, July 25, 1968. Office of the County Manager, Budget Analysis Division. Other expenditures not included in the above are: street lighting - $709,200; Key Biscayne Causeway - $830,000; Venetian Causeway - $296,333. Also excluded - $1,315,000 transferred from Road and Bridge Fund (gasoline taxes).

spend about $192 million for roadbed, traffic control, and traffic safety. As noted in Appendix A, the method employed to estimate these future expenditures leaves a great deal to be desired. The county government may in fact spend a great deal more or a great deal less than the projected amount. It is important to note, however, that the projection of expenditures is for the county government only. If the total cost of highway support activities were to be taken into account, expenditures by the 27 municipalities in Dade County would also have to be included.

Street and highway supporting activities such as traffic operations and traffic safety are indisputably a part of the total cost of automobile travel. But these costs are not, as a rule, included in the highway cost-revenue studies. It is usually assumed that local costs will be covered by an expanding tax base in a growing community. That is what has been done in the Mel Conner and Associates cost-revenue study, and this practice will also be followed in the present report. (1)

It is important to bear in mind that these additional local costs are a far from insignificant part of the total cost of motor vehicle travel on publicly provided roadbeds. It is especially important when additional sources of revenue are being sought, and it is also important when comparisons of the costs of mass transport systems and highway networks are being made. Mass transport system costs approximate total system costs--including the support systems--fairly closely. Highway costs as they have been estimated in Technical Report No. 7 are not system costs in the sense in which systems analysts use the term. If total highway system costs were being estimated, there would be no more reason for excluding the wages of traffic patrolmen than there would be for excluding the public bus operator in a mass transport system.

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(1) In a rough way, this assumption appears to be justified. Table A-4 in Appendix A shows projections of the Dade County tax base. This base almost doubles by 1985, and so do the projected local street and highway costs, as projected in Table A-3.

The Effects of Inflation on Highway Construction Costs

Figure 1 shows the long-term trend in highway construction costs.(1) Although year-to-year prices vary considerably from the long-term trend, the upward course of the long-term trend is unmistakable and will surprise no one. This trend was not taken into account in the cost-revenue report made by the State Road Department's consultant. This is a rather serious omission, for there is nothing in the state gasoline structure that compensates inflation. As a matter of fact, the present state tax of 7¢ per gallon, which has been in effect since the thirties, is a 3¢ tax today in terms of purchasing power.(2)

Table I-1 is an estimate of highway construction and right-of-way cost increases based on a projection of the Bureau of Public Roads Construction Cost Index. This estimate indicates highway construction cost increases amounting to roughly $104 million.

TABLE I-1

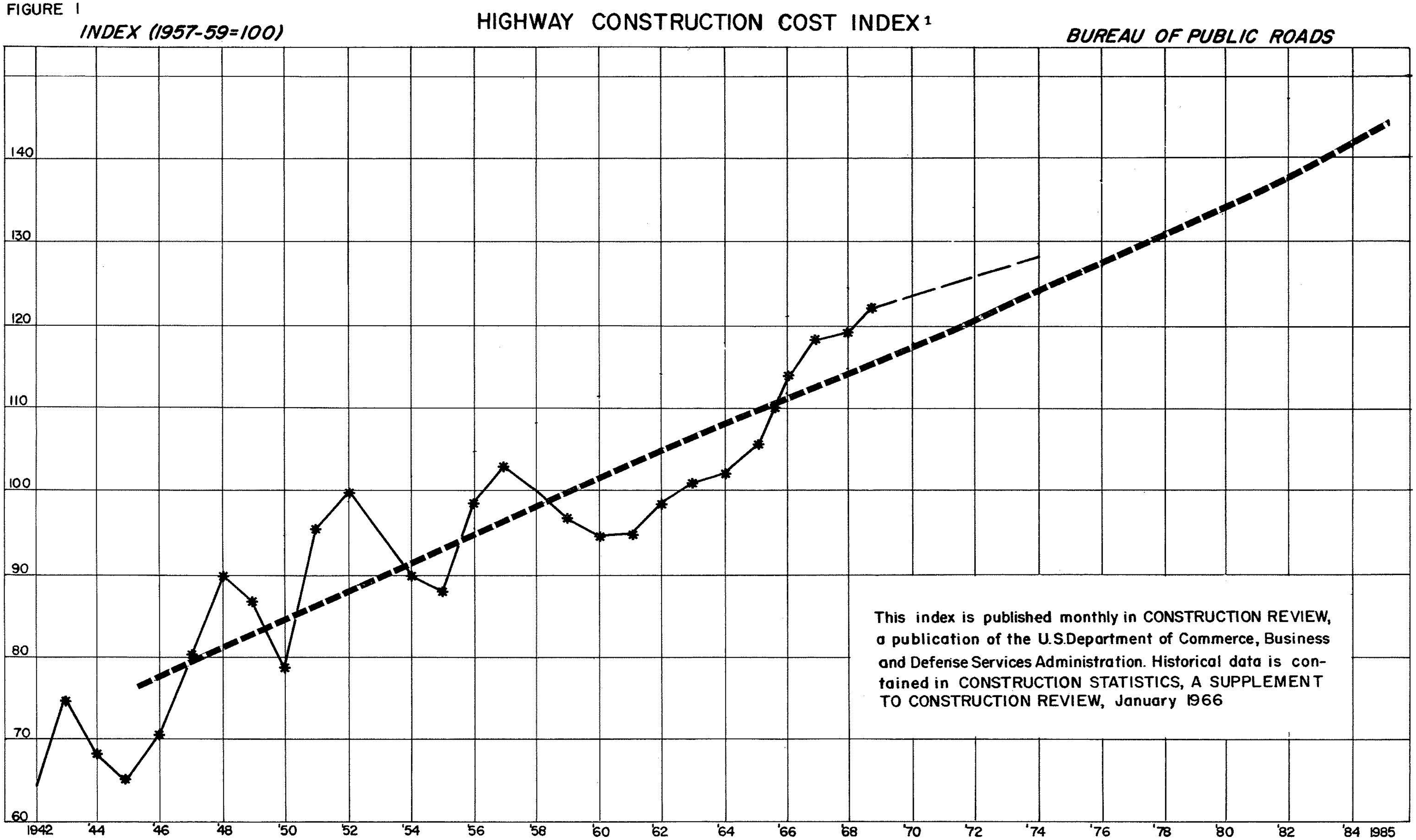
EFFECTS OF INFLATION ON
PROJECTED HIGHWAY CONSTRUCTION COSTS
(millions of dollars)

Time Period	Est. Base Construction Cost	Construction Cost Index (1967=100)	Base Cost Inflated	Added Cost Due to Inflation
1969-1975	330.0	108.5	358.3	28.3
1976-1985	462.0	116.5	538.2	76.2
Totals	792.0		891.3	104.5

(1) Based on the Bureau of Public Roads' highway construction cost index. Published monthly in *Construction Reveiw*, U. S. Department of Commerce. Historical data is contained in *Construction Statistics*, a *Supplement to Construction Review*, January 1966, p. 58.

(2) General purchasing power of the dollar has decreased from $2.05 in 1940 to $0.88 in 1966 (1957-59 = $1.00). *Statistical Abstract of the United States, 1967*, U. S. Department of Commerce, p. 349.

FIGURE 1


INDEX (1957-59=100)
HIGHWAY CONSTRUCTION COST INDEX¹
BUREAU OF PUBLIC ROADS
140
130
120
110
100
90
80
70
60
1942
'44
'46
'48
'50
'52
'54
'56
'58
'60
'62
'64
'66
'68
'70
'72
'74
'76
'78
'80
'82
'84
1985
This index is published monthly in CONSTRUCTION REVIEW, a publication of the U.S.Department of Commerce, Business and Defense Services Administration. Historical data is contained in CONSTRUCTION STATISTICS, A SUPPLEMENT TO CONSTRUCTION REVIEW, January 1966

The average annual trend line increase is only 1.3 percent per year over the base year (1967).[1] In view of recent cost increases, this rate seems inordinately low, as construction costs increased 23.5 percent between 1960 and 1967. But this is the longest period over which the index has shown continuous annual increases, and it would certainly be erroneous to assume that there will not be a cyclical reverse during which construction costs will decrease. The extent and magnitude of the downward trend will depend primarily on federal monetary policy and whether or not public expenditures at all levels of government are made in a manner which aggravates cyclical trends or in a manner which compensates for them.

THE MASS TRANSPORT PROGRAM

Mass Transportation Costs

The mass transport program recommended for Dade County by its mass transport consultant, Simpson and Curtin, is composed of 23.6 miles of rapid transit, 21.9 miles of rapid busway in the FEC corridor, and an expansion of existing, conventional bus service involving 260 new buses.[2] The basic costs of this program are shown below in millions of dollars:[3]

New buses, 260 @ $35,000 each	9.1
Rapid transit cars	25.0
Capital cost	304.0
Right-of-way	40.0
Total estimated cost of mass transport program.	378.1

(1) See Note 1 of "Notes", following Chapter VI for detailed assumptions and estimating procedures.

(2) Some form of rapid transit is proposed to run from Interama to the Miami Beach CBD to the Miami CBD to the Airport. The FEC busway would extend from S. W. 88 Street (North Kendall Drive) to N. E. 183 Street.

(3) Henry J. Kaiser Company analysts who made the cost estimates for Simpson and Curtin take pains to point out that these are "order of magnitude" estimates for capital costs only. Transit Technical Memorandum 3A, Route Selection, System Design and Cost Estimate, p. 6-2. See also Technical Memorandum No. 5, Evaluation of Alternate Transit Plans, MUATS, Simpson and Curtin, Table VI.

Effects of Inflation on Mass Transport Costs

In making crude estimates of the cost of various alternative mass transport systems for the MUATS, Kaiser engineers did not make allowances for future construction cost increases. However, they state that cost escalation rates for large scale transit projects range from 5 percent to 7 percent compounded annually. This is the rate Kaiser uses in their cost estimates of a rail transit system for the Los Angeles metropolitan area. Furthermore, they add a contingency allowance of 15 percent of the basic cost estimate.(1)

In comparison with highway construction cost increases of less than 2 percent per year, the 7 percent rate used by Kaiser seems high. All of the construction cost indices reported in Construction Review(2) show annual rates of increase of less than 5 percent for the years 1963 through 1967, and this is a period of rapidly rising costs. Furthermore, the rates shown by these indices are not compounded annually; they are annual increases over some base year. In the cost escalation estimates that follow, it will be assumed that construction costs increase 5 percent per year over the base year (1968). A contingency allowance of 20 percent of the estimated basic cost will also be included.(3)

Assumed Time Phasing

In order to get some idea of the effects of increases in construction and operating costs of the proposed mass transport program, the following assumptions will be made as to the times at which construction will be begun and when completed:

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(1) Final Report to the Southern California Rapid Transit District, Kaiser Engineers and Daniel, Mann, Johnson, and Mendenhall (architects), May 1968, p. JV 43.

(2) U. S. Department of Commerce, Business and Defense Services Administration, November 1968, p. 41.

(3) When large scale projects substantially exceed original cost estimates, it is often a result of design and engineering changes rather than a gross miscalculation of costs. Some opponents of transit projects charge that transit project costs are deliberately underestimated. See, for example, Rail Rapid Transit for the National Capitol Region, House of Representatives, 89th Congress, First Session. Report No. 536, pp. 68-69 ff.

Route	Miles	Begin Const.	Complete Const.	Total[1] Cost	Inflated Capital Cost
(Miami Beach CBD (Interama (Miami	18.1	1974	1977	254	423
(Airport (Miami CBD	5.5	1979	1981	80	180
Busway	21.9	1974	1979	44	79
	Total basic cost			378	682

Effects of increasing construction costs are calculated through the year in which construction is assumed to be complete; the costs shown are an average for the construction years. If we may judge from the experience of other communities, the assumed dates for both beginning and completion of construction are probably optimistic. Major mass transport programs are very difficult to get started.

COSTS OF FINANCING

The costs of financing highway and mass transport improvements are not explicitly considered in the cost-revenue reports the consultants have submitted. These costs are probably omitted because they extend far beyond the 1985 planning horizon and also because at the present stage of planning it is not known what part of the improvements in question will be made on a pay-as-you-go basis and how much will be borrowed. Nevertheless, it seems that if private financial agencies are to be held accountable for revealing to their clients the full costs of financing, government agencies can do no less. An attempt will therefore be made to indicate costs of financing where it is presently possible to do so, even though these costs

---

(1) Costs derived from the Kaiser Company report, Route Selection, System Design and Cost Estimate, p. 6-3. Cost of buses and operating costs are not included in this estimate. However, Simpson and Curtin's Technical Memorandum No. 5 shows capital costs of $378 million including $9 million for 260 new buses.

do not appear in cost-revenue summaries for the 1969-1985 planning period.

Both the Airport Expressway and the East-West Expressway were financed with revenue bonds backed by Dade's share of the 80 percent surplus from the fifth and sixth cents of the secondary gas tax. The bond issues amounted to $44.5 million--$25 million in 1959 and $19.5 million in 1965. Total outstanding indebtedness for the two issues in February of 1965 was $72.2 million.(1) The total cost of these two expressways is increased by approximately $28 million, or 62 percent of the amount of the bond issues. If the proposed MUATS expressways are financed in this manner, total cost will be increased comparably--or if interest rates continue to rise, considerably higher costs of financing will be incurred. Even at the rate indicated by the above bonding experience, the cost of expressways would be increased as follows:

Estimated cost of proposed expressways	$494,000,000
Interest and other costs of financing (62 percent)	306,000,000
Construction cost plus cost of financing expressways	$800,000,000

The cost of financing the recommended mass transportation system was not indicated by Simpson and Curtin. If the same percentage increase indicated for expressway projects is applied to mass transport capital costs, total mass transport costs are increased from $638 million to $1.0 billion. Total cost of the entire ground transportation program would then be $2.2 billion.

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(1) Dade County Toll Facilities, 36th Street Expressway, Financial Report, Fiscal Year Ended January 31, 1966. State Road Department, Internal Audit Division, September 1966; p. 5 (Table IV).

CHAPTER II

TRANSPORTATION REVENUES

PROJECTIONS FROM EXISTING SOURCES OF HIGHWAY REVENUE

The Gasoline Taxes

The major source of revenue for the construction of streets, bridges and highways is the 11¢ per gallon tax on gasoline. Four cents of this tax is a federal tax; seven cents is a state tax. Unlike public expenditures for other public goods and services such as education, health, public safety, defense and even other forms of transportation, highway revenue is derived from a special fund. That is to say, gasoline taxes are put in special funds which can be spent only for highway transportation facilities. No compelling logic dictates such an arrangement. In fact, this way of financing public expenditures for highways and related facilities came into existence as a result of municipal miscalculation. Municipalities all over Florida--and especially in Miami--were taken in by the extravagent fictions of the land hucksters. As a result, they built roadways for "cities of the future" to such an extent that when the bubble burst in 1926, these municipalities could not possibly meet their bond obligations. The state tax was levied so that the bond debts of the municipalities could be serviced by the state.

Practically all of the debts so incurred have been paid off, and the gasoline tax serves now as the major source of revenue for highway construction and maintenance, with the greater parts of these funds remaining under state control. In Appendix B, an attempt has been made to estimate the amount of revenue that may reasonably be expected to accrue to Dade County between the present and 1985. These estimates are summarized below.

Dade County
Summary of Estimated Revenue
from the State and Federal[1] Motor Fuel Taxes
(Millions of Dollars)

Primary Gas Tax (4¢)	226.9	
Secondary taxes		
Fifth and sixth cents (80%)	132.6	
Fifth and sixth cents (20%)		34.9
Seventh cent (80%)	59.1	
Seventh cent (20%)		14.8
Federal Aid	240.7	
Subtotals	659.3	49.7
Applicable to MUATS network(97%)[2]	.97	
Net Revenue	639.5	

The subtotal of $49.7 million (20% of the fifth and sixth cent surplus after bond debt is serviced plus a full 20% of the seventh cent) may be used in part on construction of elements of the MUATS system. But in terms of the magnitudes being considered here, this amount will be negligible and has not been included in the total of revenues applicable to the proposed MUATS network.

Reliability of Revenue Estimates

Gasoline sales during the past eighteen years provide a fairly reliable basis for estimating revenue from the secondary taxes (the fifth and sixth cent tax and the seventh cent tax) as these allocations are made according to statutory and constitutional formulae. Revenues from the primary (4¢) tax and from the federal (4¢) tax are much more difficult to estimate as these funds are distributed at the discretion of the State Road Board and the SRD. The resulting allocation to any particular county is the resultant of two forces -- statewide needs as these agencies perceive them, and political influence. Consequently, allocations to Dade County for primary roads have varied incontinently and no trend is discernible. The estimate

(1) Excluding federal aid for the Interstate system.
(2) The SRD and its consultant have estimated that 97% of the revenues will be spent within the MUATS study area.

of primary revenues therefore rests heavily on the SRD's 1968 statewide needs study which recommends that Dade County receive 18% of the statewide revenue that becomes available for distribution to the counties for construction of primary roads. This is a considerably larger proportion than Dade has received in the past (about 13%, on the average, for the years 1957 through 1966).

An even greater degree of uncertainty attaches to the estimates of federal aid highway revenue after 1975. The assumptions involved are explained in detail in Appendix B. The procedure followed in estimating future revenues in the present study was to project only existing sources of revenue, based on past performance. Then, if estimated revenues should be found deficient, possible additional sources of revenue sufficient to make up the deficit were to be investigated in a separate section. By and large, this procedure has been followed. However, an exception to this procedure was made in the case of federal aid after 1975, as it is much more likely that the federal tax will be retained and put to other uses than that it will be reduced to its pre-1956 level when the Interstate system is completed.

ESTIMATES OF NET REVENUES FROM FUTURE MASS TRANSPORT OPERATIONS

Two major types of assumptions are necessary in order to make crude estimates of future revenue from mass transport. First, completion dates for major elements of the proposed future mass transport system are required, and second, some estimate of annual revenues must be made for the years between the assumed completion dates of the elements and the year 1985. The schedule of revenues which follows (Table II-1) uses the same starting and completion dates that were assumed in Section II above, page 9, in order to estimate cost escalation.

Route	Begin Construction	Completion Date
Interama Miami Beach CBD Miami CBD	1974	1977
Miami CBD Airport	1979	1981
Busway	1974	1980

Annual estimates of revenue are made by assuming that in their first year of operation, each element will break even or show a small net operating profit. This annual revenue is then increased each year so that by 1985, the amount will correspond with the revenue estimates made by Simpson and Curtin for that year.[1]

TABLE II-1

ESTIMATE OF NET REVENUE FROM
FUTURE MASS TRANSPORT OPERATIONS

Year	Interama MB-CBD Mia-CBD	FEC Busway	Mia CBD Airport	Conventional Bus Loss	Net Revenue
1977	.0	-	-	-	-
1978	3.0	-	-	(-) 0.5	2.5
1979	3.3	-	-	(-) 0.6	2.7
1980	3.5	0	-	(-) 0.7	2.8
1981	3.7	0	0	(-) 0.8	2.9
1982	3.9	2.5	0.5	(-) 0.9	6.0
1983	4.1	3.0	0.6	(-) 0.9	6.8
1984	4.3	3.5	0.6	(-) 0.9	7.5
1985	4.4	4.0	0.7	(-) 0.9	8.2
Totals	30.2	13.0	2.4	(-) 6.2	39.4

(1) Public Transit Technical Memorandum No. 5, Evaluation of Alternate Transit Plans, MUATS, December 1968, Table VI.

CHAPTER III

TIME PHASING OF CONSTRUCTION EXPENDITURES

THE HIGHWAY PROGRAM, PRIORITY 1.

Time phasing of the highway construction program was calculated by the SRD and its consultant for two periods--from fiscal year 1968-69 through fiscal year 1974-75 and from fiscal year 1975-76 through 1984-85. A network was assumed for 1975 and traffic volumes were assigned to it. When revenues were estimated for this period, they were found to be insufficient to build the assumed 1975 network. For this reason, elements of the assumed 1975 network were shifted to the 1975-76 to 1984-85 period. The diminished 1975 network was then called the Priority 1 program(1), and the latter period was called Priority 2(2). The total cost of the elements shifted to Priority 2 is about $135 million; the total cost of the Priority 1 program is about $330 million (Table III-1, below). Revenues from the gasoline taxes for this period are summarized below in millions of dollars:(3)

TABLE III-1

THE PRIORITY 1. HIGHWAY PROGRAM
1969-1975

Expressways	Estimated Cost ($000,000)
Snapper Creek (South Dixie X-Way to South Dade X-Way)	5.8
Interama (Snake Creek X-Way and I-95 to Opa Locka X-Way)	23.3
South Dixie (I-95 at S. W. 26 Road to S. W. 112 Street)	74.5
LeJeune-Douglas (Golden Glades X-Way to South Dixie X-Way)	93.5
South Dade (Palmetto X-Way to S. W. 152 Street)	15.4
Total Expressway Cost	212.5
Arterials and other	117.5
Total Priority 1 Cost	330.0

Source: Table X, Technical Report No. 7, MC&A.

(1) Table X, Technical Report No. 7.
(2) Table XI, Technical Report No. 7.
(3) Tables B-5, B-6, B-8, and B-9 in Appendix B, this report.

GASOLINE TAX REVENUES
to 1975

Primary (4¢) gas tax	74.3	
Federal aid to primary	21.5	
Secondary (3¢) taxes		
Fifth & sixth cents (80%)	45.7	
Fifth & sixth cents (20%)		11.4
Federal aid to secondary	1.7	
Seventh cent (80%)	20.8	
Seventh cent (20%)	___	5.2
Totals	164.0	16.6

The 20% portion of the secondary taxes is returned to Dade County and may or may not be used on the MUATS network. It is probably more realistic to assume that this money will be used for maintenance and for construction not included in the MUATS program. If this assumption is made, the deficit for the Priority 1 program is as follows (in millions of dollars):

Estimated Costs, Priority 1	330.0
Estimated Revenue to 1975	164.0
Deficit	166.0

It is assumed in Technical Report No. 7 that the portion of the South Dixie Expressway included in the Priority 1 program will become a part of the Interstate system, and that the LeJeune-Douglas Expressway will be financed with revenue bonds that will be paid off with ten-cent toll collections on this expressway. On the basis of these assumptions, the total cost of the Priority 1 program to be paid with gasoline tax revenue would be reduced by 90% of the cost of the South Dixie Expressway and by the full cost of the LeJeune-Douglas Expressway. The $166.0 million deficit would then be reduced as shown below:

		($000,000)
Deficit		166.0
Less (.90 x 74.5)	67.0	
Less cost of LeJeune-Douglas Expressway	93.5	160.5
Remaining deficit[(1)]		5.5

(1) Gasoline tax revenues estimated through fiscal year 1974-75 ($164 million) are slightly greater in the present report than in TR-7 ($158 million), as the present report used the new formula for distribution of the sixth and seventh cent secondary tax.

The deficit estimated above assumes that construction costs will not change between the present and 1975. This assumption is untenable. The trend in construction costs must be taken into account. If we refer again to Figure 1, p. 6 above, we can see that construction costs in 1967 were 23.5% higher than in 1960. A projection of this trend may be considered an upper limit(1) for future construction costs, and average construction costs for the period in question may reasonably be expected to fall somewhere between this upper limit and the trend line projection of about 14% for the seven-year period. The midpoint of these projections would be about a 20% increase in construction costs between now and 1975. The average increase for the Priority 1 period would be about 10% above present costs, assuming the construction expenditures are distributed evenly throughout the period. If it is assumed that South Dixie will be built as an extension of I-95, then 90% of the estimated cost of this facility may be deducted from Priority 1 basic costs before the effects of cost escalation are calculated.

Total basic cost, Priority 1	330.0	
Less 90% of South Dixie X-Way Cost	67.0	
	263.0	
Plus average const. cost increase	26.3	
Inflated construction cost		289.3

If it is further assumed that toll collections will finance the LeJeune-Douglas Expressway, the inflated cost of this facility may be deducted from the inflated cost calculated above.

Inflated construction cost	289.3
Less inflated cost of LeJeune-Douglas Expressway	102.9
Balance	186.4

This balance must be financed from gasoline tax revenues. These revenues have been estimated at $164 million for the Priority 1 period. The deficit for this period will therefore be $22.4 million.

Balance to be financed with existing gas tax revenue	186.4
Estimated gas tax revenue	164.0
Deficit, Priority 1 program	22.4

(1) If it is assumed (a) that the present boom is at or near its peak, or, (b) that adequate measures will be taken to check inflation if the boom continues.

THE HIGHWAY PROGRAM, PRIORITY 2.

The total difference (deficit) for the highway program alone for the entire MUATS network is shown below in millions of dollars:

Basic cost, expressways and arterials	791.9	
Construction cost increase[1]	104.5	
		896.4
Revenue from gasoline taxes (97%)		639.5
Deficit, total highway network		239.7
Deficit, Priority 1 program		22.4
Deficit, Priority 2 program		217.3

The Priority 1 program seems feasible, but the deficit for the Priority 2 program will clearly require substantial revenues in addition to those estimated from future gasoline taxes.

THE MASS TRANSPORT PROGRAM

Time phasing of a mass transportation program involves such staggering uncertainties that it seems fruitless--perhaps ridiculous--to assume even a hypothetical construction schedule. With the exception of the San Francisco Bay Area, no urban area has been able to get a major mass transportation program past the planning stage. In Atlanta, planning staffs and other interest groups have been actively promoting mass transportation systems of one sort or another for more than ten years with no tangible results. Los Angeles is stacking study on study, and is probably no closer to beginning construction of even its "backbone system" than it was four studies ago. (The fifth study is now in progress)

Nonetheless, it was necessary--in order to estimate future revenues from mass transport operations--to assume some sort of time phasing. This was done in Chapter II above, page 9, and is repeated below.

(1) Since this estimate assumes an even distribution of construction expenditures over the 1969-1985 planning period, probable construction cost increases are understated in this estimate.

HYPOTHETICAL TIME PHASING
OF MASS TRANSPORTATION FACILITIES

Route	Begin Construction	Completion Date
Interama to	1974	1977
Miami Beach CBD to	1975	1981
Miami CBD	1974	1980

According to Dade's transit consultant, Simpson and Curtin, the Miami Beach transit corridor and a connection with the Miami CBD could operate at a profit it it were in existence right now. However, even if funds were currently available and an accelerated program of planning, right-of-way acquisition and construction was put into effect immediately, these routes could probably not be operational before 1976 or 1977. It was assumed also that construction of the busway in or along the Florida East Coast Railway right-of-way could proceed concurrently with rapid transit construction. The Miami CBD-Airport connection was assumed to be the least urgent component and therefore the last to be built.

CHAPTER IV

POTENTIAL SOURCES OF ADDITIONAL REVENUE

In view of the obvious inadequacy of present sources of revenue, several potential sources of revenue will be considered below. At this point, political feasibility will be largely disregarded. The different sources will be considered solely on the basis of their revenue-producing potential.

ADDITIONS TO INTERSTATE SYSTEM

Since Congress has voted to extend the Interstate System, there seems to be a fair chance that South Florida — especially Dade County — may receive additional Interstate routes. In this case, only 10% of the cost of these roadways would be paid directy by Dade County.

At most, Dade County might receive three additions to its present component of the Interstate System (I-95).

1. Extension of I-95 from its present terminus near Rickenbacker Causeway to Homestead.

2. I-75 from Miami to Tampa, which would join the present East-West Expressway at the Palmetto Bypass.

3. An urban connector joining the East-West Expressway and the southern portion of I-95 along the West Dade Expressway alignment.

If any or all of these additions materialize, the cost to Dade County would be substantially reduced. The amount of reduction for each of these facilities is shown below:(1)

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(1) Based on expressway cost estimates of Mel Conner and Associates.

Facility	Total Cost	10 Per Cent of Cost	Reduction to Dade County
West Dade Expressway	$17,000,000	$1,700,000	$ 15,300,000
I-95 Extension South	95,776,000	9,577,600	86,198,400
East-West Expressway Extension	3,810,000	381,000	3,429,000
Maximum possible reduction			$104,927,400

COUNTY TAX ON GASOLINE SALES

Assumption

That a county gas tax could be added to the state and federal taxes. This tax could presumably be collected through existing machinery for state and federal gasoline taxes and returned almost in its entirety to Dade County, as collection costs for the existing taxes are less than 0.5% of total collections.

Based on projected gasoline sales, the revenues shown below could be anticipated for the 1985 planning period for **each cent** of county tax imposed:(1)

1¢ per gallon will yield	88,771
2¢ per gallon will yield	177,542
3¢ per gallon will yield	266,313
4¢ per gallon will yield	355,084
5¢ per gallon will yield	443,855
6¢ per gallon will yield	532,626
7¢ per gallon will yield	621,397

On the basis of projected gasoline sales in Dade County (Table B-7 Appendix B), and assuming that this tax would be returned to Dade County almost in its entirety, a two-cent county gasoline tax could be expected to produce revenue as shown below:

(1) Assuming 1970 as first year of collections.

Year	Gasoline Sales (000,000 gals.)	Revenue from 2¢ per gal. tax ($000,000)
1970	443.7	8.9
1971	458.6	9.2
1972	473.4	9.5
1973	448.2	9.8
1974	503.0	10.1
1975	517.8	10.4
1976	532.6	10.7
1977	547.4	10.9
1978	562.2	11.2
1979	577.0	11.5
1980	591.8	11.8
1981	606.6	12.1
1982	621.5	12.4
1983	636.3	12.7
1984	651.1	13.0
1985	665.9	13.3
		177.5

EXPRESSWAY TOLLS

Table IV-1 shows estimates of revenues that might be expected from six county-operated toll stations on major proposed expressways — plus the East-West Expressway, which is nearing completion. Net revenues would be 7 or 8 percent less, according to Airport Expressway experience. Traffic volumes used in these calculations are approximately midway between the 1975 and 1985 MUATS traffic assignments. An annual revenue-bonding capacity of 1:15 was used to estimate bonding capacities. To obtain annual yield, it was assumed that traffic on Saturdays and Sundays will be 75% of the average daily traffic.

INCREASE IN VEHICLE REGISTRATION FEE

Assumptions

That an increased tag fee could be assessed in Dade County as a local option and that this additional revenue would be returned practically in its entirety to Dade County; that the additional fee would not be great enough to induce an appreciable number

TABLE IV-1

PRIORITY ONE EXPRESSWAY BONDING CAPACITY
1969-1985

Facility	Stations	ADT[1] 1975	ADT 1985	ADT Used	Annual Toll Yield ($000,000)	Bonding[2] Capacity ($000,000)	Estimated Cost of Facility ($000,000)
South Dixie (I-95 to S.W. 112 St.							74.5
North of LeJeune-Douglas	1	90,000	107,000	100,000	3.4	51.0	
South of LeJeune-Douglas	1	93,000	157,000	125,000	4.6	69.0	
LeJeune-Douglas (S. Dixie to Golden Glades)							93.5
North of Airport	1	106,000	132,000	120,000	4.4	66.0	
South of Airport	1	99,000	94,000	95,000	3.5	52.5	
South Dade (Palmetto to S.W. 152 Street)	1	87,000	71,000	80,000	2.9	43.5	15.4
			(26,700)				
East-West[3]	1	75,000	90,000	80,000	2.9	43.5	--
TOTALS	6				21.7	325.5	

(1) Average daily traffic
(2) Assuming a 15:1 bonding factor
(3) Existing expressway and toll station

of Dade County residents to purchase tags outside the county; or that such diversion could be made illegal and effectively enforced.

Although the actual increases in tag fees should be proportionate to the existing vehicle weight schedule, a flat average of 5 dollars per vehicle will be used for present estimates.

Total Est Revenue 1968-1988 average increase of $5 per tag	$98,175,000

Each $5 addition to the registration tag fee could be expected to add almost $100,000,000 to revenue. An additional assessment of $30-$40/year per tag (on the average would come somewhere near raising the total amount needed for the proposed highway and mass transport network ($600 million).

PROPERTY TAX ASSESSMENT

The tax base for both the unincorporated areas and the municipalities has been forecast as follows (in millions of dollars):

	1968	1970	1975	1980	1985
Total Dade County	$6,077	$6,695	$8,200	$9,700	$11,350

For the twenty year period 1968-1988, the tax base may be expected to be more than twice the 1968 base.

Revenue Required - 600 million

Staging Requirement - 200 million, 1970 - 200 million, 1975 - 200 million 1980

Bonding Factor - 15 (*1 million annual revenue will float $15 in revenue bonds) $\frac{200}{15} = 13\ 1/3$ million

<u>1970</u> Tax Base - 6,695 million

6,695 million x (millage rate) = 13 1/3 million

Tax Millage = $\frac{13\ 1/3}{6{,}695 \times 10.3} = 1.991$ mills

1975 Tax Base = 8,200 million

Tax Millage = $\frac{13\ 1/3}{8200}$ = 1.626 mills

1980 Tax Base = 9,700 million

Tax Millage = $\frac{13\ 1/3}{9,700}$ = 1,374 mills

Summary

1970	1.991 = 1.991
1975	1.991 + 1.626 = 3.617
1980	1.991 + 1.626 + 1.374 = 4.991

ADVANCE ACQUISITION OF RIGHTS-OF-WAY

If the unit costs of roadway construction can be reduced, this reduction may be considered an additional source of revenue. It is the unanimous opinion of the officials most closely involved in the public road-building process that large amounts could be saved through use of one or more of the several advance land acquisition techniques that are being used in other states. For example, a revolving fund technique has been in effect in California since 1952, where it was estimated that in the first four years of operation, advance acquisition of $180 million worth of future right-of-way resulted in a saving of about $400 million, based on the appraised value of the property at the time construction began.(1)

The relatively high land values that communities commonly pay for rights of way are a result of normal community growth plus the demonstrated trend for land speculators to operate in the area of an announced highway improvement unless acquisition is accomplished far in advance of the beginning of construction. Furthermore, Dade County often has to pay for the removal of buildings from rights-of-way. In some cases, buildings have been constructed on land that has been officially designated as roadway right-of-way. This is a blatantly expensive and wasteful way of carrying on public business.

Both of the major forces contributing to increased land

(1) Acquisition for Right-of-Way, American Association of State Highway Officials, 1962, p. 572.

values — community growth and land speculation — have been strong in Dade County. It follows that savings from advance right-of-way acquisition could be especially great in Dade County. Nevertheless, it is standard practice for right-of-way acquisition to immediately precede the letting of construction contracts. In fact, it frequently delays construction, and in a period of rising construction costs, delays are costly.

It would be difficult to estimate even roughly how much money could be saved through the adoption of more sensible land acquisition techniques, but the savings would be substantial if California's experience is typical.

FEDERAL AID TO MASS TRANSPORT

Present aid to urban mass transportation is limited to the one-half to two-thirds federal aid on technical studies, purchases of capital equipment, and demonstration projects. Although federal aid for large scale projects is not currently available, most projects assume from one-half to two-thirds federal aid(1) — more, perhaps, as a point of strategy than with the expectation of actually receiving it any time soon. As the county's transit consultant has indicated, the future with regard to financial assistance for urban transit capital improvements is quite vague and uncertain at this time.

(1) Seattle and Atlanta assumed 50% federal aid; Washington, D. C. — two thirds. The San Francisco Bay Area project, however, did not count on any federal aid for construction or equipment.

CHAPTER V

RECOMMENDATIONS

On the basis of the foregoing analysis of past revenues and expenditures as well as the prospects for the future, several recommendations are offered below. These are followed by an explanation of the recommended choice of additional sources of revenue.

GENERAL RECOMMENDATIONS

1. That the estimated revenue that will be required to finance the highway and mass transport programs be raised by means of a combination of expressway tolls and a county sales tax on gasoline.

2. That both expressway tolls and the county gasoline sales tax be completely controlled by Dade County officials, so that expenditure decisions and the responsibility for these decisions are a matter of local option so far as new sources of revenue are concerned.

3. That the deficit for the proposed expressways and arterials be financed from tolls on expressways and that the revenue from the county gasoline sales tax be spent or reserved for expenditure on the mass transportation program that is being developed by the county's mass transportation consultant.

4. That certain rigidities in state highway classification criteria be removed so that Dade County and other populous counties will be able to use all of the gasoline tax money that will be returned to them in future years.

5. That expenditures for both roadways and mass transport facilities be made in a manner that takes advantage of the benefits that may be obtained by following accepted principles of compensatory public spending.

6. That the development of the more expensive fixed rapid transit facilities be contingent upon the availability of federal aid amounting to at least 50% of total estimated capital costs, unless it is determined by transit consultants that portions of the system will be self-financing.

7. That the existing requirement that the Dade County Metropolitan Transit Authority operate its bus system so as to make a profit be rescinded so that present and future service can be expanded as recommended by Dade County's transit consultant for the MUATS.

8. That an adequate revolving fund for advance acquisition of rights-of-way and other anticipated public uses be established as a perpetual Dade County budget category, the initial fund being drawn from the general tax fund and to a lesser extent from the portion of the fifth, sixth and seventh cent gas taxes that is returned to Dade County.

EXPRESSWAY TOLLS

Priority One Program

Further use of expressway tolls has been recommended by practically every agency involved in the MUATS. At present, toll stations exist on the Airport and East-West Expressways. Net revenues from tolls on the Airport Expressway have been more than double the revenues forecast for this facility, and they are presently sufficient to meet debt service requirements on both the Airport and the East-West Expressway.[1] Rather than a complete system tolling all expressways, it is recommended that no more toll stations be planned than are thought to be necessary to meet the estimated deficit in projected highway program revenues. By reason of the Airport Expressway toll revenue experience, revenues from the East-West Expressway could be

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(1) Two bond issues are involved — $19.5 million in 1959 and $25 million in 1965 — for a total of $44.5 million. Dade County Toll Facilities, Financial Report, Florida State Road Department, 1966, Schedule I-1, p. 21.

used to finance the next expressway project.[1] Use of actual toll revenues instead of someone's estimate should be a decided advantage to Dade County in obtaining a bond issue for additional expressway construction.

The size of the deficit in the highway program depends substantially on decisions with respect to extensions of the Interstate network. Some assumption is necessary, but the Mel Conner assumption (I-95 to Homestead, I-75 to Tampa, and an urban connector along the West Dade Expressway corridor from the East-West Expressway to I-95 extended) seems totally unrealistic. Present pressures and influence are limited to promotion of I-75 without the urban connector. If it is assumed that this will be the only addition to the Interstate network in Dade County, there will be no appreciable reduction in the cost of the proposed network. Even if the urban connector is included as a part of I-75, no great cost reduction is involved, as the cost of this segment has been estimated at about $20 million. It is probably preferable to assume that Dade County will get I-75 only, without the urban connector. Table V-1 above shows the estimated bonding capacities of Priority 1 expressways, based on traffic volumes forecast for 1975 and 1985 by the MUATS trip-generation model. If these estimates are fairly close, only five additional toll stations will be required.

Total cost of expressways for Priority 1 has been estimated at $212.5 million (Table III-1 above), which indicates an excess expressway bonding capacity of $113 million. Revenues from existing sources (gas taxes) for the Priority 1 period have been estimated at $164 million, not including $16.6 million that will be returned to Dade County for use on primary, secondary, or other roads and bridges. Cost of MUATS arterials have been estimated at $117.5 million (Table III-2 above). If classification criteria are changed, or a larger part of gasoline tax money is returned to be spent at the discretion of local agencies, all arterial improvements included in the MUATS plan can be made out of forecast revenues with an excess of $46.5 million.

Priority Two Program

No additional tolls should be required for the Priority 2 highway program. Total costs for this program are estimated to be

(1) This would require refinancing the Airport and East-West Expressway, as toll revenues from both facilities are committed to the combined debt service of these two facilities. Refinancing should probably be deferred until interest rates are more favorable and the earning capacity of the East-West Expressway (and its effect on Airport Expressway volumes) has been established.

$462 million.[1] Projected revenues for the entire planning period, 1969-1985, total $639.5 million. Only $185.5 million of these forecast revenues are used in the Priority 1 program. The balance, $454.5 million plus the excess bonding capacity ($117 million) and the excess gas tax revenues from the Priority 1 program ($46.5 million) should be more than adequate to finance this portion of the highway program without recourse to additional revenue sources.

COUNTY GASOLINE TAX

It is recommended that a portion of the revenues that will be required for the implementation of the proposed mass transportation systems be raised by means of a two-cent county gas tax, collected through existing machinery but returned almost in its entirety to Dade County. There are two major reasons for choice of this source of additional mass transport revenue. First, highway-users benefit by the reduction of highway traffic that mass transportation makes possible. It does not seem unreasonable then, to expect highway users to pay a relatively small part of the costs of mass transportation. Second, it is a source that would vary roughly in proportion with need. As gasoline consumption and congestion on the highways increases, so does the need for mass transport. There is a possibility of an incidental effect that would also be beneficial. The combination of an additional two-cent county gasoline tax plus the general upward trend of gasoline prices may have the effect of reducing the number of one-car-one-person trips.

There will of course be strong objections and perhaps effective resistance from some who are accustomed to thinking of public streets and highways as a self-supporting sort of public enterprise — like a municipal power plant. They are certain to view the use of gasoline taxes to support mass transport as what they choose to call "diversion" of funds. But the "diversion" argument stands or falls on the basis of self-sufficiency, and as a complete operating system, streets and highways are far from being self-sufficient. As shown in Section I of the present study, even an incomplete tabulation of the costs of the street and highway support system in Dade County adds up to over $8 million each year, most of which is funded out of general revenues. The diversion argument is unquestionably a two-way street. But it is best simply to avoid it as it leads no where in <u>either</u> direction.

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(1) This is the difference between total costs ($792 million) and the Priority 1 costs ($330 million).

CHAPTER VI

CONCLUSIONS

FEASIBILITY

As noted in the introduction, the major purpose of this cost-revenue study is to shed some light on the question of the financial feasibility of the proposed transportation plan. It has been suggested that the community could pay for the proposed improvements by means of ten-cent tolls on selected expressways and a two-cents per gallon county gasoline tax. However, the question of feasibility cannot be answered by considering transportation costs and revenues in isolation. If transportation costs were the only category of public expenditure in which there appears to be a need for an increased rate of expenditure, and if public expenditures in future decades were to be concentrated largely on transportation facilities, then certainly the community could in this sense "afford" the recommended transportation improvements. But this is not the case. Needs over and above present budgets exist in every category of public expenditure. In short, feasibility cannot be determined by any analysis that is limited to considerations of transportation improvements alone. About all that a transportation cost-revenue study can do is eliminate those proposals that are clearly "out of the ball park." Such being the case, it is both logical and proper that it include some proposals that almost went over the fence.

MODAL INTERDEPENDENCE

There is yet another sense in which the feasibility of the proposed transportation system must be considered. The present report has emphasized the <u>total</u> cost of the major elements of the ground transportation system -- highways and mass transportation -- as it is crucially important that it be clearly understood that neither will be adequate without the other. If the proposed expressways and arterials are not built, serious inadequacies in mobility will exist -- even if the proposed mass transportation proposal were to be carried out to the letter. Conversely, the proposed arterials and expressways could not conceivably handle the projected 1985 traffic without an intolerable degree of congestion. Within some vaguely-defined limits, each mode is a substitute for the other -- but beyond these limits both modes are necessary.

However, when the two elements are viewed independently of each other, the expressway program appears much more economical than the highway program. At a cost of $792 million, roadway capacities will be increased from an average daily volume of approximately 2½ million to 6 million daily person trips. Mass transportation accommodated only about 6% of the total person trips in 1964, and the modal split assignment for 1985 is only a little over 6%, an increase from about 120,000 daily trips in 1964 to 378,000 in 1985. To attain this increase in transit riding, estimated expenditures of about $640 million will be required. When compared with roadway costs and volumes, it seems obvious that the mass transport program is not economically justifiable -- that the community would be much better off if it ignored the proposed mass transportation improvements and built more expressways and arterials instead.

FALLACIES OF ECONOMIC FEASIBILITY

This view is widely held, despite the fact that it involves some rather obvious as well as some more subtle fallacies. First, as pointed out in the highway cost analysis in Section I above, the highway costs that are typically included in cost-revenue estimates represent only a fraction of the total costs of travel by this mode. Some of the more obvious of these costs that have not been included -- traffic safety, traffic control, and local street improvements -- were estimated at $192 million for the planning period being considered. Even if this figure would to be added to the highway costs, it would fall far short of total quantifiable system cost. It does not even include all of the costs that are met with public funds, and it does not include any of the costs that are incurred as a result of private operation of automobiles, nor the opportunity costs of the very extensive support system provided by the private sector of the economy. It is important to note that these are quantifiable costs. Some consideration must also be given to non-quantifiable values such as lives lost, injuries incurred, and property damaged as a result of motor vehicle travel. And what are the effects of expressway-building on urban form? What are the costs of urban sprawl?

In comparison with the difficulties inherent in estimating the real, total costs of transportation by private auto, estimating total costs of mass transport systems is fairly simple. This is true because all costs are met with public expenditures and a preponderance of the supporting activities associated with mass transport operations are concentrated in one governmental agency. As a result, costs reported by this agency come very close to being the total quantifiable system costs. So when public expenditures for mass transport are compared with public expenditures for streets and expressways, total mass transport costs are compared with some unknown fraction of total private auto travel costs.

EFFECTS OF USING ECONOMIC FEASIBILITY TESTS

It should be borne in mind, then, that the customary "classical" economic feasibility tests of proposed transportation projects cannot show whether or not a project is economically justifiable. In the case of highway projects, they cannot do so because they do not even include all of the quantifiable costs; with transit projects, they cannot do so because too many of the benefits are incommensurable. Passing the typical feasibility test means that the project in question can pay its own way in dollars and cents. It is patently absurd to expect mass transport systems to pass this test; for several decades, they have been steadily passing from private to public ownership for the simple reason that they cannot pass the dollars and cents feasibility test.

Reliance on feasibility studies for proposed revenue-bond financing of tolled expressways or transit projects may therefore result in a disservice to the community.

Revenue financing of expressways is currently dependent upon estimates of future traffic volumes, the magnitude of the diversion of traffic from existing arterials, projected population growth, the trend in auto ownership, and a host of other factors. In all of these projections or estimates, there is considerable uncertainty. Consequently, there is a considerable leeway within which the analysts who are making the feasibility report can exercise a conservative or optimistic bias. The result is that a capricious element is introduced into public expenditure decisions that has little if anything to do with public need. The bias that is introduced by feasibility studies is usually a conservative bias, as consultants know that investment bankers prefer that future revenues be underestimated.

The Airport Expressway is a case in point. Toll collections began in December of 1961, and each subsequent year, revenue has exceeded expectations. Gross toll collections of $1,969,035 for the year ended January 31, 1966 amounted to 306% of toll collections as estimated in a traffic survey projection of 1959.(1) Fortunately, even the grossly underestimated revenue estimates were sufficient to justify the project.

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(1) Financial Report, Dade County Toll Facilities, 36th Street (Airport) Expressway, Florida State Road Department, Internal Audit Division, September 1966, p.2.

But this may not always be the case. On the basis of such feasibility studies, projects such as the South Dixie and LeJeune-Douglas Expressways may be delayed indefinitely if their construction is dependent upon standard feasibility tests, for right-of-way and construction costs may be so high that the projects will never pass the feasibility test unless, in final desperation, the cost and revenue estimates are deliberately manipulated or the project financed with general obligation bonds.

It is the piecemeal project-by-project approach characteristic of present highway financing that creates this situation in which projects for which the public need is greatest are also the hardest to justify.(1) It is not reasonable to expect every element in <u>any</u> transportation <u>system</u> to be able, standing alone, to pass the classical economic feasibility test, and it borders on nonsense to expect each element of a <u>public service</u> system to be able to pass such a test.

THE IMPORTANCE OF METHODS OF FINANCING

The question of feasibility is often reduced to the question "will the public and/or its representatives buy it?" The answer to this question may depend as much on the method of financing as it does on project costs. Highway projects are financed from a trust fund which more or less automatically allocates substantial amounts for new construction each year. Additional expressways can be financed with tolls and revenue bonds. Because of the annual allocations, bond issues can be relatively small, and in the case of revenue bonds, do not have to be approved by the electorate. In contrast, large mass transportation projects are typically financed -- or rejected -- as a result of submission to the electorate of a very large bond issue, with debt service from general revenues. Generally, this means that the major source of general revenue -- property taxes -- must be increased. Proposals to increase this tax may create a great deal of opposition that has little to do with the merit of the proposed public works.

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(1) Apparently, this situation is not uncommon -- especially when revenue bonds are the customary method of financing. In the sixth edition (1962) of <u>Municipal Finance Administration</u>, (International City Managers' Association), the following statement may be found: "Revenue bond financing places the project in the strait jacket of being strictly a self-supporting business. This may be a desirable objective, but on the other hand it may limit the project's adaptability to the general good of the community. Conditions arise where a subsidy from general taxation is essential to meet a community need." pp. 315-316.

It seems clear, then, that methods of financing may have a great deal to do with feasibility. Because of peoples' preference for automobile travel and the relatively painless way in which highway improvements are financed, the MUATS highway program appears feasible -- that is, the people will probably "buy it." The case for the mass transport plan seems much less favorable. This is one reason that it is being recommended here that the proposed mass transportation improvements be financed in part by means of a trust fund similar to the way that highway improvements are financed. Annual revenues could be used in part to finance the extensions and improvements in the surface bus system. The county's transit consultant has strongly emphasized the desirability of getting this part of the plan under way immediately. The remainder of the annual revenues could be accumulated and would decrease the size of the bond issue required for the fixed transit recommended in the plan.

THE IMPORTANCE OF TIMING

The timing of public works is important, first, simply as a means of getting the most for the public's money. Obviously, public works projects are going to cost more if they are undertaken at a time when competition for funds in both the public and private sectors of the economy is strong. During an inflationary boom such as presently exists, the cost of materials, wages, and the interest rate are high, and projects undertaken at such times will cost much more than they would if the economy were on an even keel or on a downswing.

Even more importantly, public works programs undertaken during an inflationary boom reinforce what most economists presently consider to be the most dangerous tendency in our economy. Sensible timing of large public projects such as those being proposed here can counteract the inherent instability of our economy instead of contributing to it. The accumulation of reserves for transportation projects and concentration on less costly portions of the program during booms are steps in the direction being recommended here. This does not mean that the projects are shelved until some later date. There is a great deal of work that must be done before actual construction can begin. It is imperative that this preliminary work be done so that construction can be launched in short order when the time is ripe.

These recommendations are made with full realization that it is during an inflationary boom that it is politically most difficult to postpone public expenditures. It is during a period of rapidly increasing traffic that existing highways and bridges come to seem inadequate. It is also when wages and employment are high that more people can afford better medical care, keep their children in schools and colleges, devote more time and money to recreation, and so on right down the line. There is hardly an area of public expenditure in which needs are not disproportionately greater than before. Conversely, a recession is, in the eyes of the general public, the least propitious time for increased public spending. To most people, a recession is a time to cut back government expenditures, which has the demonstrated, incontrovertible effect of reinforcing the downward spiral of the economy.

Under these circumstances, it is not surprising that local governments take the politically expedient course so that public expenditures flow with the economic tide rather than against it. However the logic of a compensatory public spending is not above the heads of the public at large. The size and estimated costs of the proposed MUATS transportation plans when current inflation factors are included should be sufficient to make even the man-on-the-street listen to reason.

LOCAL CONTROL OF REVENUES

If local officials are to be able to practice a policy of compensatory public spending with regard to transportation improvements, it is of course necessary that they be able to control the timing of these expenditures to some extent. In its 1968 study, the SRD has recommended that all of the seventh cent, rather than the present 20%, be returned to the counties to be spent at local discretion. This is also a step in the right direction, but not a very long one. It is therefore recommended in the present study that additional sources of transportation revenue be controlled locally, subject only to design and maintenance standards by the SRD where the state system is concerned.

If it is not possible or practical to refinance the Airport-East-West expressways, the first expressway in the MUATS system should be financed with a general obligation bond issue to avoid dependence on feasibility estimates. Other expressway building could then be financed with revenue bonds backed by <u>actual</u> toll revenue experience. It has been estimated that toll revenues can provide all of the additional revenue that would be required for the highway program if toll stations are county-owned and operated.

TRANSPORTATION OPTIONS

Undoubtedly, some who read this report will be of the opinion that it shows an excessive concern for mass transport and a consequent lack of concern for the highway program. This accusation cannot be denied, but it can be countered on the basis of the fact that highway construction is a going funded business, whereas mass transport in Dade County has no source of funds for improvements other than the fare box. Nor do proposals for mass transport usually elicit the support -- either public or official -- that highway improvements generally enjoy.

Another reason for emphasizing the financing of mass transport hinges on the overall stated purpose of the MUATS -- the attainment of transportation balance. This is a complex ideal and its attainment is dependent to some extent on more or less technical calculations and to some extent on public policy based on what public officials think people want. It is well-known that where streets and expressways are adequate, people prefer to travel by private automobile. But it is equally well-known that in large, rapidly growing communities, auto traffic becomes increasingly congested -- even where the most ambitious expressway programs have been carried out. Expressways invariably attain their design capacities much sooner than was anticipated.

It is when over-crowding of expressways occurs on a large scale that it becomes evident to highway-users that expressways alone cannot handle peak-hour volumes in a satisfactory manner. Los Angeles is the classic example. Transportation planners are now trying to get construction started on a $2½ billion transit project, but it seems quite obvious that this community waited too long, and that this is generally the case with mass transportation in rapidly-growing, automobile-age communities. It is impossible to build enough expressways to handle the volumes of traffic that have developed, and no alternative has been provided. Most of the people in the community have been given no choice.

It seems obvious that this situation can be avoided if mass transportation and expressways and arterials are developed concurrently. The effect of doing so would be to make the choice of mode a meaningful choice -- which it presently is not -- for an increasingly large proportion of the people of Dade County. It is generally recognized that about 25% of the population are "captive" bus riders. They have no autos. Oddly enough, this same term is seldom applied to auto drivers or riders who have no reasonable alternative to the private auto -- especially for the home-to-work trip.(1) Yet they, too, are captives for exactly the same reason. They have no meaningful choice. The difference between the two situations is that auto drivers are mostly happy captives. They do not care about the existence of an alternative -- until the congestion really gets bad. But by the time the need for mass transport is widely recognized, it is already too late, for many years will elaspe before even a skeletal transit system can be designed, engineered, financed, and finally constructed.

MODAL SPLIT PROCEDURES

It was noted many years aso by an official in HHFA that the major transportation studies being required by this agency were incapable of producing anything but a "highway solution" to the urban transportation problem (2), and experience to date justifies his contention. The principal causes of this bias are first, the "modal split" procedures that define modal balance and second, the misuse of the concept of economic demand that is used to justify these procedures. Modal split procedures are used to estimate the proportion of future intracity travel demand for both public transit (irrespective of type) and the private automobile. There are two legitimate ways of making forecasts of the future such as this: by extrapolating from past trends and by projecting meaningful correlations. The first method is not used at all. Transit usage is declining everywhere, and an extrapolation of this trend would inevitably predict its final demise. Since this pronostication would not be politically acceptable, the correlation method is generally used. Projections of certain variables that are assumed to have a causal relationship to transit-riding -- usually auto ownership, residential density, income levels, travel-time ratios, etc. -- are used as inputs in multiple correlation exercises to predict the amount of future transit-riding for which provision should be made. In this case, it is the inputs that are simple extrapolations of past trends, and it is assumed that the relationship between variables and transit riding will remain the same. It is not

(1) The SRD modal split report is an exception as it does refer to captive auto riders. See p. 8, Development and Testing of Modal Split Models, MUATS Technical Report No. 4, Florida State Road Department and Mel Conner and Associates.

(2) Victor A. Fischer, "The New Dimensions of Transportation Planning" Proceedings of the 1964 Annual Conference, American Institute of Planners, August 16-20, 1964.

surprising that the transit-riding prediction is invariably about the same as the existing division between mass transport and the private auto. Furthermore, the predicted modal split is presented as a precise, single-figure estimate rather than as a range reflecting the probabilities of variance in the inputs and variations in assumptions about transportation policy.

In fact, the modal split calculation is far less scientific and objective than it appears at first glance. It is impossible for the gravity-model engineers to predict the modal split for 1985 without knowing what sort of transportation policy will be followed in the intervening years. But the question of tranportation policy is precisely the question to which the whole analysis is addressed. The obvious course for the analyst is to make different assumptions about transportation policy (and therefore the 1985 modal split) and use the model to predict the consequences of the varying assumptions. This is a quite legitimate procedure -- provided the assumptions differ significantly and that the "independent" variables in the model are re-estimated for each assumption.(1) But this is not done. No significant variations in modal split are assumed. As noted, it is simply assumed to be practically the same as the existing model split.(2) This being the case, no significant changes in the variables is expected(3), and the whole process may be summarized as follows: past transportation policies produced the present transportation system (modal split) which produced the variables that are used to predict the future modal split which produces future transportation policy which with the passage of time becomes past transportation policy. The circularity of this process and the critical role of the policy assumption must be obvious to the most casual observer.

THE DEMAND FOR TRANSPORTATION FACILITIES

It is difficult to see how this process can be seriously accepted as transportation planning -- but it is. The usual justification for projection of the existing situation is that this situation is an expression of "consumer" demand -- that is, people have expressed their preference for travel by private auto by the fact that they have

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(1) Actually, the variables are highly interdependent. Furthermore, projections of these variables are generally made on the basis of a single forecast -- population.

(2) Development and Testing of Modal Split Models, MUATS Technical Report No. 4, Florida State Road Department and Mel Conner and Associates, Inc., p. 34.

(3) Ibid., p. 67.

bought autos in ever-increasing numbers, and by the fact that transit ridership all over the country has steadily declined. If this conception of transportation demand is accepted, the transportation status quo becomes the recipient of the approbation and approval that attaches to the idea of consumer sovereignty in the private economy. On the other hand, any planner who suggests that the transportation status quo be altered is immediately suspect and may be accused of attempting to substitute his own preferences for the expressed will of the majority.

But is is the status quo truly an expression of consumer demand? There is some reason for thinking that it is not. In the first place, it is meaningless to talk about the demand for transportation facilities in 1985 without reference to costs. When economists talk about demand, it is invariably associated with a certain cost or price. In fact, demand is usually presented as a curve or schedule representing the quantities of some product or service that will probably be (or has been) bought at various unit prices for that product. To speak of a demand for highway facilities in 1985 to accommodate 6 million vehicle trips prior to any cost calculations has the same significance as saying that there is presently a demand for ten million 80-foot yachts simply because there may be that many people who would like to have one.

Demand, then, is a function of cost. More importantly, it is also a function of the availability of substitutes. In the private economy, a producer cannot raise the price of his product if there is a comparably priced substitute for it. If he does, demand for his product may drop precipitously. On the other hand, if there is no acceptable substitute for his product and the product is a necessity, the producer has considerable latitude for raising price without decreasing demand. This is essentially the current and projected situation with regard to ground transportation facilities in Dade County. As noted above, the people of Dade County are mostly either captive auto or captive transit riders. And if they are given no more choice -- no more possibilities for substitution -- than at present, then certainly they will pay whatever the costs of auto and transit happen to be in 1985, for their very existence in a large urban area is dependent on their being able to move about by some means other than their feet. If only one mode of transportation is provided for most people, the "demand" for that mode becomes a self-fulfilling prophecy. But it is meaningless so far as consumer preference is concerned. If the concepts of economic demand and consumer sovereignty are to be legitimately used to determine transportation balance, a lot more people must be given a choice -- as a result of public transportation policy decisions and expenditures.

The MUATS conception of transportation balance (the modal split) is not a strictly technical calculation, as it is based on crucially important policy assumptions. If the modal split prediction is accepted uncritically, the policy assumptions automatically become operative.

The existing modal split is not simply a result of inexorable market forces or an expression of economic demand, for it is also a result of past transportation policy — or lack of it. And the same is true of the 1985 modal split. To some unknown extent, the actual 1985 modal split depends on what transportation policy is carried out. The primary purpose of the MUATS should have been to give decision-makers some idea as to what variations in the modal mix are feasible. The alternatives so developed could then have been evaluated in terms of their probable contributions to broad community goals. Unfortunately, no such alternatives were developed, and the question of transportation balance remains unanswered and largely unexplored.

NOTE 1

Time phasing of construction and costs has been attempted only to the extent of assigning street and highway projects to one of two periods: 1969-1975 and 1976-1985. To estimate construction cost increases for these time periods, index values for the mid-point of each time period were multiplied by estimated construction cost for each period. For the first period, however, the index was increased from the long-term trend value of 119.3 to 126.0 so that it would be more reasonable in terms of current business cycle behavior. (See Figure I-1)

The BPR construction cost index does not include right-of-way costs. For lack of data, it has simply been assumed that future increases in land value due to inflation will occur at the same rate as increases in construction costs. Increases in land values attributable to community growth have been taken into account in the estimates of right-of-way costs made by the SRD's consultant, and are included in the total cost figure ($792 million).

NOTE 2

Construction cost increases for the three elements of the mass transportation network were estimated by assuming the following cost index:

Year	Index	Year	Index
1968	100	1977	145
1969	105	1978	150
1970	110	1979	155
1971	115	1980	160
1972	120	1981	165
1973	125	1982	170
1974	130	1983	175
1975	135	1984	180
1976	140	1985	185

For the construction periods assumed for each element, the index was averaged and this average multiplied by the estimated 1968 base cost to obtain inflated costs for each element (millions of dollars):

Element	Est. Cost	Cost Index	Inflated Cost
Interama-Miami B. CBD - Miami CBD	254.0	140	355.6
Miami CBD - Airport	80.0	160	128.0
Busway	44.0	178	78.3
Totals	378.0		561.9
Cost Increase	183.9		
	561.9		

APPENDIX A

LOCAL COSTS NOT INCLUDED IN MUATS COST ESTIMATES

In Table A-1 budget allocations of the Dade County Public Works Department are shown for those divisions that are wholly or partly involved in construction, maintenance and operation of streets and highways in Dade County. These allocations, as shown in Table A-2, form the basis for a projection of county expenditures for this transportation mode. Although the budgeted amounts include some expenditures on functions other than streets and highways, the rate of increase they show may reasonably be expected to be applicable to actual county ground transportation expenditures. For those fiscal years in which budgeting practice permits comparison, the annual average rate of increase was 3.9 per cent.

The estimate of local costs(1) in Table A-2 was obtained by applying this rate to the Budget Analysis Division's calculation of the 1968-69 budget allocations for "Movement of Ground Traffic" (Table A-3). It is unfortunate that the estimate of the county's future expenditures from sources other than the gasoline tax must be made from a one-year historical base. Any error in this base will be compounded over the years the projection covers. As budget allocations by functional categories have not been made in previous years, there does not seem to be any alternative to this method, which is, admittedly, a poor one.

Error in the estimate of local expenditures is virtually certain to be in the direction of understatement, as the Budget Division estimate of expenditure for movement of ground traffic does not include portions of joint costs in the Public Works Department - such as administration ($446,480), engineering control and services ($664,600), and mobile equipment ($2,250,072). Some undetermined portion of these budget categories should be charged to the street and highway function. Nor has any attempt been made to estimate traffic court costs or parking costs.

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(1) "Local" costs in this case means costs that are paid from revenue sources other than gasoline tax. Actually, they are all local costs.

APPENDIX A

TABLE A-1

BUDGET ALLOCATIONS
MAINTENANCE AND CONSTRUCTION - COUNTY ROADS & BRIDGES
AND MAINTENANCE OF SECONDARY SYSTEM

Public Works Department Division	1962-63	1963-64	1964-65	1965-66	1966-67	1967-68	1968-69
Traffic Planning	123,760	126,599	128,228	142,328	148,320	151,340	319,546
Engineering - right-of-way	176,130	202,721	203,290	228,816	243,910	263,809	306,325
Engineering - highway	308,449	309,720	322,720	368,115	312,079	319,761	340,369
Engineering - control & services	483,029	502,470	550,470	600,199	626,733	640,570	664,600
Operational traffic (traffic control)	123,286	117,748	129,822	132,393	149,149	169,245	43,979
Traffic maintenance	384,619	419,952	416,515	437,515	474,595	499,097	511,450
Traffic signals	718,671	813,458	778,566	633,592	672,665	567,068	637,235
Road & bridge maintenance	1,102,735	1,076,204	1,076,204	1,110,000	1,167,301	1,393,456	1,475,600
Civil engineering					173,875	190,700	203,945
TOTALS	3,420,679	3,552,208	3,605,336	3,652,958	3,968,627	4,195,026	4,503,049
Per cent increase over previous year		3.8	1.5	1.3		5.7	7.3

Source: Annual Budgets,
Metropolitan Dade County

TABLE A-2

MOVEMENT OF GROUND TRAFFIC
PROVISION OF ROADBED

	HIGHWAYS	FEEDER STREETS & BRIDGES	STREET LIGHTING
111.01 Administration			
.04 Right of Way Engineering	153,162	153,162	
.05 Highway Engineering		340,369	
.10 Civil Engineering	10,920	10,920	10,920
.25 Road & Bridge Maintenance		1,475,600	
140.02 Special Services			
22.21 Streetlighting - Lease			250,000
22.22 Streetlighting - County Owned			90,000
22.23 Streetlighting - City Transfer			360,000
49.90 Reserve for City Transfer - Streetlighting & Bridges		28,500	46,500
611.03.7200 Railroad Crossing Protection		50,000	
611.10.100 Civil Engineering			60,800
Sub-Total	164,082	2,058,552	818,220
TOTAL			3,040,854

TABLE A-2 (cont.)

TRAFFIC CONTROL

		TRAFFIC SIGNALS	SIGNS	DIRECTION OF TRAFFIC
GENERAL FUND				
130.01	Traffic and Transportation			
.02	Traffic Planning			319,546
.03	Operational Traffic	25,178	25,179	
.04	Traffic Signals	637,235		
.05	Traffic Maintenance		511,450	
CAPITAL OUTLAY FUND				
611.03.1100	Traffic Signal Coordination of Arterial Streetlighting	100,000		
.03.1400	New Signal Installation	30,000		
.03.3100	Traffic Sign Reflector		25,000	
.03.5100	Permanent Pavement Markings		20,000	
Sub-Total		792,413	581,629	319,546
TOTAL				1,693,588

TABLE A-3

PROJECTION OF DADE COUNTY BUDGET ALLOCATIONS
FROM LOCAL SOURCES OF REVENUE

FISCAL YEAR		LOCAL COST PROJECTED*
1968-69		8,175,000
1969-70		8,454,000
1970-71		8,825,000
1971-72		9,169,000
1972-73		9,527,000
1973-74		9,899,000
1974-75		10,285,000
1975-76		10,686,000
1976-77		11,103,000
1977-78		11,536,000
1978-79		11,986,000
1979-80		12,453,000
1980-81		12,939,000
1981-82		13,444,000
1982-83		13,968,000
1983-84		14,513,000
1984-85		15,079,000
	TOTAL	192,481,000

* Projection factor: .039. "Local" cost does not include returns to Dade County from gasoline tax collections in Dade County.

PROJECTIONS OF DADE COUNTY AD VALOREM TAX BASE

The purpose of this analysis is to project the Dade County Property Tax Base upon which the Ad Valorem Property Tax is levied by the cities and the County to 1985 by five-year intervals. The base level from which these projections were initiated was the tax roll upon which 1968 property taxes were levied. This roll totalled $6,077 million. This figure consists essentially of all commercial and residential real and personal property (including inventories) less homestead, widows and veterans exemptions.

Because of the court-directed requirement that all assessments be based on 100% of actual value in 1966 plus earlier efforts to reassess tax rolls in anticipation of the County's taking over all municipal assessments, past trends in valuation provide very little help in forecasting the future tax base.

The approach followed in making the projections has therefore followed a "value-added" concept. This approach assumes that the property tax base should increase at least as much as the value of new construction throughout the forecast period. The big advantage to the method is that reliable data is available on past trends for value of construction as measured by building permits for the unincorporated area and all but a few of the smallest municipalities. The approach assumes that the value of new construction will be added to the tax rolls as it occurs at amounts which approximate permit values. Of course, in the case of resident-owned and occupied single-family homes and condominiums, homestead exemption would accrue as a deduction from the net tax base. At the same time, however, the land upon which improvements were made could be expected to show a modest increase over its unimproved assessment level. In addition, personal property and inventories would be added to the rolls for all new residences and businesses. Some improvements would also be deducted through demolition, primarily in the older cities.

On balance it seems reasonable to expect that the tax base should increase nearly as much as the value of new construction in each jurisdiction and it has been on this basis that the following forecasts have been constructed.

TABLE A-4

TAX BASE FORECAST
1968-1985
Dade County, Florida

(Millions of Dollars)

Political Jurisdiction	1968	1970	1975	1980	1985
Miami	$1,426	$1,530	$1,800	$2,050	$2,260
Miami Beach	731	800	950	1,100	1,250
Hialeah	384	425	525	625	750
Coral Gables	314	345	420	480	550
North Miami	162	180	220	260	300
North Miami Beach	140	155	185	215	250
Other Municipalities	580	630	750	870	990
Total Municipalities	$3,737	$4,065	$4,850	$5,600	$6,350
Unincorporated Area	2,340	2,630	3,350	4,100	5,000
Total Dade County	$6,077	$6,695	$8,200	$9,700	$11,350

The above projections seem reasonable in light of projected population increases. Thus, the 1968 roll is equivalent to $5,050 per capita for an estimated 1,200,000 residents while the 1985 roll is equivalent to $5,700 for each of the 1,955,000 residents projected for that year. Although the estimates are stated in current dollars and do not account for any inflationary factor, it seems likely that the future will continue to reflect higher levels of investment in homes and businesses per resident.

APPENDIX B

PROJECTIONS OF ANTICIPATED REVENUES FOR DADE COUNTY FROM GASOLINE SALES TAXES

Although the seven cent state gasoline tax is collected as one tax, it is administered as three separate funds. The four cent primary tax provides working capital for the Florida State Road Department as well as funds for construction and maintenance of the state's primary road system. The fifth and sixth cents (second tax) and the seventh cent (third tax) are allocated to Florida counties according to statutory and constitutional formulas for construction of the state secondary system and, to a lesser extent, county roads and bridges. The following estimates of future revenues from these sources are based on the assumption that projections of gasoline sales in Florida and Dade County provide the most reliable basis for making long-term estimates of future gas tax revenues.

ESTIMATES OF ANTICIPATED REVENUE FROM THE PRIMARY GAS TAX

The amounts allocated to Dade County by the State Road Department budget in the past twelve years are shown in Table B-1.[1]

(1) This twelve year period was selected because it includes all of the years during which a particular State Road Board formula was in effect. This formula was supposed to give the Fourth District either 27.0 or 28.5 per cent of total disposable funds. Effective July 1, 1967, the formula was modified and the Fourth District share became 30 per cent.

TABLE B-1

PRIMARY FUND BUDGET ALLOCATIONS TO DADE COUNTY
FY 1956-57 through FY 1967-68

Fiscal Year	Amount	Fiscal Year	Amount
1956-57	$ 7,746,000	1962-63	$ 7,245
1957-58	8,533,000	1963-64	7,103
1958-59	11,334,000	1964-65	4,260
1959-60	7,414,000	1965-66	17,735
1960-61	4,130,000	1966-67	16,885
1961-62	4,660,000	1967-68	5,230

SOURCE: Annual Budget, Florida State Road Department

Obviously, the budgeted amounts are far too erratic to permit a simple trend line projection. Furthermore, the State Road Department (SRD) has only recently discontinued its practice of overbudgeting by about 50 per cent. The amounts budgeted are not the same as the amounts actually spent. The SRD recently made a study[1] of primary contracts let during the ten calendar years 1957 through 1966. The results were presented in a manner that precludes a year-by-year comparison of contracts let and budgeted amounts. Table B-2 makes this comparison to the extent that it is possible to do so.

TABLE B-2

TOTAL PRIMARY FUND CONTRACTS LET
DADE COUNTY

Time Period[2]	Ten Year Study	SRD Budget
1956-66 (10 yr. average)	$6,574,000	$ 8,930,000
1957-60 (4 yr. average)	6,015,000	7,853,000
1961-64 (4 yr. average)	7,040,000	5,814,000
1965-66 (2 yr. average)	6,833,000	17,310,000

(1) Known as the "Ten-Year Special Study: Primary Road Fund Construction Contracts," prepared by SRD, Fiscal Division, R. H. July, Comptroller.
(2) Budgeted amounts are for fiscal years 1957-58 through 1966-67. Ten-Year Study is for calendar years.

It is clear that the Ten-Year Study is also inadequate as a basis for projecting primary revenues for Dade County. However, both the SRD budget and the Ten-Year Study have some value as points of reference against which the reasonableness of projections reached by other methods may be roughly checked. The method that has been followed and some of the data used in obtaining the following estimates of primary revenues for Dade County were developed by the SRD and its consultant, Mel Conner and Associates.(1) This method uses a projection of statewide taxable gasoline sales as its basis. To the portion of gasoline sales that is allocated to the primary fund, other minor sources of revenue are added: then the costs of maintenance, resurfacing, administration, etc. are deducted. The balance is for distribution among Florida counties on the basis of needs, as these needs are perceived by the State Road Department, the State Road Board, the governor, the county commissioners, and perhaps others.

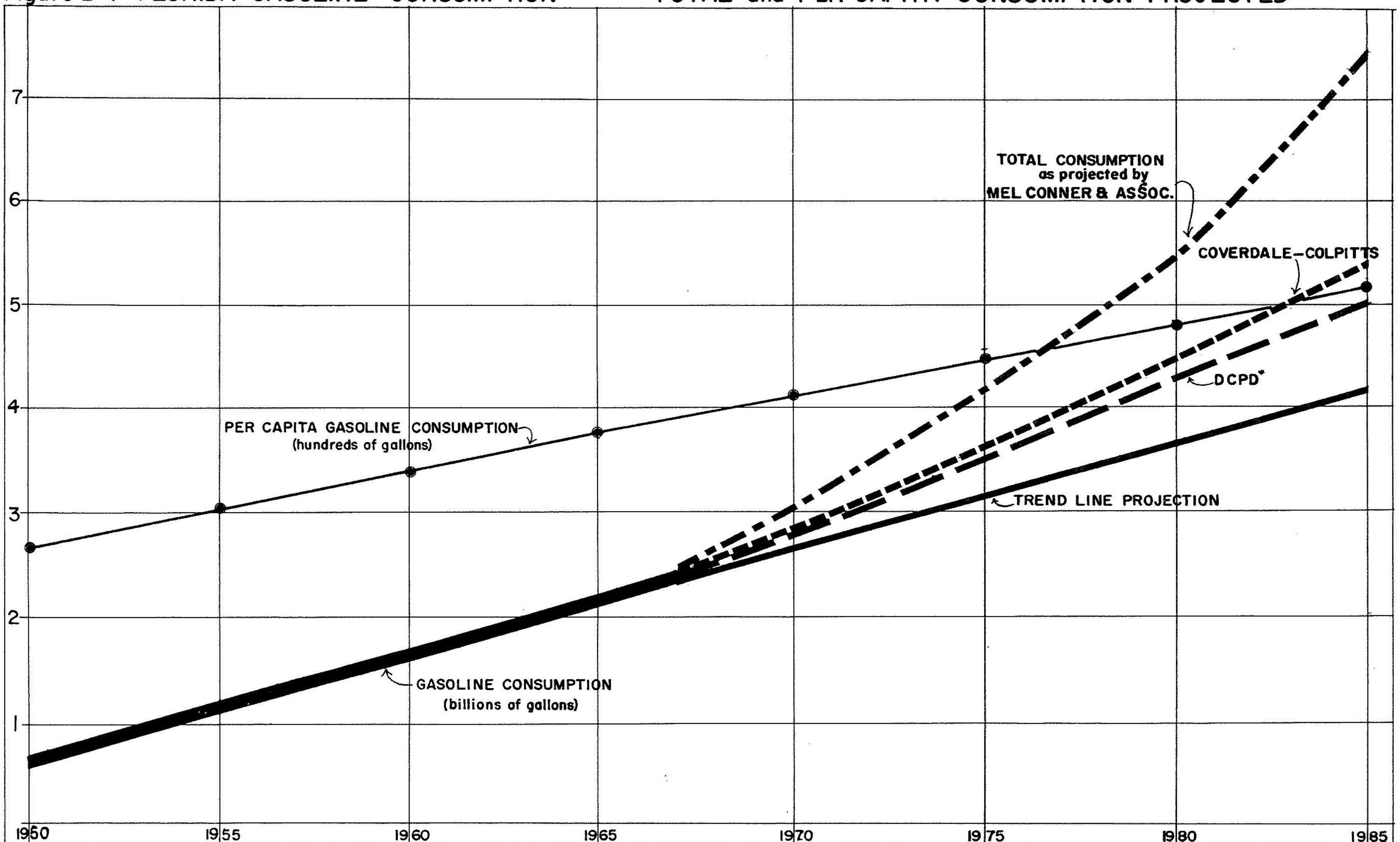
Figure B-1 shows the projections on which the present estimate of Florida's future gasoline sales is based and Table B-3 shows the revenue these sales will produce. This forecast of sales of 5 billion gallons in 1985 is a compromise between two different ways of projecting future sales; 1) a simple trend line projection of past sales, which produces the figure 4.17 billion gallons for the year 1985, and 2) a projection of per capita gasoline consumption. The per capita gasoline consumption for 1985 (520 gallons) was multiplied by the Bureau of Census' high and low projections (10,535,000 and 9,012,000) of Florida's population growth to 1985, producing figures of 5.48 and 4.69 billion gallons respectively. A "middle" population estimate gives 4.88 billion gallons. These estimates are ranged below:

Basis for Estimate	Gas Consumption in 1985
Trend line projection	4.17 billion gallons
Low population estimate x per capita sales	4.68 billion gallons
Middle population estimate x per capita sales	4.88 billion gallons
High population estimate x per capita sales	5.48 billion gallons

Within this range, some latitude exists to permit the exercise of judgment, intuition, or to impart a conservative or optimistic bias to the forecast. The choice of 5.0 billion gallons in 1985 represents a considerable variation from the trend line projection. This optimistic bias rests chiefly on the assumption of a more equitable distribution of income which would undoubtedly cause a large increase in car ownership in what are presently low-income families.

(1) Published as MUATS Technical Memorandum No. 7: Costs and Financing.

Figure B-1 FLORIDA GASOLINE CONSUMPTION —— TOTAL and PER CAPITA CONSUMPTION PROJECTED



*DADE COUNTY PLANNING DEPARTMENT

TABLE B-3

FLORIDA GASOLINE TAX REVENUE PROJECTIONS
1968-1985

Fiscal Year	Total Gasoline Sales (millions) (of gallons)	4¢ Primary Gas Tax Revenue ($ millions)	1¢ Gas Tax Revenue (5th & 6th cents) ($ millions)	1¢ Gas Tax Revenue (7th cent) ($ millions)	Total State Gas Tax Revenue (7¢) ($ millions)
1968	25,700				
1968-69	2,720	108.8	54.4	27.2	190.4
69-70	2,862	114.5	57.2	28.6	200.3
1970-71	3,005	120.2	60.1	30.0	210.3
71-72	3,148	125.9	63.0	31.5	220.4
72-73	3,290	131.6	65.8	32.9	230.3
73-74	3.432	137.3	68.6	34.3	240.2
1974-65	3,575	143.0	71.5	35.8	250.3
Subtotal	22,032	881.3	440.6	220.3	1,542.2
1975-76	3,718	148.7	74.4	37.2	260,3
76-77	3,860	154.4	77.2	38.6	270.2
77-78	4,002	160.1	80.0	40.0	280.1
78-79	4,145	165.8	82.9	41.4	290.1
79-80	4,288	171.5	85.8	42.9	300.2
1980-81	4,430	177.2	88.6	44.3	310.1
81-82	4,572	182.9	91.4	45.7	320.0
82-83	4,715	188.6	94.3	47.2	330.1
83-84	4,858	194.3	97.2	48.6	340.1
1984-85	5,000	200.0	100.0	50.0	350.0
Subtotal	43,588	1,743.5	871.8	435.9	3,051.2
TOTAL	65,620	2,624.8	1,312.4	656.2	4,593.4

Figure B-1 also shows the projection made for the SRD by its consultant, Mel Conner and Associates, and by another engineering firm, Coverdale and Colpitts. The present estimate of anticipated revenues has been made because the Mel Conner projection, on which Technical Report No. 7, The Highway Program: Cost and Financing is based, is not considered to be methodologically defensible for the following reasons:

1. It is assumed by Mel Conner and Associates that the increase in Florida gasoline sales is geometric. A plot of the time series in question shows unequivocally that the increase is arithmetic, i.e., the trend line is linear. (See Figure B-1). The Coverdale-Colpitts estimate errs in the same way, but to a lesser extent, as the rate of increase is lower to begin with and decreases every five years as shown below:

2. The selection of a 6.5% rate of increase to 1975 and 5.5% thereafter is largely arbitary. The time series cited in the Mel Conner and Associates report is shown below:

1957-58	6.6%
1958-59	8.1%
1959-60	4.7%
1960-61	2.4%
1961-62	6.2%
1962-63	4.7%
1963-64	6.3%
1964-65	6.2%
1965-66	2.0%
1966-67	2.7%

The mean for this series is 5.0; the median is 5.5. So far as statistical method is concerned, the mean is a better measure of central tendency than the median, as the median tends to be less stable. For example, if the percentage increase for 1956-57 (8.8) is added to the time series above, the median becomes 6.2%. But if the percentage increase for 1967-68 is added, the median is 4.7%.

3. The deviation from the historical trend line for Florida gasoline sales is justified in the Mel Conner and Associates report on the basis of an impending "social renaissance" in which improved

urban transport will be a major element. It may very well be, as the Mel Conner and Associates report states, that it is "reasonable to assume that urban travel, as a function of the total social trend toward better communications, will increase at a faster rate in the future than has been experienced in recent years." (p. 18). However, it may be highly erroneous to assume that "better communications" necessarily means travel by private auto, or that the increase in this type of movement will deviate radically from the established trend. There are many factors that may reasonably be expected to affect future gasoline sales — some upward and some downward:

a. The rate of future population growth

b. The changing age composition of the population of Florida.

c. The trend toward more restrictive requirements for both drivers and autos.

d. Development of alternatives to the gasoline engine.

e. The trend in the use of small cars that deliver high gasoline mileage.

f. The trend toward two or more cars per family.

g. Effects of the war on poverty on car ownership among low-income families.

h. Effects of increasing congestion on streets and expressways.

i. The trend toward increased emphasis on mass transport, including federal aid.

j. Changing federal housing policy and the trend toward apartment living.

Undoubtedly, there are other factors. But even the above list is sufficient to show that the net effect on the established trend line is uncertain even as to <u>direction</u> — to say nothing of amount. Nevertheless, Mel Conner and Associates insists that its forecast is realistic, basing its defense in the last resort on the contention that "almost undebatable is the fact that new modern expressways and streets generate new travel by the same people, and that this, in turn, generates added revenue from gasoline taxes." (p.18). Undoubtedly, expressways generate some new trips. But they also reduce auto operating costs — especially gasoline consumption, if we can believe the cost-benefit studies that are sometimes used as economic justification of highway construction. To some unknown extent, this reduction in operating costs offsets the increase in trips.

A more important shortcoming of the new-trip-generation assumption stems from the fact that this effect is already reflected in the trend line for gasoline sales. Expressway building in Florida has been going on for quite a few years — in the nation as a whole, even longer.(1) Nationally, per capita motor fuel consumption in recent years does not bear out the Mel Conner and Associates assumption. On the contrary, per capita consumption shows a smaller rate of increase in the expressway era than in previous years. (Table B-4).

Table B-5 shows how the SRD expects that the 4¢ primary tax revenue (Table B-3) will be used in Florida. Column (2), "Other Revenue," is that revenue received by the SRD from vehicle permits, outdoor advertising fees, vehicle overweight penalties, and other minor sources. Column (4) is the SRD's estimate of maintenance costs of the primary network to 1985. Although these costs are presently more than 20% of the total 4¢ gasoline tax revenue, this is considered inadequate. These costs are increased over the years so that maintenance costs are almost 32% of the total 4¢ revenue in 1985. In Column (5), costs of primary resurfacing is shown to amount to 10% of primary funds after all other expense deductions have been made. Column (6), "Off the Top," represents a reserve for special projects such as Disney World and Interama. Column (7) shows the administrative costs of the SRD decreasing from about 20% of total 4¢ primary revenue at present to 15% in 1985(2) Column (11) shows the amounts remaining

(1) One survey of expressway building estimated in 1964 that in 20 major cities 3,043 miles of freeway had been built; at the same time, an additional 1,960 miles were proposed. (Estimates exclude Interstate network, of which 60% was open to traffic in the middle of 1967.) According to this estimate about 3/5 of foreseeable expressway construction in these cities had been completed in 1964. Urban Freeway Development in Twenty Major Cities, Automotive Safety Foundation, 200 King Building, Washington, D. C., August 1964, p. 45.

(2) The SRD is to be commended for its good intentions.

TABLE B-4

UNITED STATES MOTOR FUEL CONSUMPTION

Year	Consumption[1] (millions of gallons)	Per Cent Increase	Population[2] (millions)	Per Capita Consumption	Per Cent Increase Per Capita
1950	40,280		151.9	265.2	
1951	42,951	6.6	154.0	278.9	5.2
1952	45,526	6.0	156.4	291.1	4.4
1953	47,890	5.2	159.0	301.2	3.5
1954	49,636	3.9	161.9	306.6	1.8
1955	53,116	7.0	165.1	321.7	4.9
1956	55,711	4.9	168.1	331.4	3.0
1957	57,443	3.1	171.2	335.5	1.2
1958	59,087	2.9	174.1	339.4	1.2
1959	62,226	5.3	177.1	351.4	3.5
1960	63,714	2.4	180.0	354.0	0.7
1961	65,048	2.1	183.1	355.2	0.3
1962	66,637	2.4	185.9	358.4	0.9
1963	64,516	3.2	188.7	341.9	4.6
1964	67,901	5.2	191.4	354.8	3.8
1965	71,104	4.7	193.8	366.9	3.4

Source: Statistical Abstract of the United States, 1967, U.S. Department of Commerce, Bureau of the Census, pp. 4 and 561.

(1) Total consumption — trucks, busses and autos.
(2) Total resident population, excluding armed forces abroad.

for primary construction. Column (12) shows Dade County's share (18%) as determined by the SRD's 1968 needs study.

Table B-6 is an estimate of the amounts of federal grant-in-aid money that Florida and Dade County may expect to receive between now and 1985. Although the state receives this money in special categories (primary, secondary, urban primary, etc.) no attempt has been made to forecast these categories. It is simply assumed here, on the basis of the SRD 1968 needs study, that Dade will receive 18% of the federal money.

The projected Highway Trust Fund Revenues in Column (1) of Table B-6 are those of the U. S. Department of Transportation, Federal Highway Administration, Bureau of Public Roads.(1) To obtain the Column (2) figures, it was assumed that 5% of the Trust Fund would be used for maintenance and operation of the Interstate system.(2) In Column (3), the existing return factor for Florida was assumed to apply to the entire planning period.

These projections are based on the critical assumption that the federal tax of 4¢ will be continued after Interstate construction is completed — presumably in 1974 or 1975. Existing legislation decrees that the federal gas tax will return to its pre-Interstate level of 1.5¢ per gallon. Furthermore, the AASHO reports recommend and assume that the regular grant-in-aid money that will become available if the federal tax is not reduced in 1975 will all be used for highway construction. In other words, AASHO's conception of a balanced urban transportation system is a projection of the existing situation. In terms of federal aid, this conception of balance allowed $4,400 million for highways and $125 million for mass transport in 1968.

It is probably unrealistic to assume — as has been done in both this report and the SRD report — that the highway officials and other vested highway interests will have it all their way. If the present federal aid estimates and assumptions are correct, the federal aid portion of state highway revenues will become increasingly large. This could be very significant if the federal government should see fit to exercise more influence on the way these and state matching funds are used. Neither the U. S. Department of Transportation nor the U. S. Department of Housing and Urban Development are committed to one form of transportation, as is the case with the Bureau of Public Roads.

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(1) From the AASHO Finance Committee Report of February, 1968.

(2) The original AASHO report of 1967 allowed 10% for Interstate after 1975. The Florida SRD and its consultant reduced the Interstate share to 5% with no explanation.

TABLE B-5

FLORIDA AND DADE COUNTY
FORECAST OF PRIMARY REVENUE AND EXPENDITURES
Fiscal Year 1968-69 through 1984-85
(Millions of Dollars)

(1) Fiscal Year	(2) 4¢ Primary Gas Tax	(3) Other Revenue	(4) Total (1)+(2)	(5) Primary Maintenance	(6) Primary Resurfacing	(7) Off The Top	(8) Administration
1968-69	108.8	6.0	114.6	25.8	5.7	2.0	22.0
1969-70	114.5	6.0	120.5	27.3	6.1	2.0	21.8
1970-71	120.2	6.0	126.2	29.8	6.4	2.0	22.8
1971-72	125.9	6.0	131.9	31.3	6.7	2.0	23.9
1972-73	131.6	7.0	138.6	34.1	6.7	3.0	25.0
1973-74	137.3	7.0	144.3	35.6	7.1	3.0	26.1
1974-75	143.0	7.0	150.0	38.5	7.2	3.0	27.2
Subtotal	881.3	45.0	926.3	222.4	45.9	17.0	168.8
1975-76	148.7	7.0	155.7	40.0	8.3	3.0	25.3
1976-77	154.4	7.0	161.4	43.2	8.5	3.0	26.2
1977-78	160.1	8.0	168.1	44.8	8.7	4.0	27.2
1978-79	165.8	8.0	173.8	48.1	8.9	4.0	28.2
1979-80	171.5	8.0	179.5	49.7	9.2	4.0	29.2
1980-81	177.2	8.0	185.2	53.2	9.6	4.0	26.6
1981-82	182.9	8.0	190.9	54.9	10.0	4.0	27.4
1982-83	188.6	9.0	197.6	58.3	10.1	5.0	28.3
1983-84	194.3	9.0	203.3	60.0	10.4	5.0	29.1
1984-85	200.0	9.0	209.0	63.2	10.6	5.0	30.0
TOTAL	2,624.8	126.0	2,750.8	737.8	140.2	58.0	446.3

TABLE B-5 (contd.)

(1) Fiscal Year	(9) Hazard Locations Etc.	(10) Federal Aid Interstate Matching	(11) Column 3 less Cols. 4,6,7,8,9	(12) Balance Col. 10 less Column 5	(13) Dade County's Share (18% Of Column 11)
1968-69	3.0	5.0	56.8	51.1	9.2
1969-70	3.0	5.0	61.4	55.3	10.0
1970-71	3.0	5.0	63.6	57.2	10.3
1971-72	3.0	5.0	66.7	60.8	10.8
1972-73	4.0	5.0	67.1	60.4	10.8
1973-74	4.0	5.0	70.6	63.5	11.4
1974-75	4.0	5.0	72.3	65.1	11.7
Subtotal	24.0	35.0	457.5	412.6	74.3
1975-76	4.0	-	83.4	75.1	13.5
1976-77	4.0	-	85.0	76.5	13.8
1977-78	5.0	-	87.1	78.4	14.1
1978-79	5.0	-	88.7	79.8	14.4
1979-80	5.0	-	91.6	82.4	14.8
1980-81	5.0	-	96.4	86.8	15.6
1981-82	5.0	-	99.6	89.6	16.1
1982-83	5.0	-	101.0	90.9	16.4
1983-84	5.0	-	104.2	93.8	16.9
1984-85	5.0	-	105.8	95.2	17.1
TOTAL	72.0	35.0	1,401.3	1,261.1	226.9

TABLE B-6
FLORIDA AND DADE COUNTY
ESTIMATE OF TOTAL FEDERAL GRANTS-IN-AID
FOR HIGHWAY IMPROVEMENTS
(Except Interstate)

Fiscal Year	Federal Highway Trust Fund ($ 000)	95% of Total ($ 000)	Fla. Fed. Aid Return Factor = .021030823 x (2) ($ 000)	Federal Aid Revenue to Dade County (18%) ($ 000)
1968-69			18,415	3,072
1969-70			18,415	3,072
1970-71			18,415	3,072
1971-72			18,415	3,072
1972-73			18,415	3,072
1973-74			18,415	3,072
1974-75			18,415	3,072
Subtotal			128,905	21,504
1975-76	5,460,000	5,187,000	109,087	19,636
1976-77	5,590,000	5,310,000	111,674	20,101
1977-78	5,720,000	5,434,000	114,281	20,570
1978-79	5,850,000	5,558,000	116,889	21,040
1979-80	5,980,000	5,681,000	119,476	21,506
1980-81	6,110,000	5,804,000	122,063	21,971
1981-82	6,240,000	5,928,000	124,671	22,441
1982-83	6,500,000	6,052,000	127,378	22,928
1983-64	6,500,000	6,175,000	129,865	23,376
1984-85	6,630,000	6,298,000	142,452	25,641
TOTALS	60,450,000		1,217,836	240,714

In fact, AASHO is admittedly afraid that funds presently earmarked for highway use may in time come to be used partly to finance mass transport, and it would probably be best to view the AASHO reports as the opening salvos in an impending battle between highway and mass transport advocates.(1) Nevertheless, since no counter-proposals to the AASHO recommendations are presently available, they will be used in the present study — as interpreted and modified by the SRD and its consultant — bearing in mind that they impart an upward bias to estimates of federal aid revenue for highways after 1975.

REVENUE FROM SECONDARY GAS TAX

The Fifth and Sixth Cent Tax

Revenue from this tax — also called the second tax — is deposited monthly in the State Road Distribution Fund, which is managed by the State Board od Administration. A new allocation formula has currently gone into effect.(2) This formula increases Dade's share of the secondary fund. It is based on Dade's land area (per cent of state total), the per cent of statewide collections that are contributed by Dade County, and the percentage of the state population residing in Dade. Gasoline sales in Dade County were projected (Figure B-2 and Table B-7) so that Dade's collections could be expressed as a percentage of statewide collections. The collection factor was calculated for each year according to changes in projected collections for the county and the state; the population factor was changed according to county and state population estimates for 1970 and 1980. Projected funds to Dade from this source total $200,689 million to 1985. Eighty percent of this amount is retained by the State Board of Administration to be spent on secondary roads and for

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(1) This is the attitude of the National League of Cities, which is highly critical of the AASHO reports. See Nation's Cities, September, 1967, p. 15.

(2) The Dade County return factor under the new formula is derived as follows (1968-69):

2 parts collection = (2)(0.16058)	=	0.32116
1 part area	=	0.03668
1 part population	=	0.17865
		0.53649

$\frac{0.53649}{4}$ = 0.13412 or 13.412% of the total amount to be distributed from second tax collections.

Source: Dade County Public Works Department

Figure B-2

DADE COUNTY

TAXABLE GASOLINE SALES

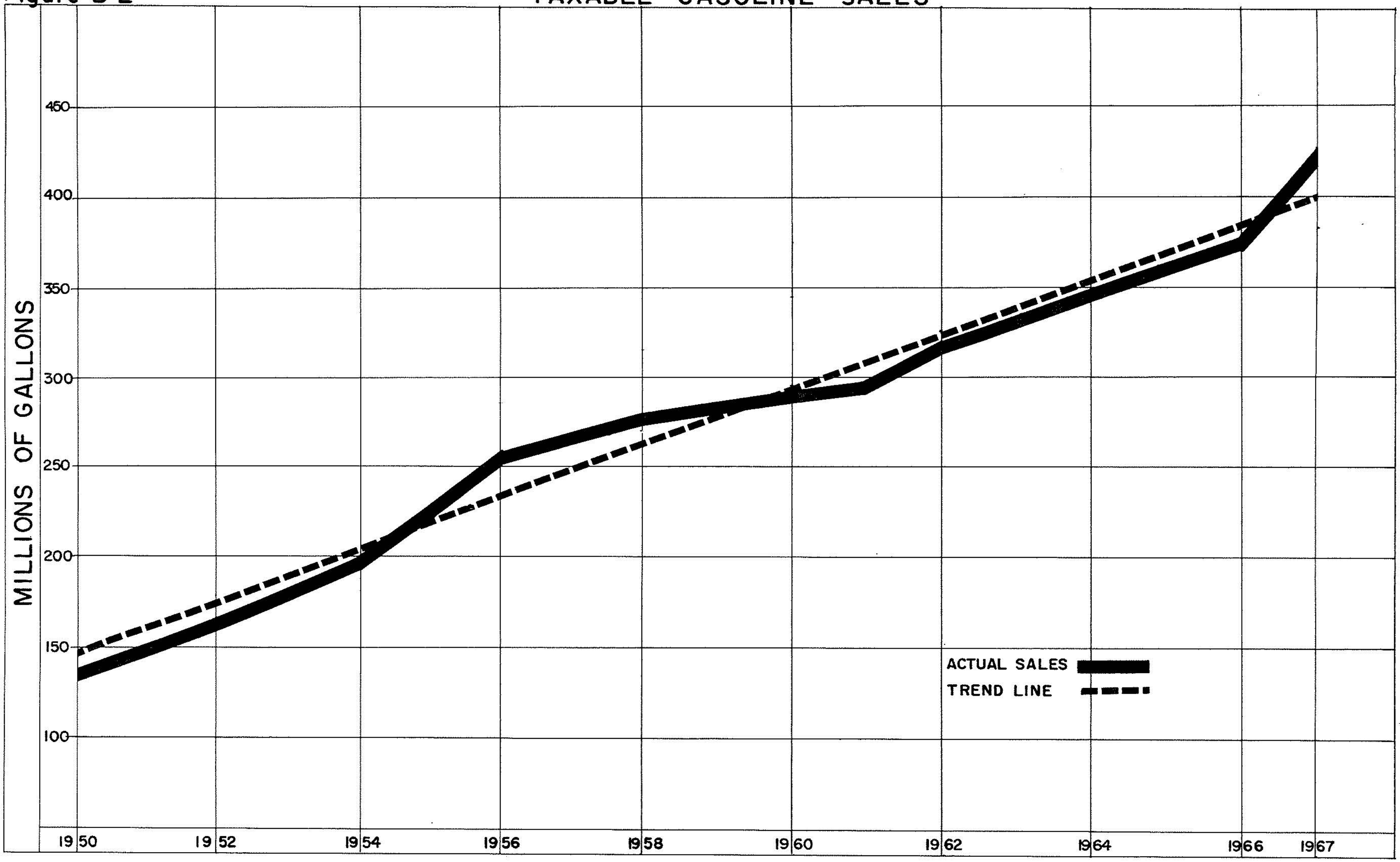

TABLE B-7

DADE COUNTY
PROJECTED TAXABLE GASOLINE CONSUMPTION
AND TOTAL REVENUES TO STATE AND FEDERAL GOVERNMENTS
FROM EXISTING GASOLINE TAX STRUCTURE
(millions of gallons and millions of dollars)

	Annual Sales (millions of gallons)	Federal & State (11¢)	Federal (4¢)	State Primary (4¢)	State Secondary & County (2¢)	State Secondary & County (1¢)
1966	384.5	42.29	15.38	15.38	7.69	3.84
67	399.3	43.92	15.97	15.97	7.99	3.99
68	414.1	45.55	16.56	16.56	8.28	4.14
69	428.9	47.18	17.16	17.16	8.58	4.29
1970	443.7	48.81	17.75	17.75	8.87	4.44
5-yr. Total	2,070.5	227.75	82.82	82.82	41.41	20.70
1971	458.6	50.45	18.34	18.34	9.17	4.59
72	473.4	52.07	18.94	18.94	9.47	4.73
73	488.2	53.70	19.53	19.53	9.76	4.88
74	503.0	55.33	20.12	20.12	10.06	5.03
1975	517.8	56.96	20.71	20.71	10.36	5.18
5-yr. Total	2,441.0	268.51	97.64	97.64	48.82	24.41
1976	532.6	58.59	21.30	21.30	10.65	5.33
77	547.4	60.21	21.90	21.90	10.95	5.47
78	562.2	61.84	22.49	22.49	11.24	5.62
79	577.0	63.47	23.08	23.08	11.54	5.77
1980	591.8	65.10	23.67	23.67	11.84	5.92
5-yr. Total	2,811.0	309.21	112.44	112.44	56.22	28.11
1981	606.6	66.73	24.26	24.26	12.13	6.07
82	621.5	68.37	24.86	24.86	12.43	6.22
83	636.3	69.99	25.45	25.45	12.73	6.36
84	651.1	71.62	26.04	26.04	13.02	6.51
1985	665.9	73.25	26.64	26.64	13.32	6.66
5-yr. Total	3,181.4	349.96	127.26	127.26	63.63	31.81
1986	680.7	74.88	27.23	27.23	13.62	6.81
87	705.5	76.51	27.82	27.82	13.92	6.96
88	720.3	78.14	28.41	28.41	14.22	7.11
Totals	12,610.4	1,384.96	503.62	503.62	251.84	125.91

Table B-7 Explanation

Table B-7 and its projections of gasoline consumption in Dade County and the tax revenues this consumption would generate is a simple trend line projection. The base period is 1950 to 1965. The increase in gasoline consumption during this period plots out in a time series as a linear function with mild deviations from the trend.

This tabulation of gas tax revenues is based on the assumption that both the federal and state taxes on gasoline remain constant; but it can also be used to estimate future revenues assuming various changes in the tax structure. The revenue estimates are in constant dollars; i.e., no attempt has been made to forecast the effects of increases or decreases in the purchasing power of the dollar amounts shown.

As a check on the trend line projection, an independent projection of gas consumption was made on the basis of gasoline consumption per capita and gasoline consumption per registered motor vehicle for the same base period. This method produced an estimated gasoline consumption of 670 million gallons in 1985.

TABLE B-8

DADE COUNTY
FORECAST OF STATE SECONDARD FUNDS
FROM FIFTH AND SIXTH CENT STATE GAS TAX
(New Formula)
($ 000)

Fiscal Year	Statewide Revenue from 2¢ Gas Tax	Formula Factor	Dade County's Share	80% Surplus	20% Surplus	Federal Aid to Secondary
1968-69	54.4	.12975	7,058	5,647	1,411	243
1969-70	57.2	.12861	7,356	5,885	1,471	243
1970-71	60.1	.13174	7,918	6,334	1,584	243
1971-72	63.0	.13078	8,239	6,591	1,648	243
1972-73	65.8	.12992	8,548	6,838	1,710	243
1973-74	68.6	.12898	8,848	7,078	1,770	243
1974-75	71.5	.12824	9,169	7,335	1,834	243
Subtotal	440.6			45,708	11,428	1,701
1975-76	74.4	.12756	9,490	7,592	1,898	1,640
1976-77	77.2	.12694	9,800	7,840	1,960	1,706
1977-78	80.0	.12637	10,110	8,088	2,022	1,775
1978-79	82.9	.12582	10,430	8,344	2,086	1,844
1979-80	85.8	.12531	10,752	8,602	2,150	1,915
1980-81	88.6	.12390	10,978	8,782	2,196	1,988
1981-82	91.4	.12336	11,275	9,020	2,255	2,065
1982-83	94.3	.12294	11,593	9,274	2,319	2,144
1983-84	97.2	.12255	11,912	9,530	2,382	2,224
1984-85	100.0	.12219	12,219	9,775	2,444	2,307
Total	1312.4		165,695	132,555	33,140	21,309

purchase of right-of-way for primary roads[1] — i.e., eighty per cent of the surplus remaining after any outstanding bonds are serviced. Twenty per cent of the surplus goes directly to the county to be spent on county roads and bridges at the discretion of local officials. The 80% portion, referred to as "restricted funds," can be used only by resolution of the county commissioners and may be accumulated. The second tax may be used for primary roads by resolution of the county commissioners; the 80% portion of the seventh cent may be used only for secondary roads.

Estimated revenues from the fifth and sixth cents of the state gasoline tax are shown in Table B-8. Total anticipated revenue from this source is $165,695,000.

The Seventh Cent Tax

This tax, also called the third gas tax, is distributed by the State Board of Administration in accordance with a new formula which gives populous urban areas a larger share than had formerly been the case. It is used in the same way as the second tax, except that it is not used for bond retirement, and is restricted to secondary roads. The formula according to which the seventh cent is distributed is shown below for the years 1968-69:

3 parts collection	= (3)(.15184) =	0.45552
1 part area	=	0.03668
		0.49220

$$\frac{0.49220}{4} = 0.12305$$ or 12.305% of statewide collections from the seventh cent gas tax.

Source: Dade County Public Works Department

The total anticipated revenues of $73,854,000 for Dade County from the seventh cent gas tax are shown in Table B-9.

(1) Dade County is unique among Florida counties in that it contains no part of the state secondary system. As a result, Dade maintains roads which in other counties would be maintained by the state. No one seems to know what the purpose of this arrangement is.

TABLE B-9

DADE COUNTY
FORECAST OF SECONDARY FUNDS
FROM SEVENTH CENT STATE GAS TAX

Fiscal Year	Statewide Revenue From 1¢ Gas Tax	Formula Factor	Dade County's Share	80% Surplus	80% Surplus
1968-69	27.2	.12305	3,347	2,678	669
1969-70	28.6	.12133	3,470	2,776	694
1970-71	30.0	.11974	3,592	2,874	718
1971-72	31.5	.11829	3,726	2,981	745
1972-73	32.9	.11700	3,849	3,079	770
1973-74	34.3	.11560	3,965	3,172	793
1974-75	35.8	.11448	4,098	3,278	820
Subtotal	220.3			20,838	5,209
1975-76	37.2	.11346	4,221	3,377	844
1976-77	38.6	.11254	4,344	3,475	869
1977-78	40.0	.11168	4,467	3,574	893
1978-79	41.4	.11086	4,590	3,672	918
1979-80	42.9	.11009	4,723	3,778	945
1980-81	44.3	.10939	4,846	3,877	969
1981-82	45.7	.10858	4,962	3,970	992
1982-83	47.2	.10795	5,095	4,076	1,019
1983-84	48.6	.10736	5,218	4,174	1,044
1984-85	50.0	.10682	5,341	4,273	1,068
TOTAL	656.2		73,854	59,684	14,770

DADE COUNTY
SUMMARY OF PROJECTED
GASOLINE TAX REVENUE
($millions)

Primary (4¢) gas tax		226.9	
Total federal aid		240.7	
Secondary taxes			
Fifth and sixth cents	(80%)	132.6	
Fifth and sixth cents	(20%)		34.9
Seventh cent	(80%)	59.1	
Seventh cent	(20%)		14.8
Subtotals		659.3	49.7
Applicable to MUATS		.97	
Study Area (97%)		639.5	

None of these estimates is strictly comparable with the SRD estimate of total revenue from existing sources. The subtotal which excludes the portions that will be returned directly to Dade County comes the closest to being comparable with the SRD estimate of $742.5 million. However, the Dade County Planning Department estimate was made using the new formula for distribution of the fifth and sixth cents of the state gasoline tax. This new formula will increase Dade's share by about $60 million over what it would have been with the old formula. To be comparable with the SRD estimate, the Dade County Planning Department estimate would have to be reduced by this amount. The comparable revenue estimates would then be as follows:

State Road Department		$745.2 million
Dade County Planning Department	633.8	
less	60.0	
		$579.5 million
Difference		$165.7 million

Strictly speaking, neither estimate is made entirely on the basis of existing revenue sources. In both estimates, it is considered highly improbable that the federal tax will actually be reduced when the Interstate network is completed. If this assumption should prove to be incorrect and the six-fold increase in federal aid to Dade County in 1975 (Table B-6) does not materialize, then both estimates would be grievously in error.

APPENDIX C

LIST OF MUATS REPORTS

The following is a list of background reports to be published as part of the Miami Urban Area Transportation Study:

Study Design for Miami Urban Area Transportation Study

Economic, Population and Land Use Projections

Community Attitudes for Transportation Planning

Laws and Ordinances

Goals for Transportation

Implementation of the Plan

Continuing Program for Transportation Planning

Commercial Model Development

Transit Cost Allocation Model Development

Present Transit Service

Corridors for Transit Improvement

Route, System, Design and Cost Estimates

Forms of Mass Transportation

Evaluation of Alternate Transit Plans

Street and Highway Master Plan

Transit Master Plan

Airport Master Plan

Terminal Facilities Master Plan

Seaports Master Plan

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CONTINUING PROGRAM FOR TRANSPORTATION PLANNING

MIAMI URBAN AREA TRANSPORTATION STUDY

METROPOLITAN DADE COUNTY, FLORIDA

transportation

CONTINUING TRANSPORTATION PLANNING PROGRAM

Prepared By

The Metropolitan Dade County Planning Department for
the Miami Urban Area Transportation Study
702 Justice Building
1351 N.W. 12th Street
Miami, Florida 33125

October 1968

The preparation of this report was financed in part through an urban planning grant from the Department of Housing and Urban Development, under the provisions of Section 701 of the Housing Act of 1954, as amended.

TABLE OF CONTENTS

TABLES

INTRODUCTION

The Continuing Planning Process for the Miami Urban Area Transportation Study is aimed at the analysis of the dynamic changes taking place in Metropolitan Dade County. This is necessary for evaluating the actual balance between the transportation needs of the residents of Dade County and the leval of service provided by the transportation system at any given time. The Continuing Planning Process will be carried out by a joint program involving County, State and Federal governments with the active participation of the metropolitan community.

SCOPE OF THE PROGRAM

The Continuing Program will be tied to the planning program and to other County programs. The General Land Use Master Plan will provide the frame of reference for the Continuing Program. The objectives of the Continuing Program are:

1. To review and evaluate the goals, objectives and policies of land use and transportation process and plans.
2. To monitor and analyze social and economic changes.
3. To monitor and evaluate transportation changes.
4. To monitor and evaluate land use changes.

5. To revise and update the transportation and land use planning process and plans.

6. To promote and serve community participation in the planning process.

The program presented in this report will provide the means for achieving these objectives. The main criteria used in designing these activities has been the use of existing administrative and financial structures of all the agencies participating to avoid the need for new legislation and to achieve the most efficient use of all resources.

ORGANIZATIONAL STRUCTURE

The Continuing Program will be guided by a Policy Committee. It will receive advise from a Technical Committee and will cooperate with different Federal Departments and Agencies. The program will have a Director, a Deputy Director and a Technical Coordinating Committee acting as an executive secretariat. All cooperating departments will provide the technical staff required for carrying out the work program. The following is a brief explaination of each part of the organization.

POLICY COMMITTEE

The function of this Committee is to establish the policies of the program activities and to guide the over-all program. This Committee will consist of the County Manager (or his representative) as permanent chairman and the Director of each County and State agency contributing to the cost of the study. Representatives of the Federal government will be ex-officio and will have no voting functions.

TECHNICAL ADVISORY COMMITTEE

The Technical Advisory Committee will be instrumental in assessing public reaction to the program activities and in securing full utilization of the data developed by the study. It will advise the Director and the Policy Committee on the operation of the program.

This Committee will be large, and in order to achieve efficient operations, it will be divided into six sub-committees that will deal with specific problems. These sub-committees are:

1. Sub-committee on Streets and Highways
2. Sub-committee on Public Transit
3. Sub-committee on Terminal Facilities
4. Sub-committee on Social Change
5. Sub-committee on Land Use Change
6. Sub-committee on Economic Growth

The responsibilities, structure and membership of each sub-committee will be decided by the Policy Committee, which will act upon recommendations from the entire Technical Advisory Committee.

The Technical Advisory Committee will be made up of members of all contributing agencies, as is the Policy Committee. Other members will be the representatives of city departments of planning and traffic, civic groups and others who might be instrumental in insuring the success of the program.

<u>Program Director</u>

The Program Director will have general responsibility for the entire program. He will also assume the position of Director of some of the participating agencies.

<u>Assistant Director</u>

The Assistant Director will be responsible for the administration of the study, and will assist the Director in his work.

<u>Technical Coordinating Committee</u>

This Committee will be made up of five members, with one representative coming from each of the following offices: Dade County Traffic and Transportation; Dade County Public Works; Dade County Planning Department;

Dade County Metropolitan Transit Authority; and the Florida State Road Department. The Director of the program will be the Chairman of this Committee. The main task of this Committee is to coordinate the work and responsibilities of all agencies. It will be a "working committee" that will not participate in policy decisions.

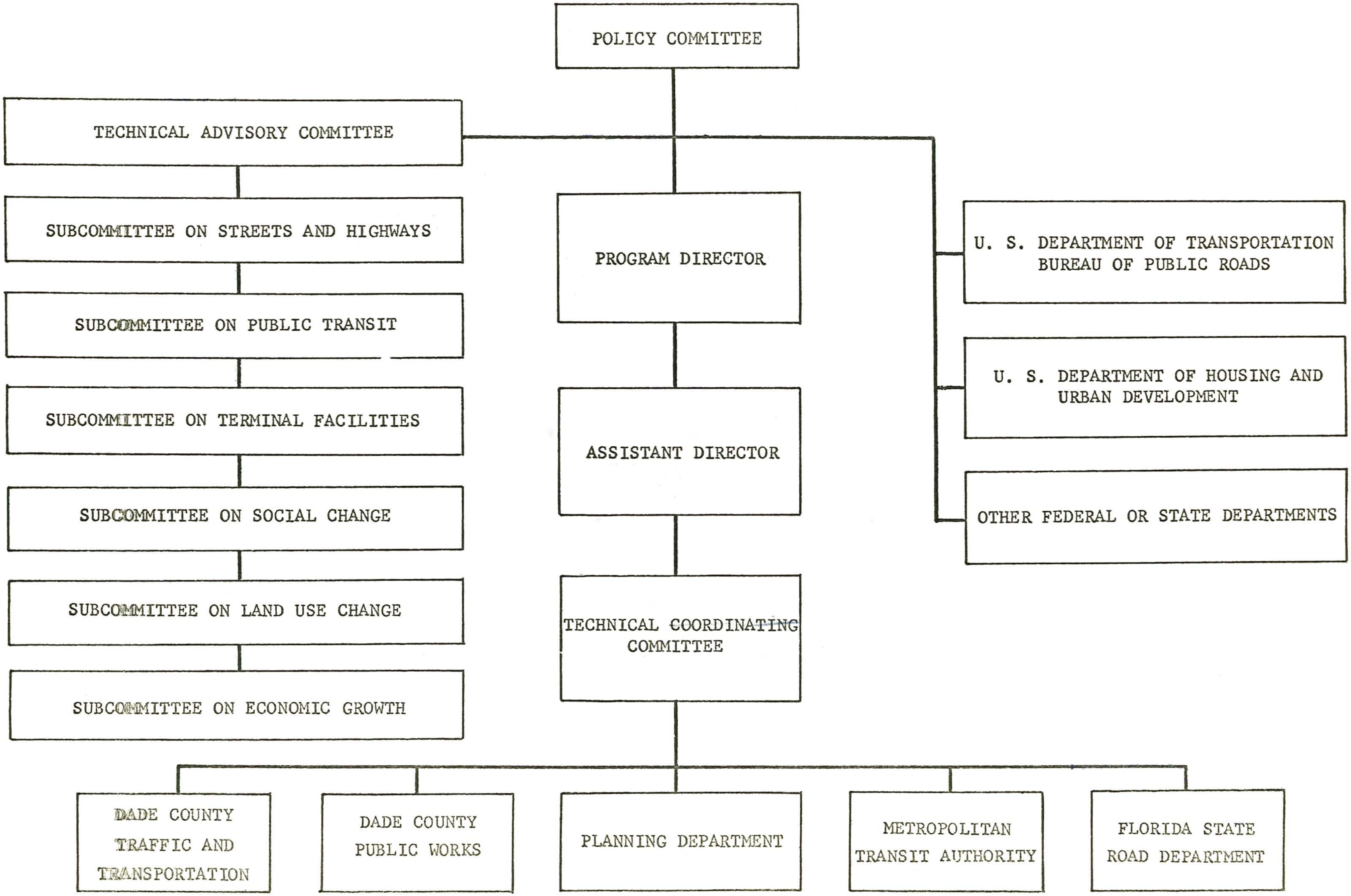
FUNCTIONAL AND FINANCIAL RESPONSIBILITIES

A study of the financial program is not covered because of the limited purpose of this report, which is to obtain the reaction of the various agencies participating in the transportation study. Also, the availability of Federal funds is not known at this time. The functional responsibilities of each agency are presented on pages 9 - 12 and summarized in tables 1 and 2.

The agencies cooperating in the program will prepare and submit annual work programs to the Technical Advisory Committee and Policy Committee. Both Committees will discuss and evaluate the annual program, making recommendations for change or approval to the participating agencies. During the first year of the program, all the work will be performed by the agency staffs or by consultants.

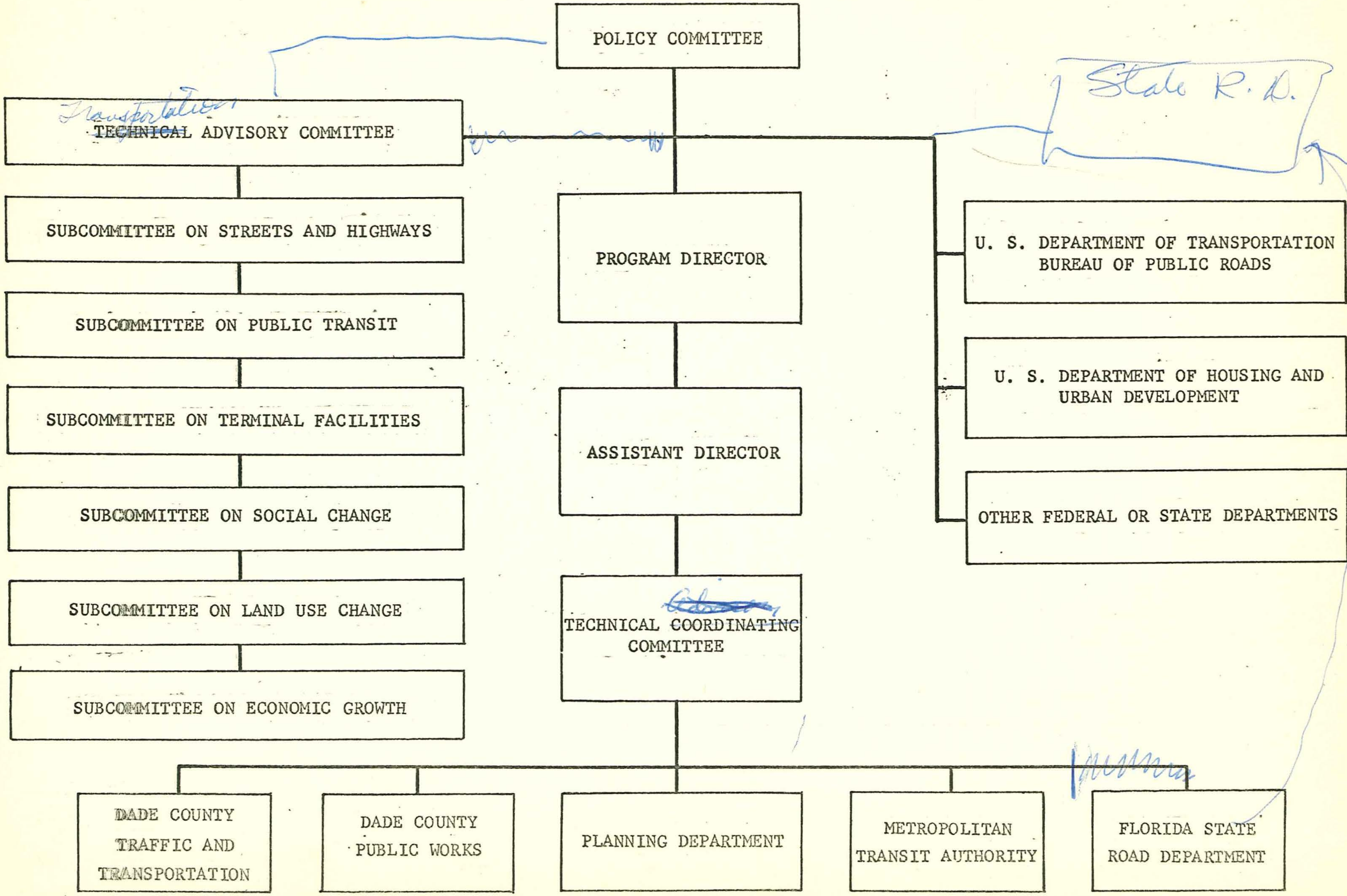
MIAMI URBAN AREA TRANSPORTATION STUDY

ORGANIZATION OF THE CONTINUING TRANSPORTATION AND LAND USE PLANNING PROGRAM



MIAMI URBAN AREA TRANSPORTATION STUDY

ORGANIZATION OF THE CONTINUING TRANSPORTATION AND LAND USE PLANNING PROGRAM



CONTINUING PROGRAM IMPLEMENTATION

The activities of this program are classified in three groups:

1. Monitoring and evaluating basic data used as inputs for the projecting models
2. Producing new projections by application of existing or new models
3. Evaluating the planning process and adopted plans as they relate to changing conditions

MONITORING AND EVALUATING BASIC DATA

This section is summarized in Table 2 . The following is a brief explaination of the activities to be performed as part of the Continuing Planning Program.

Transportation

There are three activities in the area of transportation that will be covered by the Continuing Program. They are the updating of the origin and destination data, changes in system characteristics and changes in systems operations.

Origin and destination data. This process is designed to provide a detailed inventory of the changes in travel patterns in Dade County. Permanent traffic counters for the continuous monitoring of metropolitan traffic growth will be installed at master control stations located along the screen lines defined by the Miami Urban Area Transportation Study. Origin and Destination information will

Table____. Monitoring and Evaluating Metropolitan Changes
Continuing Planning Program, Dade County

Activity	Department in Charge	Frequency of Technical Reports
TRANSPORTATION		
Origin and Destination Data		
Person Movements	DCDOTT	Annually/5 years
Goods Movements	DCDOTT	Annually/5 years
System Characteristics		
Transit	MTA	Annually
Highway	DCDPW/FSRD	Annually
Terminal	DCDOTT/DCPD	Annually
System Operations		
Transit	MTA	Annually
Highway	DCDOTT/FSRD	Annually
Terminal	DCDOTT/DCPD	Annually
ECONOMICS		
Employment		
Growth	DCPD	Annually
Shift Patterns	DCPD	Annually
Income		
Changes	DCPD	Annually
Shifts in Patterns	DCPD	Every 5 years
SOCIAL		
Population		
Growth	DCPD	Annually
Shifts	DCPD	Annually
Living Patterns		
Social Mobility	DCPD	Annually/5 years
Leisure Time	DCPD	Annually/5 years
Recreation	DCPD	Annually/5 years
Attitudes and Values		
Metropolitan Area	DCPD	Every 5 years
Selected Areas	DCPD	Annually
LAND USE		
New Developments		
Subdivisions	DCPD	Annually
Zoning Activities	DCPD	Annually
Building Permits	DCPD	Annually
LEGAL AND ~~FINANCIAL~~ Legislative		
Administration Procedures	DCDOTT/DCPD	5 years
Legal Studies	DCLD/ DCDOTT/FSRD	5 years
~~Financing~~	All agencies	Annually/5years

FINANCIAL

11 8

be collected periodically at these stations, using post card surveys or similar information-gathering techniques. This information will be used in the calibration of traffic generation and distribution procedures.

The new Department of Traffic and Transportation, working together with the Planning Department and the State Road Department, will prepare a specific and detailed Work Program for these activities. The Metropolitan Transit Authority will produce similar data related to public transit service.

The Department of Traffic and Transportation will publish two types of reports. Once a year, it will present the data needed for annual programming, and every five years data for an overall evaluation will be gathered and analyzed.

Changes in system characteristics. This activity is designed to keep an up-to-date inventory of highway facilities, including changes in design standards and priorities in design and construction. This work will be performed by the Dade County Public Works Department in cooperation with other agencies in the highways and terminal part. The Metropolitan Transit Authority will prepare similar information related to transit operations.

The Public Works Department keeps records of the engineering and construction programs of the County. The same type of basic data produced today will be utilized in updating the inventories.

The final output of this part of the Continuing Program will be two reports, based on Public Works and Metropolitan Transit Authority programs. They will be published every year, and will evaluate the changes in both systems.

Changes in systems operations. Among the data collected are traffic volume counts at selected points. By recording the changes in traffic volumes, the daily flow data can be compared with the projected data for seasonal variations. Similar data will be collected and analyzed by the Metropolitan Transit Authority. The Department of Traffic and Transportation, in cooperation with the Florida State Road Department, will produce annually a report containing the findings of the highway part.

Economics

The Dade County Planning Department receives and analyzes substantial amounts of information on the economic activities of the County. This program will be expanded and re-designed to produce the data needed for the evaluation of metropolitan transportation in Dade County. Every year the Planning Department will publish a report of basic economic data and every five years a complete analysis of changing economic patterns will be presented. Information to be collected and analyzed will be changes in employment and income, and changes and shifts in employment and income patterns.

Social

The Dade County Planning Department is now preparing annual reports on population changes. This activity will be expanded to cover the needs of the Continuing Program. This expansion will take the form of an annual report detailing the social inputs for use in transportation study models. The information to be collected and analyzed will be: population growth and shifts; living patterns; social mobility; leisure time; recreation; and community attitudes and values as they relate to the entire metropolitan area or selected areas.

Land Use

The information now being prepared by the Planning Department will be expanded and elaborated according to the needs of the transportation study. Information to be collected and analyzed will be subdivision characteristics, zoning activities and construction and demolition permits.

The final output will be an up-to-date land use map with accompanying background information.

Legal and Financial

This part of the program is closely tied to the administrative procedures of the county and the State. The outcome of this will be a report on the effectiveness of the whole range of legal and financial procedures in Dade County. The main activities to be considered will be administrative procedures, legal studies and financing.

PRODUCTION OF NEW PROJECTIONS

Calibration of Existing Forecasting Models

This activity will require a highly technical analysis of the forecasting procedures which periodically evaluate the effectiveness of the models. It is assumed that every year or two, the existing models will be calibrated according to the actual data collected. Every five years the Continuing Program will consider the need for preparing new models after evaluating existing ones. Preparation of this program will be a joint effort of the Dade County Planning Department, the Dade County Department of Traffic and Transportation, the Florida State Road Department, and the Dade County Department of Public Works. This activity is summarized in Table 3 on page 13.

Table_____ Producing of new projections
Continuing Planning Program, Dade County

Activity	Department in Charge	Frequency of Technical Reports
Calibrating Forecasting Models	DCPD, DCDOTT FSRD	annually/5 years
Development of New Models	DCPD, DCDOTT FSRD	5 years
Testing Alternates Developments	DCPD, DCDOTT FSRD, DCDPW	5 years or less

Table_____. Evaluating Plans and Planning Process
Continuing Planning Program, Dade County

Activity	Department in Charge	Frequency of Technical Reports
Evaluation of the Planning Process	All Agencies Participating	Every 5 years (partial reports any time)
Evaluation of Approved Plans	All Agencies Participating	Every 5 years (partial reports any time)

Development of new models during the first year of the Continuing Program will be limited to the development of a residential model to be used as a tool for evaluating the projected land uses and the potential impact of the unpredicted changes in Dade County. The model will be developed by a consultant, with the cooperation of all agencies participating in the transportation study.

<u>Testing of Alternate Developments</u>

This program is designed to test alternate developments in local areas using the information prepared by the Miami Urban Area Transportation Study. This will imply the use of computers in the evaluation of the impact of those land use changes on the approved transportation plan or changes in the priorities of the plan.

EVALUATING THE PLANNING PROCESS AND THE ADOPTED PLANS

Dade County will develop a unique approach to the evaluation of plans. The major emphasis of the program will be placed on the analysis of the effectiveness of the planning process in achieving the goals and objectives of our community.

This activity will consist of two parts; evaluation of the planning process and evaluation of the approved plans. This evaluation will produce a major report every five years, and eventually, specific reports on selected topics based on local needs.

Metropolitan Dade County has a continuous planning program in operation which is aimed at the preparation and enforcement of comprehensive plans for the development of the county. The General Land Use Master Plan, officially adopted by the Planning Advisory Board on October 28, 1965 and approved by the Board of County Commissioners November 30, 1965, was designated a part of this continuous program. The ordinance creating the Planning Department and the Planning Advisory Board states that the General Land Use Master Plan shall be reviewed "as often as desirable, but at least once a year," and that the plan must be completely re-evaluated and updated every five years.

Metropolitan Dade County will integrate the Continuing Program of the transportation study with this continuous planning program so that all the available resources may be utilized in the most efficient way. This will help to improve the quality of the planning services available to the county.

Specifically, the major updating and adjustment of the transportation plan will coincide with the review and evaluation of the General Land Use Master Plan. Basic data for both programs will be similar and the final output of these continuing programs will be revised and updated transportation plans and land use plans.

THE ROLE OF INFORMATION

The Miami Urban Area Transportation Study has produced a large volume of technical data that can be used in many ways by the public. The Continuing Program will update and complement this material and will provide another important service to the community by making it possible to document economic, social and physical trends in Dade County. This service will not be limited to reports and maps. It will also take the form of staff time in answering information requests on different subjects and preparing special reports on specific subjects.

A newsletter will report monthly on the staff activity of the Miami Urban Area Transportation Study and its contributing agencies. A technical journal, to be published at regular intervals, will deal with various technical and administrative aspects of the study. In addition to the dissemination of information related to the study, these publications will have the added value of assisting in the recruitment of the caliber of professionals desired for the Miami program through their wide distribution.

Special reports will also be issued from time to time consisting of manuals, interim reports, reports on selected topics, and reports on local areas of Dade County as they relate to the transportation planning process. All the information produced by the Miami Urban Area Transportation Study and the Continuing Program will be kept in an accessible location and form, preferably in the Dade County Data Processing Department.

TENTATIVE SCHEDULE FOR THE PROGRAM

Table 4 on page 18 shows a tentative schedule by years for the activities of the Continuing Program.

According to the new techniques adopted by the U.S. Department of the Census, there will be a substantial amount of data available in the form of block statistics, making it possible to update the 550 traffic zone characteristics. It will probably be necessary to complement census data with some sampling ofspecific data not included in the census.

TABLE - MIAMI URBAN AREA TRANSPORTATION STUDY

CONTINUING TRANSPORTATION PLANNING PROGRAM - DADE COUNTY

ACTIVITY		YEAR 1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985
1. Monitoring and Evaluating																		
Transportation	Origin and Destination									▲					▲			
	System Characteristics	●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
	System Operations	●	●	●		●	●	●	●		●	●	●	●		●	●	●
Economics	Employment	●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
	Income	■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
Social	Population	●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
	Living Patterns	■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
	Attitudes and Values	■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
Land Use	New Development	●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
	Zoning	●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
	Building Permits	●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
Legal and Financial																		
	Administration Procedures	●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
	Legal Studies	■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
	Financing	■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
Producing of New Projections																		
Calibration of Forecasting Models		■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
Development of New Models		▲	■	■	▲	■				▲					▲			
Testing of Alternates Development			■															
3. Evaluating Plans and Planning Process																		
Evaluation of the Planning Process		■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
Evaluation of Approved Plans					▲					▲					▲			
4. Continuing Information Service																		
Reports on the program regular activities		●	●	●	▲	●	●	●	●	▲	●	●	●	●	▲	●	●	●
Special reports on selected topics		■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■
Information Requests		■	■	■	▲	■	■	■	■	▲	■	■	■	■	▲	■	■	■

● full report including all the activities; it is countywide

■ report on some aspects of the activity and/or related to some local areas in Dade County

▲ full report, including analysis and recommendations of all activities; it is countywide

APPENDIX

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
BUREAU OF PUBLIC ROADS
WASHINGTON, D.C. 20591

May 3, 1968

INSTRUCTIONAL MEMORANDUM 50-4-68
33-30

SUBJECT: Operations Plans for "Continuing" Urban Transportation Planning

This memorandum is designed to provide for uniformity in the interpretation of the "continuing" requirements of Section 134, Title 23 USC. In addition it supplements paragraph 4c of PPM 50-9 dated June 21, 1967. It requires that every urban transportation study prepare an operations plan for continuing transportation planning.

A continuing transportation planning process must be responsive to the needs of the local area and to the changes occurring in the area. Current, valid data concerning land use, travel, and transportation facilities should be maintained to allow revision and reevaluation of the transportation plan as conditions change from those initially analyzed and forecast.

In order to assure that all urban studies are making effective plans for continuing transportation planning in their respective areas, a continuing operations plan should be prepared by each study. This operations plan should be sufficiently comprehensive to delineate the tasks, organizations, and financing necessary to carry the continuing program forward. Each plan should include the following items:

a. An outline of the organizational structure for performing continuing planning, including related committees.

b. An outline of the scope of the continuing planning, with a breakdown of the functional and financial responsibilities of all participating agencies.

c. A description of the surveillance methodology to be employed in identifying changes in land development and travel demand, including assignment of responsibility for providing inputs to the various models.

d. A description of the land use and travel forecasting procedures to be utilized, including specific information required for the various analyses.

e. A description of any work remaining to be completed on the ten basic elements (PPM 50-9 paragraph 5) including a schedule for completion of the work.

The operations plan should be developed cooperatively and should have the explicit approval of the appropriate committees in the local study organization.

Because of the many variations in organizational structure, financing, size, procedures utilized, and availability of secondary data, no attempt is being made to specify in detail the requirements of an approved continuing operations plan. Rather, attached is a general outline which describes five elements which should be incorporated into all plans. These guidelines should not be taken to be all inclusive. Each study is encouraged to carefully examine its specific planning process and to adapt and innovate in preparing the plan.

All studies now in the continuing phase or about to enter the continuing phase should submit their continuing operations plan for review and approval within four months of the date of issuance of this memorandum. In the future, all studies will be required to have an approved continuing operations plan before they can be considered to be in the continuing phase.

The operations plans should be submitted by the State highway departments to the appropriate Bureau of Public Roads division office. The plans should be reviewed by the division and regional offices and then submitted to the Washington office for comment prior to approval action by the regional office. If from time to time significant changes in study operations occur or are contemplated, a revised operations plan should be prepared and submitted to Public Roads.

F. C. Turner

F. C. Turner
Director of Public Roads

Enclosure

Guidelines Supplementing
IM 50-4-68

April 1968

These guidelines identify the five elements that are essential to a continuing planning process.

1. Surveillance.--The maintenance of land use, socio-economic data, and transportation system characteristics on a current basis is necessary to properly compare and evaluate the existing conditions in relation to the forecasts made in developing the recommended plans and programs and to determine if the assumptions made previously are holding over time. The identification of the magnitude and location of growth by zone, district, census tract, or other analysis areas that can be readily translated to the zones utilized for transportation system analysis should be inherent in any evaluation of change. Each study should develop current estimates of growth annually. These might include, for example, population, employment, or other socio-economic changes by analysis area. To the maximum extent possible, surveillance procedures should be tied into existing administrative records such as building permits, school enrollment, new utility hookups, etc.

Direct indications of traffic growth should be determined from a traffic counting program that provides vehicle-miles of travel by functional system and area and from transit usage data. Changes in the transportation system characteristics should be identified to the degree necessary to evaluate their effect. Some of these changes would include traveltime, accident rates, capacity, level of service provided, additional road mileage, parking supply in critical areas, etc.

Changes in land development policy should be identified in the detail necessary to evaluate their effect upon the future plans. These changes could be identified by recording new zoning ordinances, approved changes in existing ordinances, major zoning variances, new utility installations, transportation improvement projects, flood control, land reclamation projects, etc.

Other actions taken by local, State, and Federal government and major private developers should be identified so that their effect can also be evaluated. These actions could include the approval of urban renewal projects, public housing, major subdivisions or industrial parks, water and sewer programs, open space, and transit grants, and the action of local jurisdictions on the adoption of the plan.

2. Reappraisal.--Reappraisal is the systematic sequence of activities directed at maintaining the planning process as a valid and effective regional program. Since some elements of the process require more frequent review than others, reappraisal is carried on at three levels of intensity; namely, Level 1 (Routine Review), Level 2 (Major Review), and Level 3 (Plan Reevaluation).

A. Level 1 - Routine Review

The annual surveillance program should provide for determining if the changes in urban development are in accordance with the forecasts. If land use changes differ significantly from the forecast, and traffic figures are needed for planning and design, the revised land use should be used to estimate trip ends in the area affected to get a better measure of the impact of the changes on the transportation system. If the transportation impact is significant, the forecast of land use should be updated as a basis for developing new traffic estimates for project planning.

It is recommended that every study have a short range (5 year) program of improvements that is updated on an annual basis.

B. Level 2 - Major Review

Based on the results of a Level 1 review, a more major review of the plan may be indicated. In any event, transportation plans should undergo major review every 5 years, and at that time the target year should be pushed forward so the planning process can produce 20-year design data at all times. In order to maintain the minimum 20-year design period, it is suggested that a target year of 25 years be utilized at the beginning of the planning period. This work should also include an evaluation of the ability of the entire travel forecasting process to simulate actual travel. As a minimum, synthetic trips developed from current trip estimates should be assigned to a current network with the assigned volumes being compared to ground counts. If inconsistencies occur, it may be necessary to collect new travel data to recalibrate or revise the forecasting models. Application of the revised trip desires to the previously adopted system may indicate that a new network analysis is necessary.

The major review process should be carried through an updating of the priority program listing.

C. Level 3 - Plan Reevaluation

When significant changes in technology, taxing powers, growth assumptions or distribution policy of public funds occur, a full reexamination of the transportation and land use plans should be made. In any event, the reevaluation should be made at least every 10 years.

This reevaluation of the plan should include all the elements of the major review process plus a reconsideration of the planning goals and objectives; a review of the population, employment, and economic forecasts; a full network reanalysis including a reexamination of the role assumed for mass transit; the examination of relationships between parking and land use densities; and a restudy of the financial resources available to finance the needed improvements and an extension of the priority program of projects. This reevaluation of system and program would include the examination and updating of the technical procedures being used in light of the continually evolving transportation and land use planning technology.

3. Service.--One of the main objectives of the urban transportation planning process is the development of the ability to provide needed planning data and assistance to those responsible for plan implementation. The output derived from the planning forecasts and analyses has limited value until applied to the decision making process. The service function should not be limited to the study participants but should also include the other public and private sectors involved in community development and implementation programs.

Such services might include: Supplying current and forecast socio-economic, land use, and traffic data; preparation and updating of maps; publicizing study recommendations; detailed analysis of various elements of the recommended plan; assistance in the development of State and Federal needs estimates; assistance to operating agencies responsible for implementing various proposals; and evaluation of alternative development plans that may be proposed from time to time. The true effectiveness of the planning process will ultimately be measured by the extent of its contribution to proper project selection and design.

4. Procedural development.--New techniques must be developed for both transportation and land use planning if better estimates of future conditions are to be developed. While it would be desirable for every study to invest in the development of new procedures, the limitations of manpower and staff are realized. It is, therefore, recommended that each State undertake a research program on urban planning techniques and urban growth patterns in at least one urbanized area.

Every urban study should keep continually abreast of new analysis techniques and should make every effort to upgrade the quality of its process by incorporating new or improved procedures as they are developed.

5. Annual report.--The continuing transportation planning process should not be limited to technicians and to technical and policy committee members. The entire process should be given exposure to demonstrate that the process is truly taking place and also to justify to the local citizens the continual expenditure of public funds.

The report should include a quantitative summary of all surveillance items but more importantly it should summarize the degree to which the process has been successful. This can be accomplished through several analyses. First, what has been the progress in implementing the recommended transportation plan? What construction has taken place that is not in accordance with the plan? Is land development occurring in a pattern that is consistent with the land use plan? The answers to all these questions then lead to a reexamination of the transportation and land use plans and also of the steps taken to implement these plans.

In order to help coordinate private development with the construction of transportation improvements, it is suggested that each study consider using the annual report as a means of publishing the short range (5 year) improvement program.

DRAFT

Continuing Transportation Planning Program

The proposed program is based on the requirements defined by the Bureau of Public Roads (instructional Memorandum 50-4-68, May 3, 1968).

The Bureau of Public Roads recommend that the following items "should be included in each continuing program."

a. Outline of the organizational structure. The outline that we present is substantially different from the Florida State Road Department proposal. Our structure is centralized in Dade County. The Policy Committee is larger that in MUATS and the TAC has a variety of functions that can be achieved through the work of various subcommittees.

The creation of one Director for the program and one assistant director will simplify the problem of coordination among participating agencies.

b. Outline of the scope of the program. It is presented in general terms. The financial responsibilities are not presented, mainly because the participation of BPD was not known at the time of ~~[illegible]~~ writing this report.

c. Description of surveillance methodology. A summary of method and procedures is presented, based on the experience of other metropolitan areas.

d. Description of land use and travel forecasting procedures. The program is considering the development of a Residential Model as a first step, and this will be part of the forecasting methods.

e. Description of the work remaining on the ten basic elements (PPM 50-9 paragraph-5). This refers to the MUATS Program. It is not necessary to include this schedule because the work-program is almost completed.

Besides this five items, BPR place strong emphasis on the cooperation among agencies. The propose program for Dade County is a cooperative ~~and~~ venture. The three Committees, Policy, Advisory and Coordinating, will help in the efficient use of liviable resources and in the implementation of the Transportation Plan.

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COMMERCIAL MODEL DEVELOPMENT FOR TRANSPORTATION PLANNING

MIAMI URBAN AREA TRANSPORTATION STUDY
METROPOLITAN DADE COUNTY, FLORIDA

8

transportation

TITLE: Commercial Model Development for Transportation Planning

AUTHOR: Metropolitan Dade County Planning Department

SUBJECT: Regional Shopping Centers

DATE: November 1968

LOCAL PLANNING AGENCY: Metropolitan Dade County Planning Department

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HUD PROJECT NO: Florida P-30

SERIES NO: n.a.

NO. OF PAGES: 82

ABSTRACT:

This report develops a technique for projecting the growth potential of regional shopping centers in metropolitan areas. Estimates are developed for geographic location, probable size, annual sales, and sales per square foot for regional centers in the Miami Urban Area for 1985. The location of community shopping centers is estimated, but not developed and tested by the model to determine probable size, annual sales, and sales per square foot. However, the same technique may be used to project the growth potential of community and neighborhood shopping centers that is developed and used for regional shopping centers.

COMMERCIAL MODEL DEVELOPMENT FOR TRANSPORTATION PLANNING

Prepared by

The Metropolitan Dade County Planning Department for the
Miami Urban Area Transportation Study
702 Justice Building
1351 N. W. 12 Street
Miami, Florida 33125

November 1968

The preparation of this report was financed in part through an urban planning grant from the Department of Housing and Urban Development, under the provisions of Section 701 of the Housing Act of 1954, as amended.

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PREFACE

This is one of several background reports related to the inventory and projection of socio-economic characteristics within the context of the Miami Urban Area Transportation Study. MUATS is a joint effort of Metropolitan Dade County and the State of Florida in cooperation with the U.S. Department of Transportation's Bureau of Public Roads and the U.S. Department of Housing and Urban Development. Other reports(1) in the series provide forecasts of economic factors affecting development, population projections, and land use activities and projections which are based upon a survey conducted during the spring of 1964 on the origin and destination of travelers, quality of mass transit, and socio-economic characteristics related to such factors as population, employment, income, school enrollment and automobile registration. The metropolitan area was divided into 550 traffic zones and information was obtained for each. The background studies thus provide the basic data inputs for the preparation of the principal elements of the MUATS program, which include metropolitan master plans for streets and highways, terminal facilities, airports, waterports, and waterways, and mass transit.

The background series, therefore, presents the findings of major study phases as they relate to the planning of all elements of transportation facilities in the Miami area and serve to advise the MUATS Technical Advisory and Policy Committees and other concerned persons of the technical details of the analysis being conducted in the urban area transportation study by the MUATS organization and its consultants.

Commercial Model Development for Transportation Planning develops a technique and presents the result of the use of a mathematical model to project the potential for growth of regional shopping centers in the metropolitan area and identifies probable size, annual sales, and estimates geographic location. Location also is estimated for community centers, but not tested by the model to determine size and sales. The central business district, business districts and community centers are considered only in relation to the effect they may have on regional centers.

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(1) See Appendix I for a list of reports in this series.

INTRODUCTION

This report uses the data collected by MUATS in 1964 to determine the location and characteristics of regional shopping centers to serve the 1985 population of the Miami urban area. A methodology is developed and findings are reported.

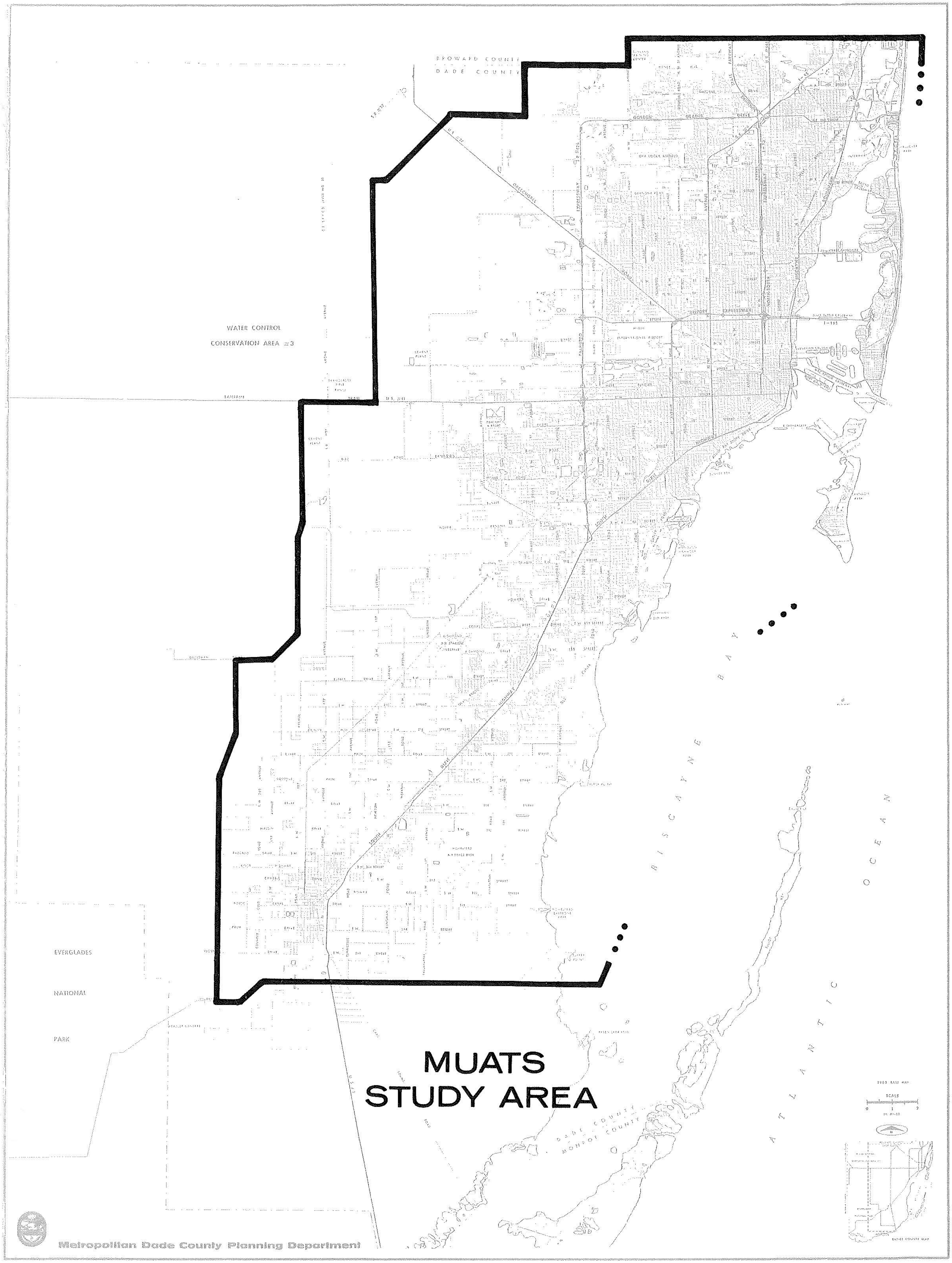
The maximum retail sales, optimum size, and sales per square foot of existing regional shopping centers are established for 1985. And the location, retail sales, size, and sales per square foot of new shopping centers are projected.

Both new and expanded centers are located where they will provide:

(1) Sales stability
(2) Economies of operation
(3) Efficient service
(4) Accessibility with a minimum of traffic congestion

Location and size of centers are estimated and sales potential developed through the use of a commercial model; that is, mathematical formulas utilizing data on the number of households and income distribution as well as highway accessibility.

Consideration also is given to the location of community shopping centers. The results of the model provide: an efficient system of regional and community shopping centers for 1985; data for revision of the General Land Use Master Plan; and revised data for future testing of the highway networks.



MUATS
STUDY AREA
BROWARD COUNTY
DADE COUNTY
WATER CONTROL
CONSERVATION AREA #3
EVERGLADES
NATIONAL
PARK
BISCAYNE BAY
ATLANTIC OCEAN
DADE COUNTY
MONROE COUNTY
Metropolitan Dade County Planning Department

BACKGROUND

The Miami Urban Area is one of the fastest growing and youngest of the 75 major metropolitan areas over 300,000 in the United States. The population increased 82 percent between 1954 and 1964 to 1,093,600, and is expected to increase another 82 percent between 1964 and 1985 to 1,955,000 according to 1968 forecasts.

However, the commercial model findings are based upon earlier forecasts for 1985 of 2½ million because the study was completed before the revisions were made. Since the reduction is not reflected in the model, the forecast size, location, and sales potential of the retail centers, in some cases, likely will occur later than 1985.

A growing concern over appropriate concepts and policies of urban spatial organization is noticeable today in many Western countries. The additional image of an urban community with its tightly-knit articulated form and structure has been seriously eroded by the effect of ever-increasing mobility, communications and the widely-distributed benefits of rising productivity. The consequent desire for a new image of the metropolitan community and the mounting problems of metropolitanization have stimulated a wave of interest in recent years in the development of appropriate concepts and criteria for urban spatial organization. This movement has led to the formulation of metropolitan plans that envisage various goal-forms that will presumably enrich the economic, social, and aesthetic life of the urbanite.(1)

This study concentrates on the regional shopping centers of the metropolitan community to determine location and potential; that is, the number of centers; the size of the centers in sales and square feet; and the size and distance of the trade area from which the patrons come.

The metropolitan area includes, not only Dade County, but the areas of South Broward County where shoppers live who patronize Dade County regional shopping centers.

---

(1) A Market Potential Model and Its Application to a Regional Planning Problem, by T. R. Lakshamanan and Walter G. Hansen, p. 1.

MERCHANDISE

The merchandise provided by the regional shopping centers is divided into three categories: shopping, convenience, and other goods. This report considers only shopping and convenience goods sales because "the other" category represents a negligible amount.

Shopping Goods

Shopping goods consist of goods consumers normally compare at different stores before buying, such as apparel or furniture.[1] Assumptions are made for the purpose of this model that at least 50% of the goods offered in 1985 at regional centers will be shopping goods. The groups are:

General Merchandise Groups

Department store and variety store

Apparel Groups

Men's and boys' wear
Women's ready-to-wear
Shoes
Family and other apparel

Furniture and Appliance Groups

Furniture and house furnishings
Household appliances

Auto Accessories

Jewelry

Books and Stationery

Gifts and Novelties

Cameras and Photographic Equipment

(1) Commercial Development, Regional Planning for the Future Commerce and the Revitalization of Business Districts in East Central Florida, by James G. Sheehan, p. 8.

Convenience Goods

Convenience goods consist of merchandise consumers desire to purchase with the least amount of effort at the nearest satisfactory establishment, such as groceries or drugs.[1] The groups are:

Food Groups

- Groceries
- Baking products
- Other foods

Drugs

Hardware

Liquor

Gasoline and Service

Eating and Drinking

Paint and Wallpaper

Florists

Services

- Shoe repairs
- Cleaning
- Laundry
- Barbers
- Beauty Salons

Other Goods

The other category includes specialty goods. This is a merchandise or service for which consumers will go out of the way to locate and purchase because of a special attraction or appeal. This includes such items as limited-issue fabrics and delicatessen foods[2] and recreational activities.

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(1) Commercial Development-Regional Planning for the Future Commerce and the Revitalization of Business Districts in East Central Florida, by James G. Sheehan, p. 8.
(2) Ibid. p. 9.

STRUCTURE AND FRAMEWORK

The commercial structure consists of a central business district, business districts, regional shopping centers, community shopping centers, neighborhood shopping centers, and strip commercial and other commercial establishments.

The commercial framework includes only the regional and community shopping centers around the central business district. This report concentrates on the regional shopping centers as part of an integral part of the inter-related spatial system of the commercial framework. The business district and community and neighborhood shopping centers are considered in relation to the effect they may have on the regional shopping centers. Some consideration is given to the location of new community shopping centers.

Central Business District

The central business district is the primary commercial concentration in an urban area. The U.S. Bureau of Census defines the central business district as an area of very high valuation; an area characterized by a high concentration of retail businesses, offices, theaters, hotels, and service businesses; and an area of high traffic flow.(1)

Sales of the central business district have not kept pace with the growing population because of the movement of the population to the suburbs and the development of regional centers to serve this population.

Business Districts

This is a major concentration of commercial enterprises on a somewhat smaller scale than the central business district. The enterprises are developed within the district independent of each other in contrast to shopping centers which are established by one entity.

Regional Shopping Centers

The regional shopping center provides a variety and depth of shopping goods comparable to a central business district. General merchandise apparel and home furnishings as well as a variety of services are offered. At least one major department

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(1) 1963 Census of Business, Major Retail Centers, Miami, Florida, SMSA, p. 11.

store with a minimum of 100,000 square feet is the principal tenant. Sometimes there are recreational facilities. The center usually occupies a minimum of 30 acres. For this report, a regional center must have annual retail sales (assuming there is no wholesale trade) of a minimum of around $10 million.

Community Shopping Centers

The community center provides, in addition to convenience goods, a wider range of facilities for the sale of shopping goods such as apparel and furniture, and may include banking, professional services and recreational facilities. A junior department store or variety store is the principal tenant. This type of center is usually located on 10 to 30 acres.

Neighborhood Shopping Centers

The neighborhood center provides for the sale of daily living needs; that is, convenience goods such as foods, drugs, hardware, and personal services. A supermarket is the principal tenant. This type of center is usually located on 4 to 10 acres.

METHODOLOGY

The technique developed to determine the distribution and characteristics of 1985 regional shopping centers assumes that the sales potential of a shopping center can be determined by how close the people live, how much income they have, the size of the center, and the distance from competing facilities.

Specific data projected for 1985 regional shopping centers are: location, retail sales, size, and sales per square foot.

There are six steps in developing and applying the mathematical model to determine the characteristics and efficient distribution of future regional shopping centers. They are:

Development

(1) Assemble basic inputs: a Link-Node base map of the 1964 street and highway network describing capacity, speed, and driving time; and a distribution of 1964 median income and number of households.

(2) Develop a control factor.

(3) Test and adjust the control factor.

Application

(4) Establish criteria to test or evaluate results.

(5) Forecast the basic inputs: a 1985 Link-Node map of the street and highway network describing speed, capacity, and driving time; a distribution of median income and number of households; estimates of location and size of regional shopping centers, location of community shopping centers, and trade area size and income.

(6) Apply control factor, test and adjust results.

DEVELOPMENT

The development of the model requires two basic inputs: A Link-Node base map of the streets and highways network and a distribution of the median income and number of households in the Miami Urban Area. This information was used to develop a control factor for a basic formula to estimate the retail sales of the regional shopping centers. Results were tested and the factor adjusted until the variance between estimated and actual sales was reduced to 8.4 percent.

Inputs

Link-Node Streets and Highway Network: A Link-Node base map used by MUATS was obtained for the first of the two inputs for the development of the model. The map mathematically described the streets and highways system of the Miami Urban Area in 1964 so that mechanical equipment and electronic computers could analyze the system for other transportation planning purposes.

Streets were defined in terms of distance, average travel speed, and average 1964 winter season daily traffic. The Miami Urban Area was divided into 550 traffic zones (See Figure 2.) and it waa assumed that all trips generated by a zone originated from a single point known as a centroid.

The centroid of each zone was marked by a heavy dot or node and numbered. Principal streets served as links and were identified by a solid line. Local streets, not included on the principal street map, were identified as hypothetical connections with dashed lines on a traffic assignment network map. The dashed lines connected the zone centroids to adjacent street links. Each centroid had no more than four connections to the system.

Small dots, also called nodes, were placed at each intersection in the system, including junctions of system links and centroid connections. Links were defined in terms of distance, speed, and traffic volume.

Median Income and Resident Households: These inputs were developed by traffic zones as part of other MUATS reports. The zones were used for the collection of data during the origin and destination study in the spring of 1964.

The median income and number of households were evenly distributed in each zone except when land use plans indicated a specific population distribution and tables were prepared. A copy

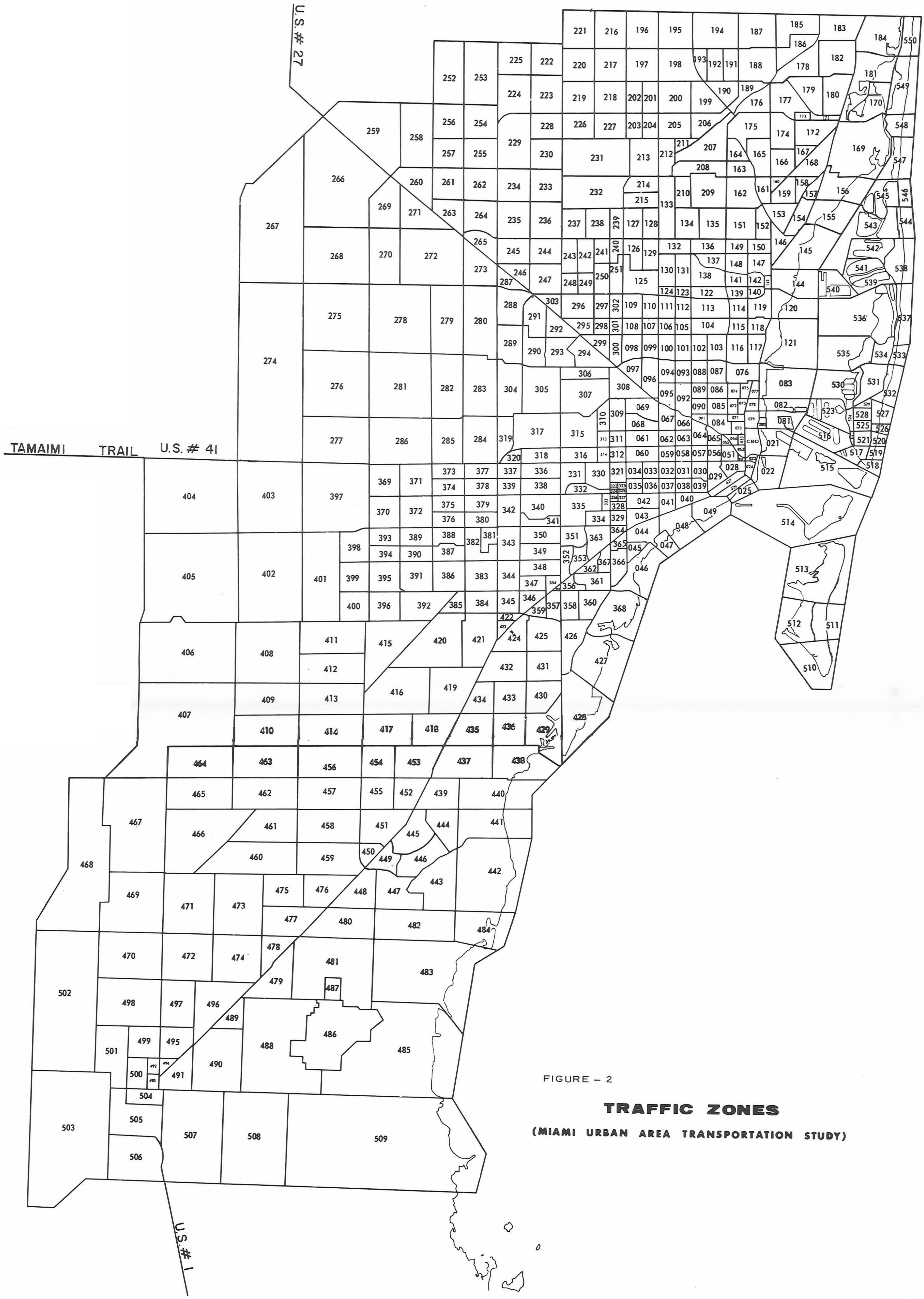


FIGURE – 2

TRAFFIC ZONES

(MIAMI URBAN AREA TRANSPORTATION STUDY)

of the tables became the second basic input for the development of the model.

The Broward County Area Planning Board provided data on median income and the number of households for South Broward residents shopping at the Miami Urban Area regional shopping centers. Information was derived from Population, Dwelling Units, Income, Employment by traffic zone prepared in October 1963 as part of the county's transportation study.

Control Factor Development

The development of a control factor for a basic consumption formula was the next step in the process of approximating the retail sales for each regional shopping center.

The basic formula states that consumption equals disposable income times the marginal propensity, or amount spent at regional shopping centers.

The median income of each traffic zone was multiplied by the number of resident households in each traffic zone to obtain a proportional estimate of income for each zone. Assumptions were made that, when the income increases, the tax factor increases; but at the same rate as income spent at regional shopping centers decreases. A table was prepared listing the proportional estimate of income by traffic zone.

Eight existing regional shopping centers were located using the 1963 Census of Business Major Retail Centers, Miami, Florida SMSA(1) as a guide. (See Figure 8.) Centers with approximately $10 million or more of annual retail sales were selected as existing regional shopping centers. They were:

Biscayne Plaza
163rd Street Shopping Center
Central Shopping Plaza
Dadeland Mall
Cutler Ridge Shopping Center
Westchester Shopping Center
Palm Springs Mile
Northside Shopping Center

An estimation was made of the trade area of each center; that is, the section surrounding a shopping center from which the

(1) Published by Bureau of Census, U.S. Department of Commerce

center draws patrons.

The sales and parking space, person trips for shopping and convenience goods, location of each center, and major thoroughfares were analyzed using the copy of the Link-Node base street and highway network, the MUATS Existing Land Use Study, 1964, Mel Conner & Associates, Inc., Dade County Productions and Attractions Abbreviated Listing, Gravity Model Run, Home Based Person Trips for Shopping and Convenience Goods, and, the General Land Use Master Plan. (See Tables 1, 2, and 3.)

In addition, a general knowledge of the area provided background regarding road patterns, degree of accessibility, and comfort in driving.

A tentative trade area was established as a circle around each regional shopping center. (See Appendix 2.) Each trade area was divided into eight pie-shaped sectors radiating from each shopping center called: NNE, ENE, ESE, SSE, SSW, WSW, WNW, and NNW.

The radii or length of the sectors was determined by estimating the driving time to the shopping center and using the size of the shopping center. Food stores were excluded when the size of the centers was determined. The distance each sector extended from the center varied according to accessibility measured in driving time. (See Figure 3.) The effective driving time for each center was the average effective driving time for the eight sectors of the trade area.

The assumption was made that the regional shopping center size-driving time ratio could be approximated by a straight line and measured in miles. Assumptions also were made that the total trade area had a homogeneous population, income, food patterns, and business competition.

The total radii of each center trade area was divided into nine concentric circles with each shopping center in the center of the circle. (See Figure 4.)

Each ring of the circle was assigned a patronage factor representing the personal preference to shop at a retail center. The factor decreased at an increasing rate as the distance from the shopping center increased. Thus, the nine concentric circles were wide near the center and narrow at the outer edges.

A patronage factor (degree of customer patronization) was assigned to each traffic zone, sometimes with one zone contain-

Table 1 - SHOPPING AND CONVENIENCE GOODS, SALES, PERSON TRIPS, AVERAGE SALE PER TRIP, REGIONAL SHOPPING CENTERS, 1963

Regional Shopping Centers	Shopping Goods Sales	Convenience & Shopping Goods Sales	Person Trips for Shopping and Convenience Goods Per Year*	Average Sale Per Person Trip	Percent of Shopping Goods Sales to Total Convenience & Shopping Goods Sales
	(Thousands)				
163rd Street Shopping Center	$28,879	$35,632	8,000	$4.45	81.0%
Northside Shopping Center	24,086	27,802	3,920	7.09	86.6
Dadeland Shopping Center	14,993	17,252	3,170	5.44	86.9
Biscayne Plaza	5,039	9,471	1,410	6.72	53.2
Central Plaza	8,609	11,739	2,770	4.24	73.3
Cutler Ridge Shopping Center	6,487	10,567	2,820	3.75	61.4
Palm Springs Mile	10,449	16,000	5,121	3.12	65.3
Westchester Shopping Center	4,913	11,082	2,330	4.76	44.3

* Mel Conner & Associates, Inc. Dade County Productions and Attractions, Home based person trips for shopping and convenience goods.

Table 2 - SQUARE FEET, REGIONAL SHOPPING CENTERS, 1963

Regional Shopping Centers	Parking Space	Department Stores	Food Stores	Other Stores	Total Gross Leasable Area Available	Department and Other Stores
			(Square Feet)			
Biscayne Plaza	900,000	63,200	18,600	218,200	300,000	281,400
163rd Street Shopping Center	1,700,000	303,020	24,594	317,386	645,000	620,406
Central Plaza	730,000	178,000	20,000	132,000	330,000	310,000
Dadeland Mall	1,677,000	N/A[1]	30,000[2]	N/A[1]	373,000	343,000
Cutler Ridge Shopping Center	755,000	116,900	22,000	104,200	243,100	221,000
Westchester Shopping Center	801,200	N/A[1]	50,000[2]	N/A[1]	306,500	256,500
Palm Springs Mile	1,505,100	328,000	99,500	124,375	551,875	452,375
Northside Shopping Center	1,200,000	262,250	29,100	173,660	485,000	455,900

(1) Not available
(2) Estimated

Table 3 - SALES PER SQUARE FOOT, REGIONAL SHOPPING CENTERS, 1963

Regional Shopping Centers	Shopping and Convenience Goods Sales (Thousands)	Available Square Feet Gross Leasable Area (Thousands)	Sales Per Square Foot
Biscayne Plaza	$ 9,471	300	$ 31.57
163rd Street Shopping Center	35,632	645	55.24
Central Plaza	11,739	330	35.57
Dadeland Mall	17,252	373	46.25
Cutler Ridge Shopping Center	10,567	243	43.49
Westchester Shopping Center	11,082	306	36.22
Palm Springs Mile	16,000	552	28.99*
Northside Shopping Center	27,082	485	57.32
		Average Dollars Per Square Foot	$ 43.67
		Range Dollars Per Square Foot	57.32 $ 31.57
		% Difference in Range	81.6%

* The 1963 Census of Business measures from 4th Avenue to 8th Avenue and the GLA is measured between 4th Avenue and 12th Avenue for Palm Springs Mile.

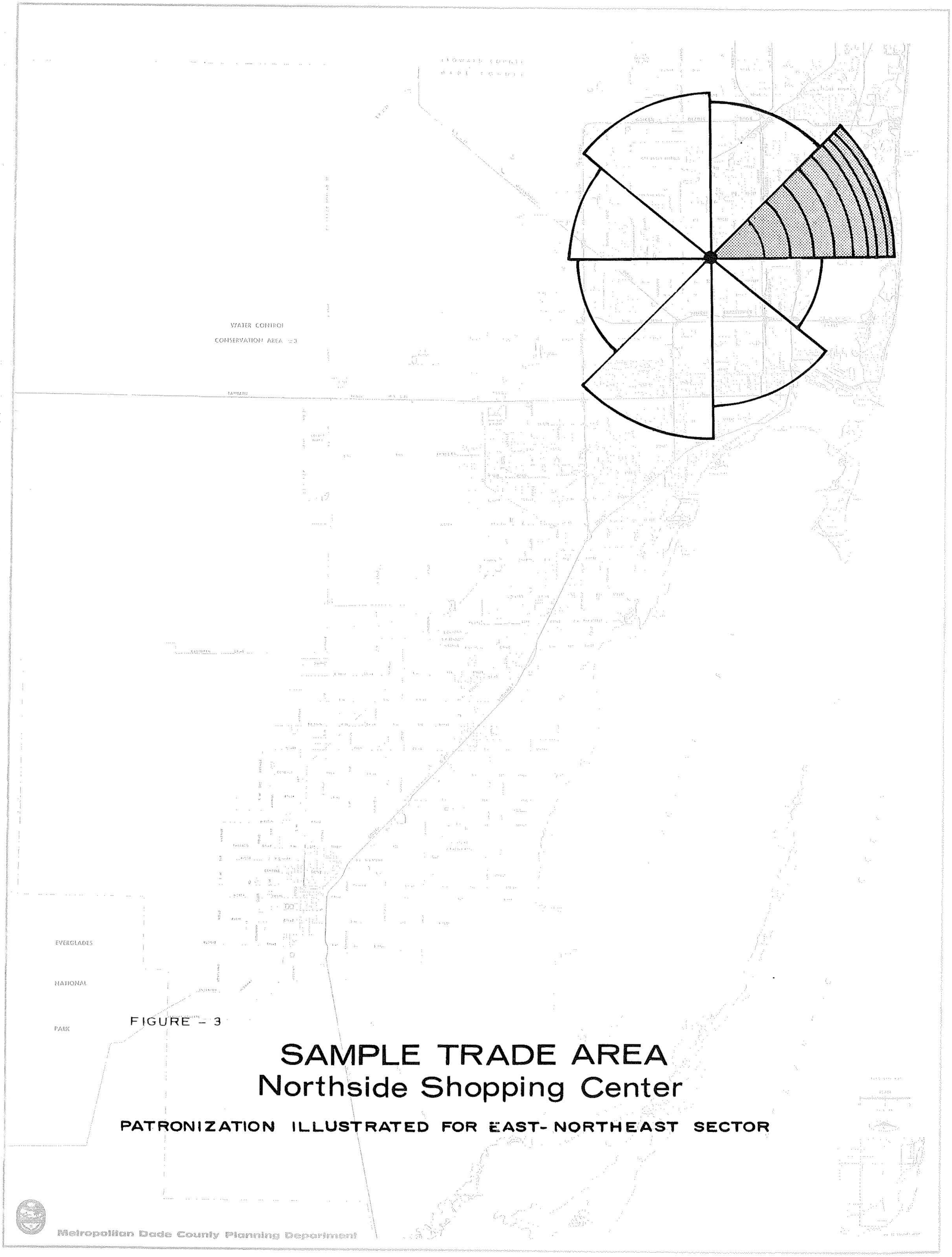
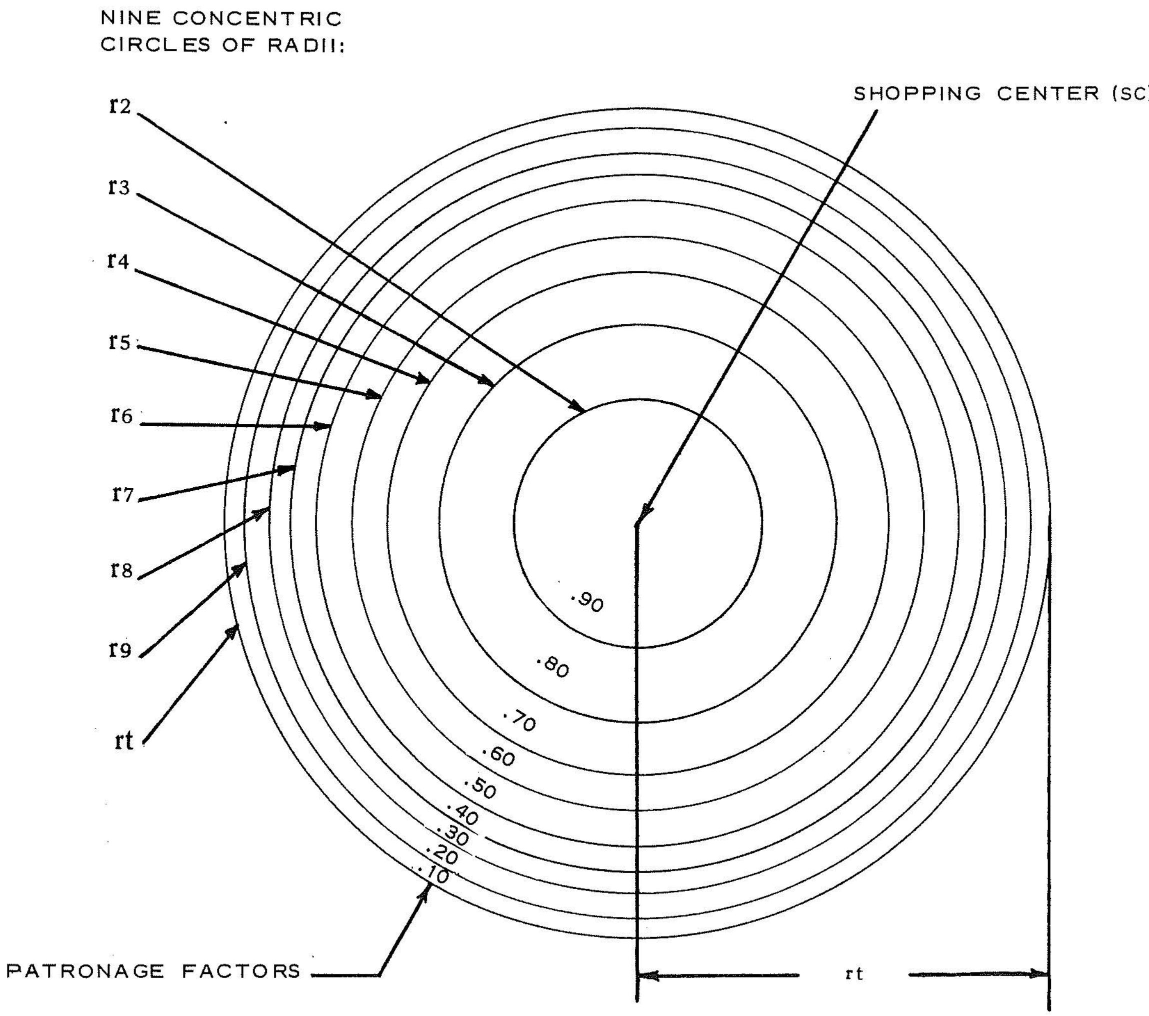


FIGURE – 3

SAMPLE TRADE AREA
Northside Shopping Center

PATRONIZATION ILLUSTRATED FOR EAST- NORTHEAST SECTOR

FIGURE – 4 PATRONIZATION DISTRIBUTION



ing factors for more than one center. (See Appendix 3.) When this occurred the factors were proportionately allocated to each center, reflecting shopping at more than one center.

A table was prepared multiplying the patronage factor in each zone by the proportional estimate of income. Next, patronization assigned to each center was totaled to obtain the proportional estimate of income. (See Appendix 4.)

Retail sales figures were obtained for use in the model from the 1963 Census of Business, Major Retail Centers, Miami, Florida SMSA published by the Bureau of Census, U.S. Department of Commerce. The 1963 data was used in the model instead of forecasting 1964 data.

Total retail sales for shopping and convenience goods in the Miami Urban Area totaled $1,005,161,000. (See Table 4.) This was divided by the 1964 proportional estimate of income for the Miami Urban Area, or $1,928,152,000 to obtain 52.130 percent as the proportional estimate of income spent on shopping and convenience goods in the Miami Urban Area.

The total 1963 retail sales of convenience and shopping goods for regional centers was $139,545,000. (See Table 4.) This was divided by $881,629,000, the estimated allocation of proportional income for the Miami Urban Area to obtain 15.828% as the percent of shopping and convenience goods purchased at regional centers.

The 52.130% was multiplied by 15.828% to arrive at the tentative control factor of 8.251%. (See Appendix 5.)

Test and Adjust Control Factor

Four tests were made to adjust the control factor so that the estimated sales would correlate to a high degree with the actual sales.

First Test: The first test determined the acceptability of retail sales, sales and parking space, and person trips for shopping and convenience goods.

The control factor was multiplied by the total allocation of the proportional estimate of income for each center to estimate the retail sales for shopping and convenience goods. The result was a 27.2% variance from actual sales.

Table 4 - RETAIL SALES, REGIONAL SHOPPING CENTERS AND TOTAL MIAMI URBAN AREA, 1963

Regional Shopping Centers	Convenience Goods	Shopping Goods	All Other Goods	Shopping and Convenience Goods	Total All Goods
		(Thousands)			
163rd Street Shopping Center	$ 6,753	$ 28,879	$ 2,134	$ 35,632	$ 37,766
Northside Shopping Center	3,716	24,086	732	27,802	28,534
Dadeland Mall	2,259	14,993	1,199	17,252	18,451
Biscayne Plaza	4,432	5,039	709	9,471	10,180
Central Plaza	3,130*	8,609	1,000*	11,739	12,739
Cutler Ridge Shopping Center	4,080	6,487	1,543	10,567	12,110
Palm Springs Mile	5,551	10,449	1,116	16,000	17,116
Westchester Shopping Center	6,169	4,913	1,391	11,082	12,473
Total	36,090	103,455	9,824	139,545	149,369
Total Miami Urban Area	599,078	406,083	578,457	1,005,161	1,583,618
			(Percent)		
Total Shopping Centers as Percent of Miami Urban Area	6.02%	25.48%	1.70%	13.88%	9.43%

* Estimated

Source: 1963 Census of Business, Major Retail Centers, Miami, Florida SMSA, Bureau of Commerce, U. S. Department of Commerce.

Second and Third Tests: These tests established a relationship between the street and highway network and the radii of the trade area. Adjustments had to be made to the shopping center size-driving time ratio. The driving time was originally estimated by using the Link-Node base street and highway network map, assuming the distance to be a straight line between two locations (direct distance). The ratio must be adjusted by a friction factor; that is, the travel restriction measured in minutes per mile which results from average driving time at a given distance. The formula is:

$$\frac{\text{Driving Time}}{\text{Direct Distance}} = \text{Friction Factor}$$

Than, the friction factor was multiplied by the total trade area radius to yield the effective driving time for the sector. The effective driving time for the center was the average effective driving time for the eight sectors.

The radii also were originally estimated by assuming that there was an homogeneous population, income, food patterns, and business competition. Adjustments had to be made to meet the requirements of the heterogeneous complexion of the Miami Urban Area. Each sector of the trade area was factored separately increasing patronization factors for sectors where there was no competition from other centers and decreasing factors when natural or man-made barriers such as water, railroads or expressways prohibited direct movement. Factors also were lowered if the Central Business District or Lincoln Road Mall or Miracle Mile business districts were in the area. Consideration also was given to community shopping center locations.

The second test adjusted the four northern most shopping centers in the Miami Urban Area to establish a higher correlation between actual and estimated retail sales. The third test adjusted the radii of the southernmost centers to establish a higher correlation.

The final radii and effective driving time was established as:

Regional Shopping Centers	Radii (miles)	Effective Driving Time (minutes)
Biscayne Plaza	4.0	13.4
163 Street Shopping Center	7.5	20.5
Central Plaza	3.25	12.6
Cutler Ridge Shopping Center	7.5	14.9
Dadeland Mall	6.0	14.2

Regional Shopping Centers	Radii (miles)	Effective Driving Time (minutes)
Westchester Shopping Center	5.0	12.6
Palm Springs Mile	7.0	16.1
Northside Shopping Center	6.5	17.5

Fourth Test: The last test projected trade radii, reduced trade areas, and adjusted patronage factors with the final control factor of 9.707%. This resulted in an 8.4% variance compared with a 27.2% variance in the first test.

The control factor was applied to the allocation of the proportional estimate of income by shopping centers to approximate the actual sales of the centers. (See Appendix 6.)

Regional Shopping Centers	$SI_a^{sc_n}$ Allocation of Propor. Income to Shop. Ctrs.	$R_a^{sc_n}$ Allocation of Income After Factoring By 8.251%	Variance from Actual Sales
Central Plaza	$126,103.8	$12,240.9	+ 4.3%
Westchester Shopping Ctr.	112,917.5	10,960.9	- 1.1%
Dadeland Mall	200,637.3	19,475.9	+12.9%
Cutler Ridge Shop. Ctr.	80,327.5	7,797.4	-26.2%
163rd Street Shop. Ctr.	336,048.3	32,620.2	- 8.5%
Palm Springs Mile	177,982.4	17,276.8	+ 8.0%
Northside Shopping Ctr.	288,177.5	27,972.9	+ 0.6%
Biscayne Plaza	103,519.4	10,048.6	+ 6.1%

APPLICATION

Since the model simulated the regional shopping center trade areas and determined actual retail sales within an 8.4% variance, assumptions were made that the model could take 1985 inputs and approximate the 1985 sales of regional shopping centers.

Criteria were established to test the results to insure sales stability, economies of operation, adequate service, and accessibility to the shopping centers.

The 1985 street and highway network and the 1985 distribution of income and number of households were developed as inputs. Estimates were made for the location and size of shopping centers, and the size and income of trade areas.

The control factor developed with 1964 data was applied and the results tested against the established criteria. No adjustments were necessary.

Establish Criteria

Economic criteria was established to judge the results of the model; that is, to determine whether the location and size of the regional shopping centers projected for 1985 would meet the needs of the population.

Four criteria were established to check the validity of the model regarding the objectives of sales stability, economies of operation, efficient service, and accessibility.

Stability: To provide economic sales stability to the commercial structure, average sales per square foot should increase yearly between 1964 and 1985, slightly greater than the yearly increase in personal income. This is based upon the fact that real wages are likely to increase because both figures are in 1964 dollars, there will be higher densities surrounding the inner rings of the cobweb pattern creating increased sales per square foot,[1] and there will be larger centers creating higher sales per square foot.

Economy: To provide economies of operation to the centers and prosperity for the urban areas, the range of minimum and maximum sales per square foot should remain relatively constant for 1964 and 1985.

Service: To insure adequate service to the urban area, the percent increase in total gross leasable area should be the same as the percent increase in the number of households between 1964 and 1985. This assumes a constant requirement of sales per household.

Accessibility: For convenient accessibility, regional shopping centers usually are located at four mile intervals from the CBD producing a cobweb pattern of the commercial structure radiating from the CBD. The pattern developed by the Northeastern

(1) "Changing population distributions and densities and locational changes among different socio-economic groups will continue to call forth two kinds of retail redistribution, namely, reduction in capacity in the central city with consequent blighting of older properties through persistent vacancy, and increases in capacity in growing suburbia," Northeastern Illinois Planning Commission, 1965, p. 91.

Illinois Transportation Study is typical of metropolitan areas bounded by water on one side.

Inputs

Link-Node Street and Highway Network: A copy of the 1985 Link-Node base street and highway network prepared for other MUATS reports was obtained as a basic input to determine accessibility of the centers. Distance, average travel, and average winter season daily volume have been forecast as part of the development of Link-Node #3. (See Figure 5.)

Households and Median Income: A forecast of the distribution of the number of households and median income also was obtained. This had been prepared by traffic zone by the Metropolitan Dade County Planning Department for other MUATS reports to obtain the number of households. The population forecast for each traffic zone was divided by 1.2 to 4.3 depending upon the average number of people projected per household in the zone.

Personal Income Per Acre - 1985, reflected dollars of income related to an acre base by traffic zone. Areas of high and low concentrations of purchasing power were readily visible. (See Figure 5.)

To determine the total personal income in each traffic zone the 1964 Dade County total personal income ($2,749,866,000)[1] was divided by the proportional estimates of income of all zones ($1,693,289,200) to obtain a conversion factor: $1.6239789.

This factor was applied to the proportional estimate of income by each traffic zone to yield total personal income of each zone. The answer was divided by acres for each zone to construct the aid reflecting total personal income per acre.

The other aid, the Change in Personal Income 1964 to 1985, reflected the differences in personal estimates of income for 1964 to 1985. Income differences were divided by acres of each traffic zone to indicate new market possibilities. Answers were factored by $1.624 to convert to personal income figures. (See Figure 6.)

Estimate Shopping Center Location and Size: Eight existing and three proposed regional shopping centers were located

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(1) Bureau of Economic and Business Research
University of Florida, Gainesville, Fla.

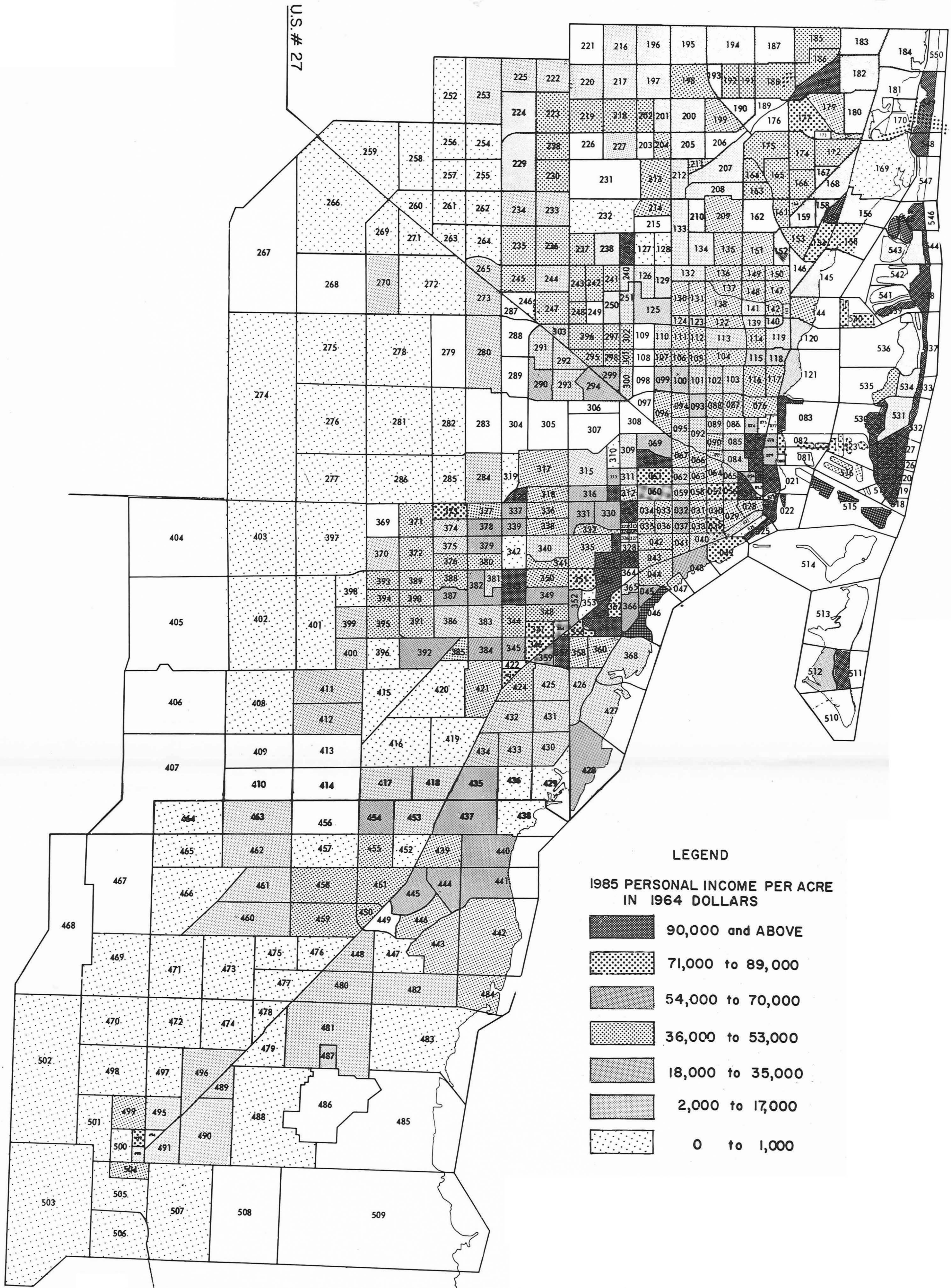

FIGURE – 5

PERSONAL INCOME PER ACRE - 1985

(MIAMI URBAN AREA TRANSPORTATION STUDY)

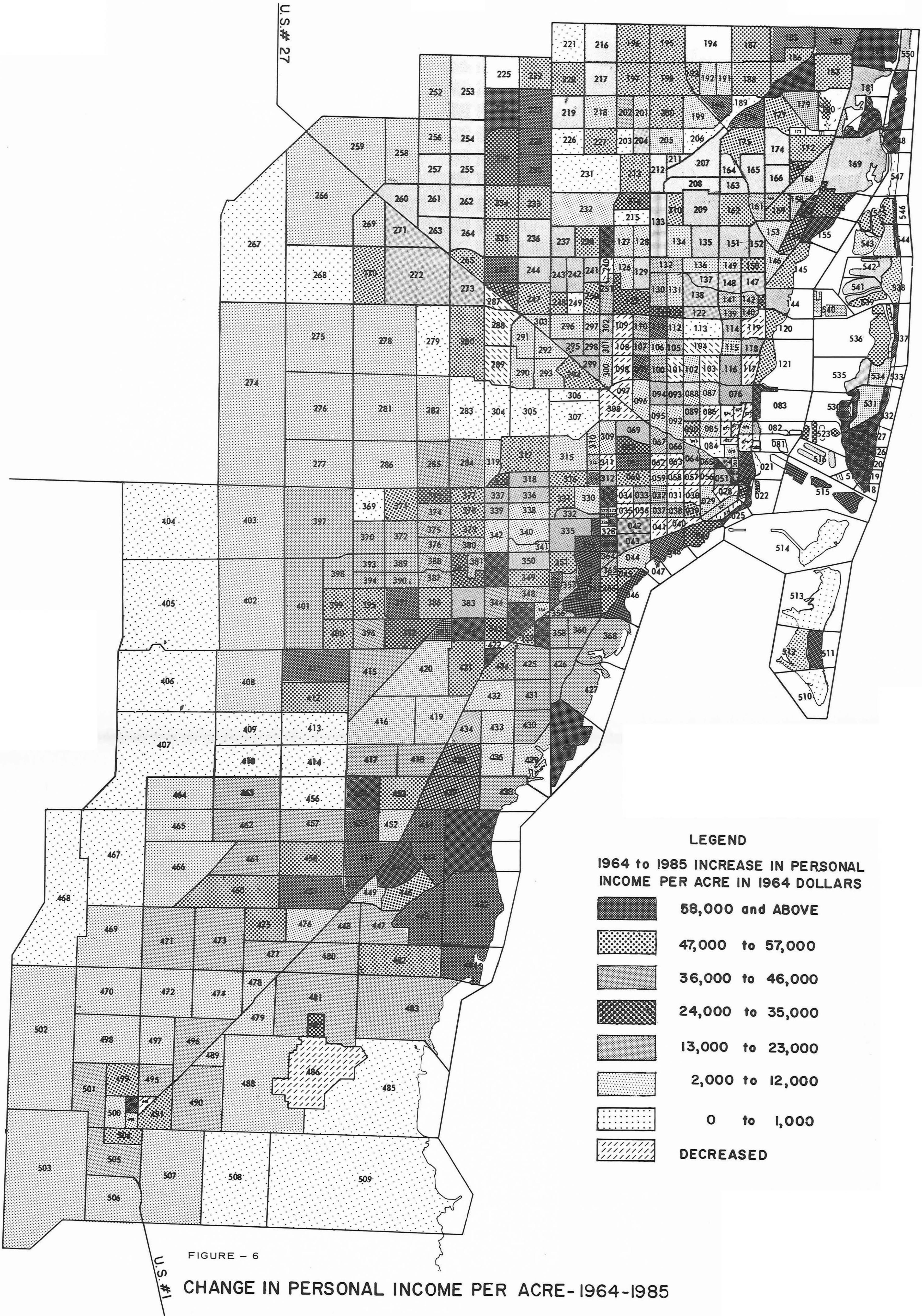

FIGURE – 6

CHANGE IN PERSONAL INCOME PER ACRE - 1964-1985

(MIAMI URBAN AREA TRANSPORTATION STUDY)

on a map. (See Figure 7.) A least squares trend line was made of the 1964 gross leasable area in square feet as a first step in forecasting the size of the existing centers.

Next, master plans of individual centers were obtained when possible. The trend toward larger size regional shopping centers was taken into consideration. Market potential, land available for expansion, and parking area requirements were analyzed for each shopping center. Parking structures were considered as a technique to provide more land area for buildings, and parking to floor area ratios.

The relationship of the regional centers to the balance of the commercial framework was considered. Since both regional and community centers comprise a basic part of the cobweb pattern around the Central Business District, the locations of both community and regional centers were estimated to create the cobweb pattern. (See Figure 10.)(1)

The General Land Use Master Plan of Metropolitan Dade County was analyzed taking into consideration the location of centers forecast for 1985. The graphic aids on personal income were used to locate market potential.

Adjustments were made to the trend lines to increase or decrease the size of the existing centers to meet the market potential when there was land to expand, or the addition of new centers was planned. Existing centers were expanded to maximum capacity and new centers to comparable size. (See Table 5.) Consideration was given to Hollywood Mall in Broward County because some Miami Urban Area residents would be part of the trade area of this center.

Three new centers were added to the eight existing centers in the vicinity of:

Miami Lakes
Richmond Drive and I-95 Extension Area
Homestead-Florida City

Estimate Trade Area Size and Income: An overlay of the 1964 trade area for existing centers was placed over the personal income graphic aids. Each trade area was analyzed to determine areas of higher income indicating greater market potential and to tentatively locate new regional shopping center trade areas and forecast size of the areas.

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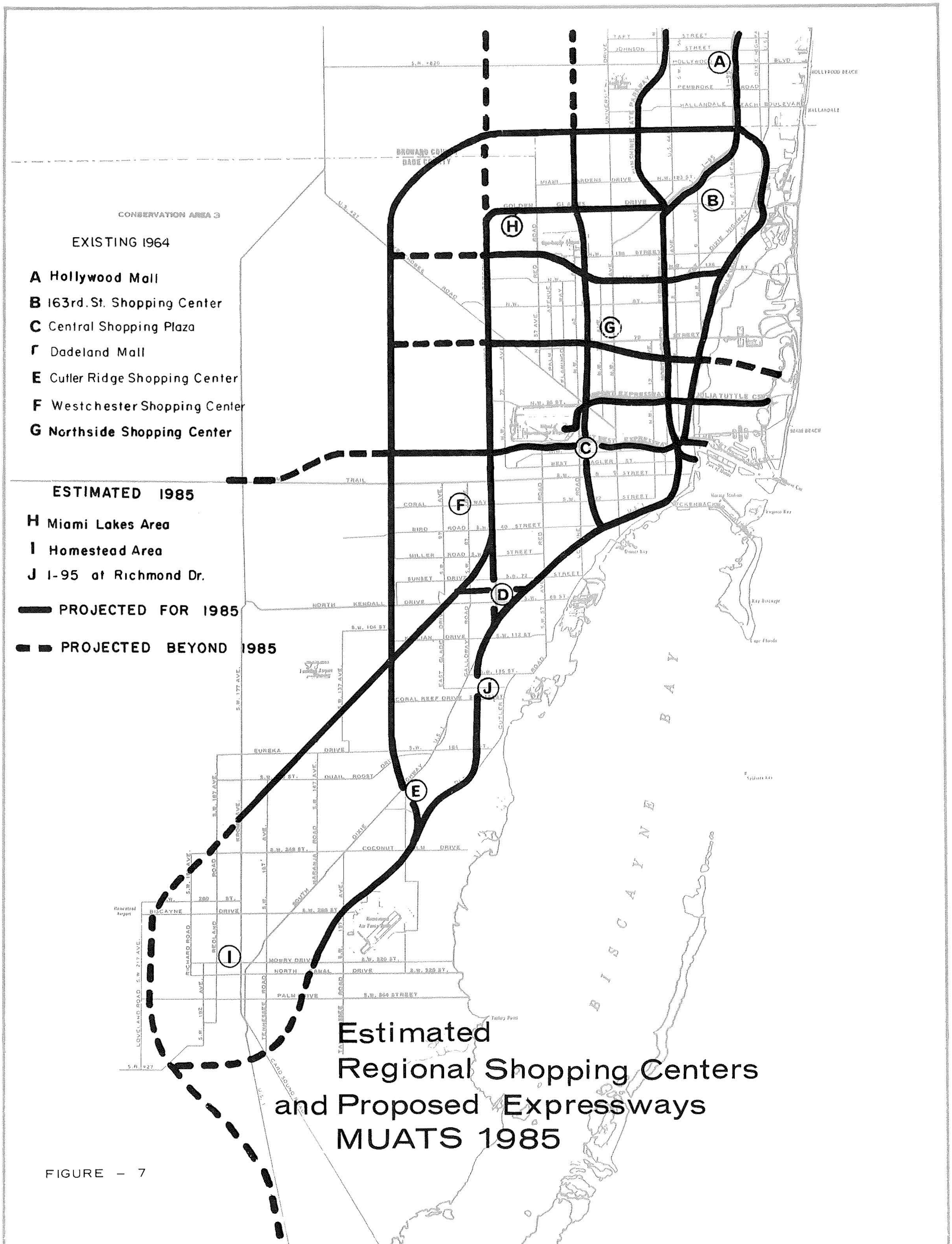
(1) For a discussion of community shopping centers see pp. 52-54



Estimated
Regional Shopping Centers
and Proposed Expressways
MUATS 1985

FIGURE – 7

Table 5 - ESTIMATED LOCATION AND SIZE, SHOPPING AREAS, 1985

Shopping Areas	(1) Traffic Zone	1963 Gross Leasable Area (square feet)	Percent Growth Forecast	1985 Forecast Gross Leasable Area (square feet)
Palm Springs Mile (Business District)	236 & 244	551,875	100	1,103,700
163rd Street Shopping Center (Regional)	173	645,000	50	967,000
Cutler Ridge Shopping Center (Regional)	449	243,100	200	729,200
Northside Shopping Center (Regional)	125	485,000	35	645,700
Richmond Dr.-I-95 Extension (Regional)	418	none	-	600,000
Hollywood Mall (Regional)	Broward	none	-	600,000
Central Plaza (Regional)	309	330,000	75	577,500
Dadeland Mall (Regional)	422	373,000	35	503,500
Miami Lakes Shopping Center (Regional)	228 & 230	none	-	500,000
Westchester Shopping Center (Regional)	374 & 378	306,500	20	367,800
Homestead Plaza (Regional)	449	none	-	300,000
Biscayne Plaza (Community Center)	143	300,000	0	300,000

(1) See Figure 2.

The shopping center size-driving time ratio developed with 1964 data was applied to determine effective driving time for each center in relation to anticipated gross leasable area in square feet. (See Figure 8 and Appendix 7.)

A least squares correlation between the effective driving time and the gross leasable area in square feet, less food stores, yielded a trend line to determine the effective driving time of 1985 regional shopping centers.

Friction factors (travel restrictions measured in minutes per mile resulting from average driving time at a given distance) were derived for each sector of the trade area for the proposed shopping centers. (See Appendix 8.)

The final step involved the derivation of the total trade area radius by shopping centers. (See Table 6.) This was accomplished by dividing the effective driving time by the friction factor for each sector. The average of the eight sectors resulted in the total trade area radius.

To determine income of the trade areas (the consumption factor that approximates retail sales) a proportional estimate of income by traffic zone was determined. Patronage factors were distributed for shopping centers by traffic zone and the proportional income estimates were allocated for shopping centers by traffic zones. (See Appendix 9.)

Apply Control Factor-Test and Adjust Results

The control factor of 9.707% developed with the model using 1964 data was multiplied by the proportional estimate of income allocated to shopping centers by traffic zones.

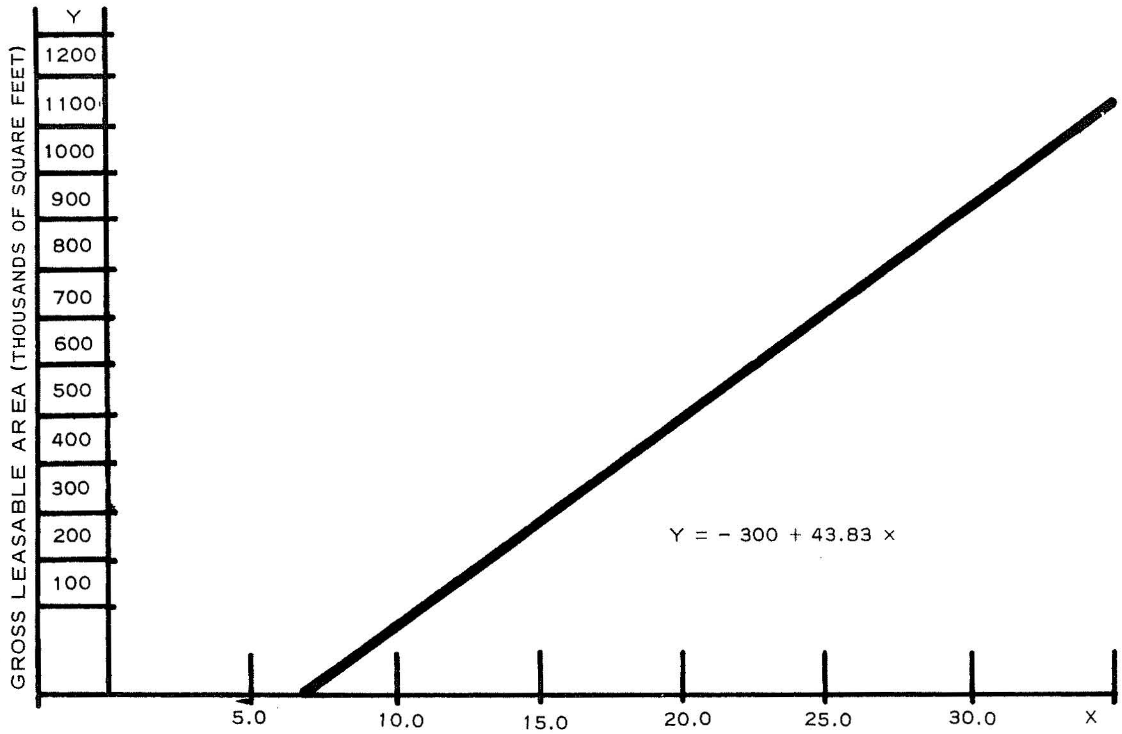
This provided an approximation of the retail sales of each center proposed for 1985. The retail sales data and the gross leasable area in square feet provided the sale per square foot for the centers. (See Table 7.)

The information was used as a basis to test the results against the criteria established to determine whether the location and size of the centers provided the objectives of sales stability, economies of operation, adequate service, and accessibility.

The comparisons or tests indicated the location and size of the centers met the objectives, except in the case of Biscayne Plaza. The model indicated that Biscayne Plaza would change to a

FIGURE – 8

REGIONAL SHOPPING CENTER SIZE – DRIVING TIME RATIO, MIAMI URBAN AREA, 1964



EFFECTIVE DRIVING TIME (MINUTES)

FOOD STORES WERE EXCLUDED

Table 6 - ESTIMATED GROSS LEASABLE AREA, EFFECTIVE DRIVING TIME, TRADE AREA RADII, SHOPPING AREAS 1985

Shopping Areas	Gross Leasable Area (Sq.Feet)	Effective Driving Time[1] (minutes)	Estimated Radii (miles)	Friction Factor Adjustments[2]	Final Radii (miles)
Palm Springs Mile (Business District)	1,103,700	32.0	15.0	-2.0	13.0
163 Street Shopping Center (Regional)	967,000	28.9	9.9	+0.1	10.0
Cutler Ridge Shopping Center (Regional)	729,200	23.5	10.6	-0.6	10.0
Northside Shopping Center (Regional)	645,700	21.6	8.1	-0.1	8.0
Richmond Dr.-I-95 Extension (Regional)	600,000	20.5	8.6	+0.4	9.0
Hollywood Mall[3] (Regional)	600,000	20.5	6.9	-1.4	5.5
Central Plaza (Regional)	577,500	20.0	7.8	-0.3	7.5
Dadeland Mall (Regional)	503,500	18.3	7.9	-0.4	7.5
Miami Lakes Shopping Center (Regional)	500,000	18.2	9.1	-0.6	8.5
Westchester Shopping Center (Regional)	367,800	15.2	5.7	-0.2	5.5
Homestead Plaza (Regional)	300,000	13.7	5.9	+0.1	6.0
Biscayne Plaza (Community Center)	300,000	13.7	4.5	0	4.5
TOTAL	7,194,400			-5.0	

(1) Derived by Facilities-Driving Time Ratio $x = \frac{y + 300}{43.83}$

(2) The general reductions in the Trade Area Radii are due to the common problem with the use of Friction Factors to estimate trip length: "Trip length with present friction factor shoots way out." A.F. Sevin, Model Split Seminar 3/30/67.

(3) Friction Factor approximate at 2.982

Table 7 - ESTIMATED RETAIL SALES, GROSS LEASABLE AREA, SALES PER SQUARE FOOT, SHOPPING AREAS, 1985[1]

Shopping Area	Retail Sales (Thousands)	Gross Leasable Area Square Feet (Thousands)	Sales Per Sq. Ft.
Biscayne Plaza (Community Center)	$10.7	300	$35.67[2]
163 Street Shopping Center (Regional)	82.3	967	85.11
Central Plaza (Regional)	48.5	578	83.91
Dadeland Mall (Regional)	41.7	504	82.74
Cutler Ridge Shopping Center (Regional)	57.6	729	79.01
Westchester Shopping Center (Regional)	21.6	368	58.69
Palm Springs Mile - CBD (Business District)	80.9	1,104	73.28
Northside Shopping Center (Regional)	39.7	646	61.46
Miami Lakes Shopping Center (Regional)	31.2	500	62.40
Homestead Plaza (Regional)	15.4	300	51.33
Richmond Dr.-I-95 Extension (Regional)	54.1	600	92.90
Hollywood Mall	-[3]	600	-
		Average $ per sq. ft.	69.68
	Minimum	Range $ per sq. ft.	51.33
	Maximum	" " " "	92.90
		% Difference in Range	81.6%

1/ 1964 Dollars

2/ This figure is not used to compute the range between minimum and maximum sales per square foot because the center will become a community center.

3/ This figure is not used because the northernmost portion of the trade area is not in the Miami Urban area.

community shopping center from a regional shopping center in 1985.[1]

The use of the model to make additional adjustments for the other centers was not necessary.

The annual increase in sales per square foot between 1964 and 1985 for regional shopping centers as a whole increased slightly higher than the yearly increase in personal income during the same period, reflecting sales stability.

The range between the lowest and highest per square foot sales in 1964 remained relatively constant to the range between the lowest and highest per square foot sales in 1985 reflecting economy of operations for the centers as a whole, and prosperity for the Miami Urban Area.

The increase in the gross leasable area in square feet of the centers between 1964 and 1985 was relatively the same as the increase in the number of households during the same period reflecting adequate service.

The cobweb pattern created by the location of community and shopping centers was similar to that of other areas in the United States, particularly the Northeastern Illinois Study. In addition, centers were located at four-mile intervals reflecting accessibility.

Only one test was necessary because: The Miami Urban Area task of forecasting was simplified with the availability of projections for a 1985 traffic system and projections for distribution of median income and number of households; the availability of master plans of the majority of private shopping centers because centers were still in the growth stage; and the use of the General Land Use Master Plan.

(1) See Findings pp. 50-51

FINDINGS

Nine regional shopping centers and 32 community centers probably will radiate from the central business district to serve as the framework for the cobweb-like commercial structure of the Miami Urban Area in 1985 or not long thereafter. (See Figure 9.) Timing forecasts can not be exact because findings are based on a 1985 population of 2½ million. This forecast, made in 1960, was reduced to 1,955,000 after the model was completed.

Application of the commercial model based on the 2½ million population forecast for 1985 indicated that seven of the eight existing centers likely will be expanded; three new regional shopping centers will be added; and one existing center will be reduced to a community center. In addition to the conversion of one regional to a community center, 13 new community centers were added to the existing 17 community centers. The development will occur, but in some cases, after 1985, based on a population of 1,955,000 for this period.

These findings were based on the assumption that existing trends and policies for large scale retail activity will continue. Market forces seem to point to retail centers of the scale envisioned in the General Land Use Master Plan to serve separate urban concentrations. Thus, one of the key components of metropolitan development appears to be consistent with the operation of urban growth processes.(1)

The location, square feet, and sales of regional shopping centers, as well as the size of the trade area and effective driving time to the centers was forecast for 1985. Location of community centers was estimated, but not tested by the model.

By-products also resulted from the development and application of the model. The technique that was established to determine the location and size of the regional shopping centers, also may be applied to testing and determining other parts of the commercial framework.

In addition, the results of this commercial model will be considered when the 1985 traffic network and General Land Use

(1) A Market Potential Model and Its Application to a Regional Planning Problem, by T. R. Lakshamanan and Walter G. Hansen, p. 3.

Master Plan are reviewed.

REGIONAL SHOPPING CENTERS

The 163rd Street Shopping Center likely will be the largest regional shopping center with almost a million square feet and Biscayne Plaza probably will become a community shopping center in 1985. The Cutler Ridge Shopping Center is expected to almost triple in size to become the second largest regional shopping center. Palm Springs Mile, although classified as a regional shopping center in 1964, is expected to resemble a business district more than a regional shopping center in 1985. When strip establishments are included, there would be more than a million square feet in the Palm Springs Mile area.

In order of size, the other regional centers probably will be: Northside Shopping Center, Richmond Drive-I-95 Extension Area, Hollywood Mall,[1] Central Plaza, Dadeland Mall, Miami Lakes Shopping Center, Westchester Shopping Center, Biscayne Plaza, and Homestead Plaza. (See Table 5.)

Retail sales in 1985 probably will range from slightly over $82 million at the 163rd Street Shopping Center to slightly over $15 million at the Homestead Plaza. (See Table 7.) Effective driving time for patrons going to and from the centers likely will vary from an average of 13.7 minutes at Biscayne Plaza and Homestead Plaza to 32 minutes at Palm Springs Mile. (See Table 7.)

Average radii of the trade area from which the regional shopping centers receive patrons is expected to range from 4.5 miles at Biscayne Plaza to 13 miles at Palm Springs. (See Table 6.)

Objectives

The objectives of the model...locating and estimating size of regional shopping centers to provide sales stability, economies of operation, adequate service, and accessibility...likely will be achieved for the Miami Urban Area as a whole. The model can be used again to more exactly evaluate centers on an individual basis which might reduce or increase size and alter geographic location.

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(1) Consideration was given to the Hollywood Mall in Broward County because some Miami Urban Area residents shop at the center.

Stability: The annual increase of sales per square foot probably will increase more than the annual median income, a requirement of the shopping center if sales stability is to be achieved. However, since the exact degree of increase was not established as part of the criteria to test sales stability, the results of the model can not be determined by this criteria alone.

The yearly increase in sales between 1964 and 1985 is expected to be 2.25% compared with the yearly increase in income of 1.60%. This is based on the average sales per square foot in 1964 of $43.67 compared with an estimated $69.68 for the centers as a whole in 1985. This represented an increase of $26.01 or a 59.5% total increase.

The weighted average of median income in 1964 was $4,971 compared with a likely weighted average of median income in 1985 of $6,936. This is an increase of $1,965 in 1964 dollars, or a total increase of 39.5%.

Economy: The range between minimum and maximum sales per square foot probably will remain relatively constant between 1964 and 1985, a requirement of the shopping centers, if economies of operation for the center and prosperity for the urban area are to be achieved.

In 1964, the lowest sales per square foot were $31.57 and the highest, $57.32 leaving a difference of $25.75, or a 81.6% range as a percent of the lower limit. In 1985, the highest sales per square foot is likely to be $92.90, and the lowest $51.33 leaving a difference of $41.57, or a 81.0% range as a percent of the lower limit.

Thus, the range in sales for 1964 and 1985 for the centers as a whole probably will be within 0.5 percentage points indicating a similar earnings mix (the amount and degree of business success throughout an area resulting in a range of earning factors).

Service: The increase in the size of the total square feet of the shopping centers is expected to be relatively the same as the increase in the total number of households in the Miami Urban Area, a requirement of the shopping centers, if adequate service is to be achieved.

The increase in the total gross leaseable area in square feet between 1964 and 1985 likely will reflect a 122% increase compared to a 125% increase in the number of resident households.

In 1964, there was a total of 3,234,475 square feet compared with 7,194,400 in 1985. Resident households, (including a portion of South Broward resident households) totaled 387,877 in 1964 compared with an expected 872,239 in 1985.

The increase in gross leaseable area compared with the number of households will probably differ only 3 percentage points when the Miami Urban Area and the shopping centers are considered as a whole.

Accessibility: The cobweb pattern of the commercial framework (retail regional and community shopping centers radiating from a CBD) of the Miami Urban Area probably will be similar to the pattern developed by other urban areas in the United States. Centers are expected to be located at approximately 4-mile intervals from the CBD.

The Miami Urban Area pattern was compared successfully to the Northeastern Illinois Study results. The test was made against this study because both areas have a water barrier to the east. The Northeastern Illinois Study had as a barrier, Lake Michigan, and the Miami Urban Area, the bays and Atlantic Ocean. (See Figures 9 and 10.)

Center-by-Center Summary

The testing of the model results against the four established criteria are summarized on a center-by-center basis. Consideration is given to Hollywood Mall in Broward County because some Miami Urban Area residents are expected to be shopping at this center in 1985.

Palm Springs Mile: This is located in Hialeah along W. 49th Street from Red Road to 12th Avenue. The area will continue to develop as a business district with regional center ramifications expanding west to the Palmetto Bypass to include strip-commercial establishments.

The model predicts sales of \$73.28 per square foot compared with \$28.99 in 1963 on the basis that there will be a 100% expansion to more than a million square feet, or to 1,103,700 in 1985. In 1963, the center contained 551,875 square feet.

Sales likely will total nearly \$81 million for shopping and convenience goods in 1985 compared with \$16 million in 1963. Effective driving time probably will be 32 minutes compared

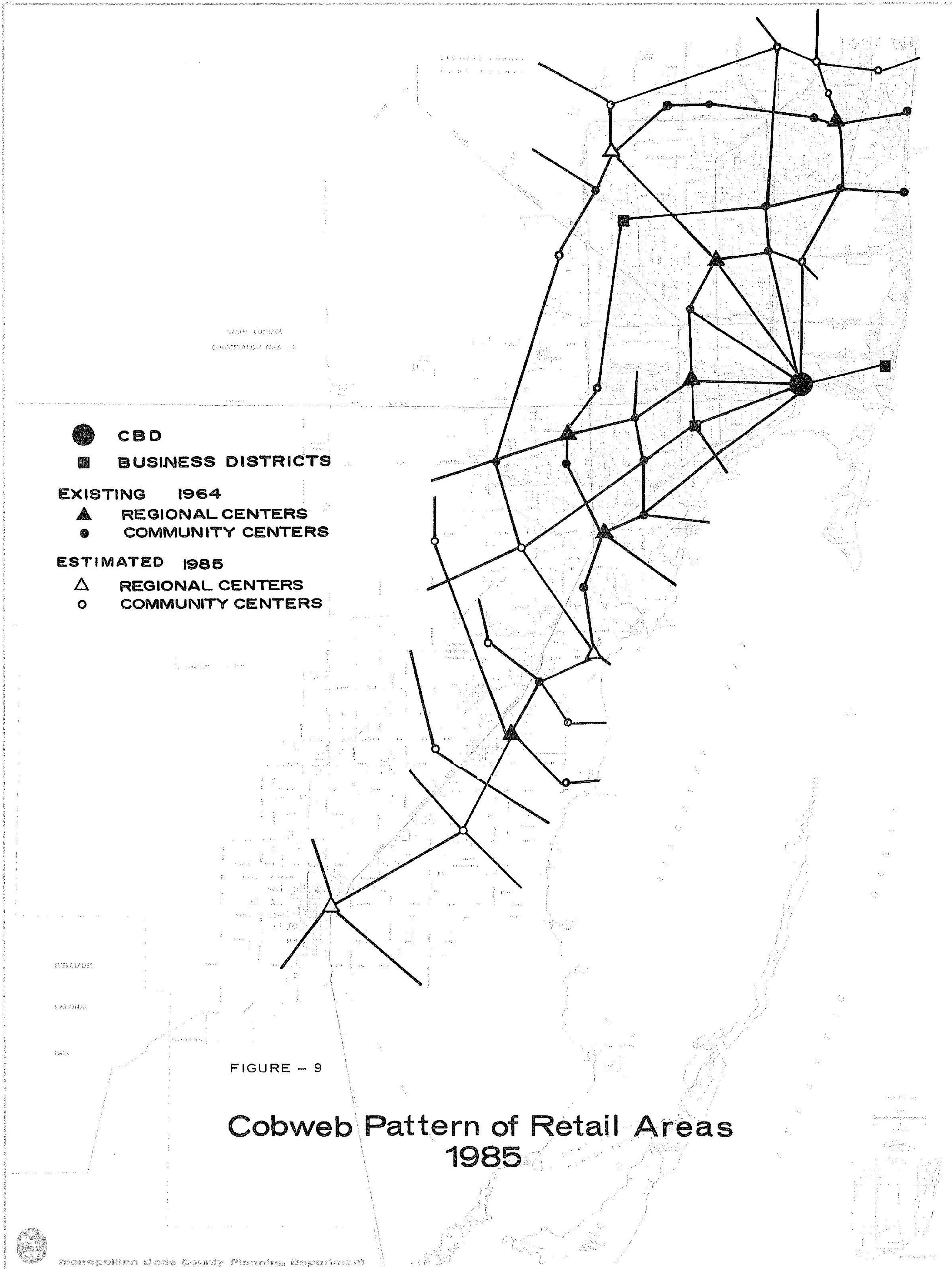


FIGURE – 9

Cobweb Pattern of Retail Areas 1985

Metropolitan Dade County Planning Department

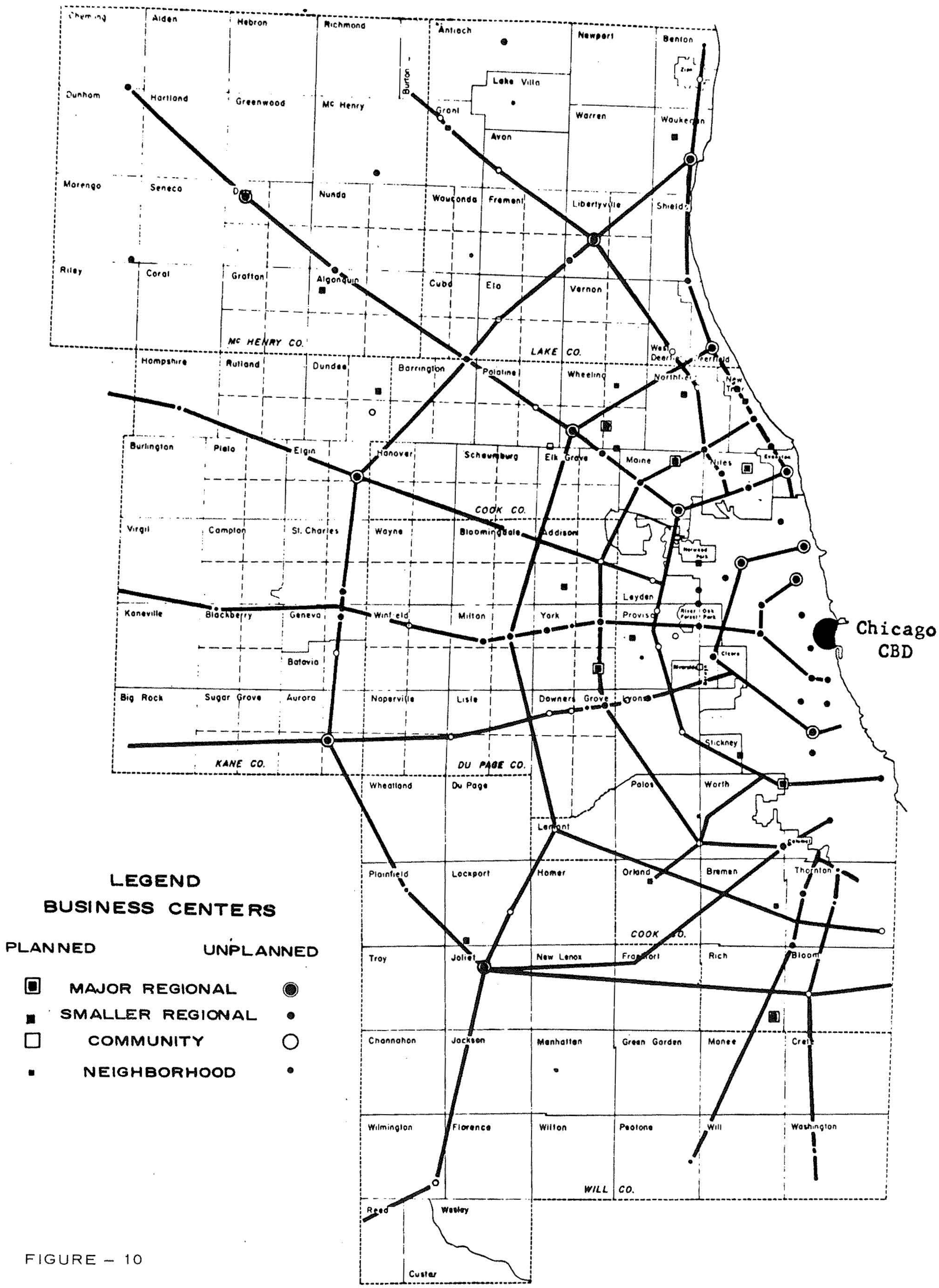
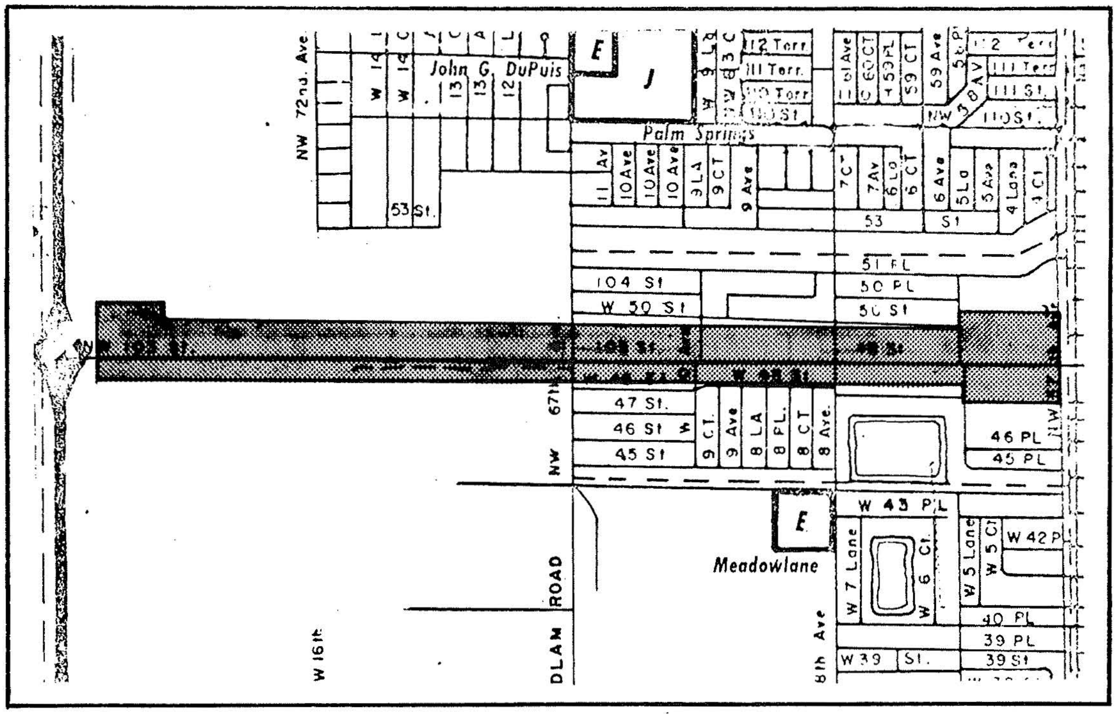


FIGURE – 10

Cobweb Pattern of Retail Centers

1980 Chicago Urban Area

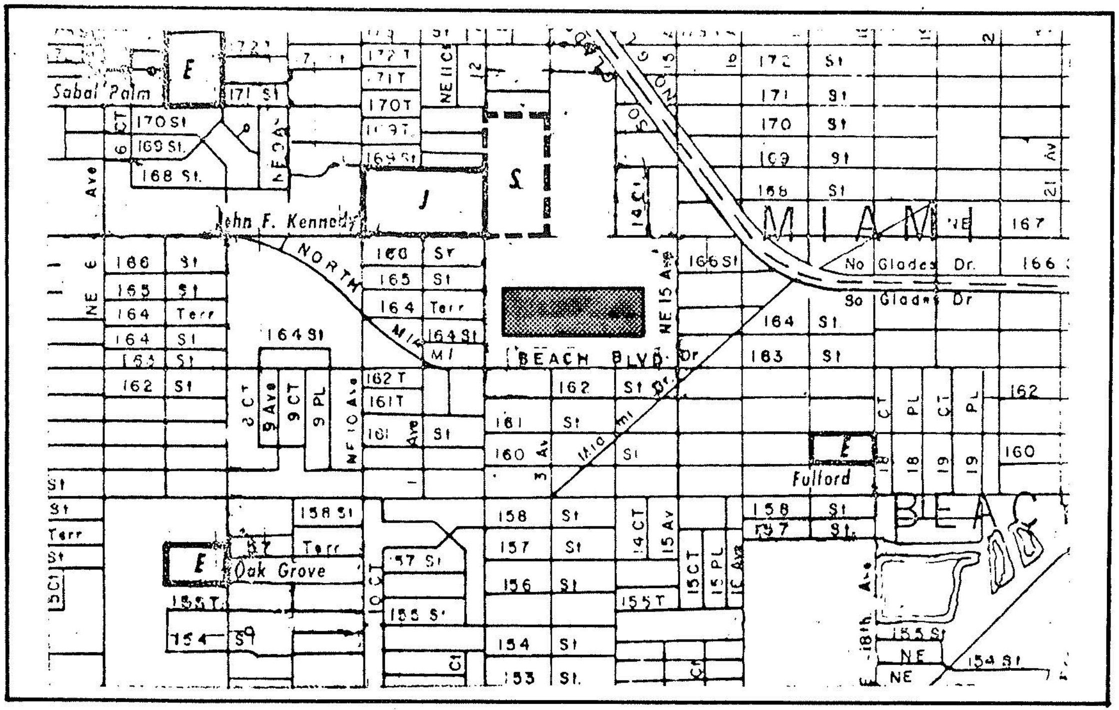
SOURCE: COMMERCIAL STRUCTURE, NORTHEAST ILLINOIS PLANNING COMMISSION, 1965



with 16.1 minutes in 1963, and the average radii of the trade area will extend to 13 miles instead of 7 miles. See map above.

<u>The 163rd Street Shopping Center</u>: This center is located in the unincorporated section of the Miami Urban Area, north of 163rd Street between N. E. 12th Avenue and 15th Avenue. The 1963 size of 645,000 square feet is expected to expand 50% to a near million square feet, or 967,000 in 1985. This would be the largest regional shopping center in the Miami Urban Area. The forecast is based upon a considerable population growth in the trade area.

The model predicts sales of $85.11 per square foot compared with $55.24 in 1963. This is based upon the forecast size which will yield about $82 million compared with almost $36 million for shopping and convenience goods in 1963.

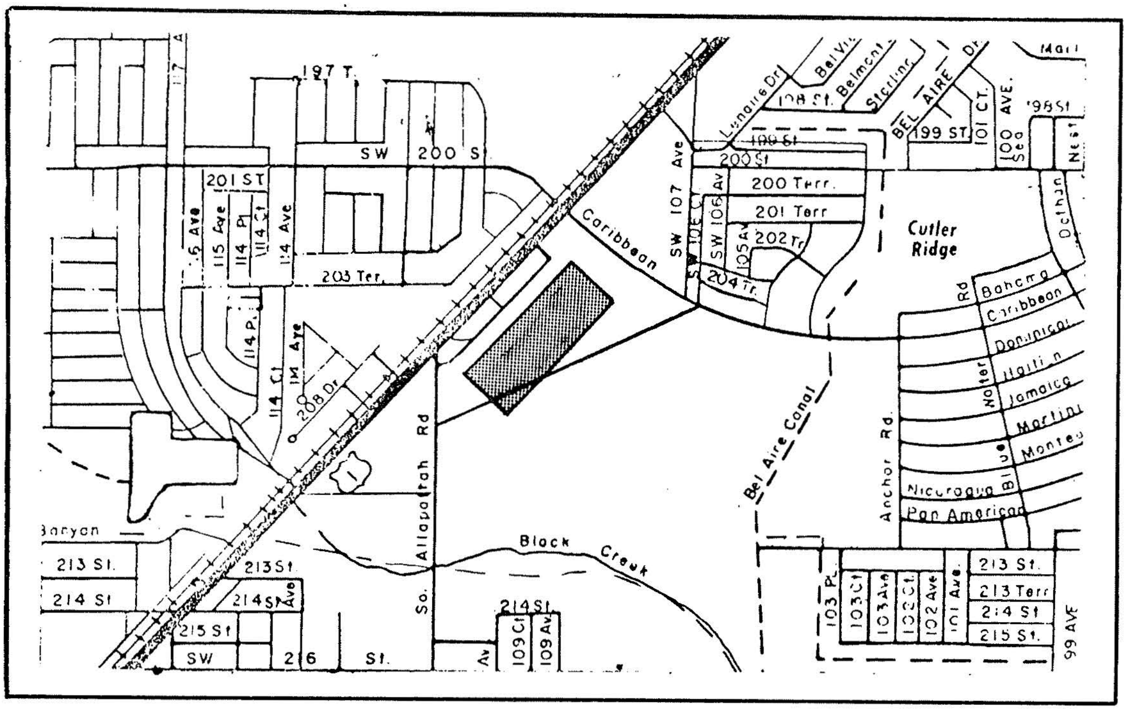


The radii of the trade area likely will extend to 10 miles from 7.5 in 1963 and effective driving time probably will be lengthened to 28.9 minutes from 20.5 minutes. See map above.

The Cutler Ridge Shopping Center: This is located in the unincorporated section of the Miami Urban Area southeast of South Dixie Highway between Caribbean Boulevard and Allapattah Road. The center is 18 miles southwest of the central business district of Miami, and is expected to be the second largest in size. Governmental agencies will be constructed within this trade area.

Cutler Ridge is expected to almost triple to 729,200 square feet in 1985 to serve the forecasted population. There were only 243,100 square feet at the center in 1963. Two or three major department stores will be added.

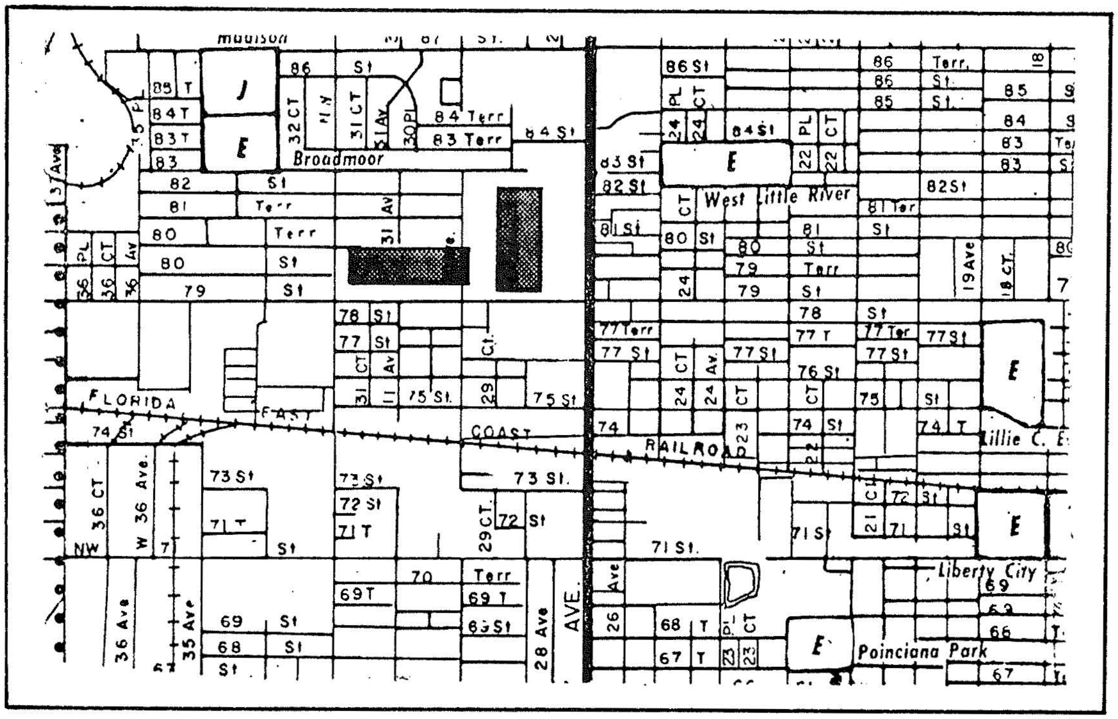
On the basis of this expansion, sales per square foot will total $79.01 compared with $43.49. Sales are expected to total nearly $58 million in 1985 compared with almost $11 million in 1963.



Effective driving time to and from the center probably will be 23.5 minutes compared with 14.9 minutes in 1964. The radius of the trade area likely will be extended to 10 miles compared with the 7.5 mile average in 1964. See map above.

<u>The Northside Shopping Center</u>: This is located in the unincorporated area of the Miami Urban Area at the intersection of N. W. 27th Avenue and N. W. 79th Street. Moderate expansion to 645,700 square feet is expected for 1985, from 485,000 square feet in 1963. This will be the third largest regional shopping center.

Sales of $61.46 per square foot are anticipated in 1985 compared to $57.32 in 1963. The 1985 earnings probably will be slightly below average reflecting an increased size and trade area of Palm Springs Mile and increased accessibility and trade area of Central Plaza in 1985. Total sales will be almost $40 million compared to about $27 million in 1963.

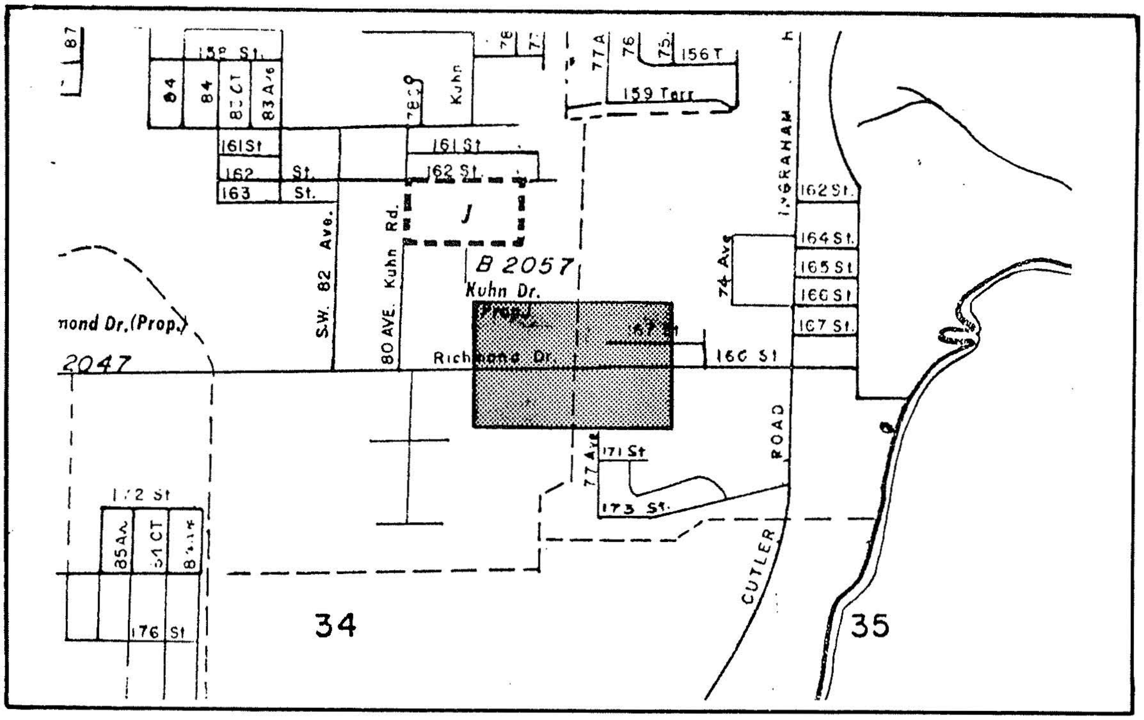


The effective driving time likely will be 21.6 minutes compared to 17.5 and the average radii of the trade area probably will be 8 instead of 6.5 miles. See map above.

Richmond Drive-I-95 Extension Area: This designates only an area and will be located in the unincorporated section of Miami Urban Area in the vicinity of the extension to the I-95 expressway. The forecast is based on the anticipated population growth in the area between Dadeland and Cutler Ridge; and the criteria of locating regional centers at about 4-mile intervals from the central business district.

The model forecasts a gross leaseable area of 600,000 square feet with sales of $92.90 per square foot, the highest in the Miami Urban Area. Total sales probably will be about $54 million.

Effective driving time likely will be 20.5 minutes with an average trade area radii of 9 miles.

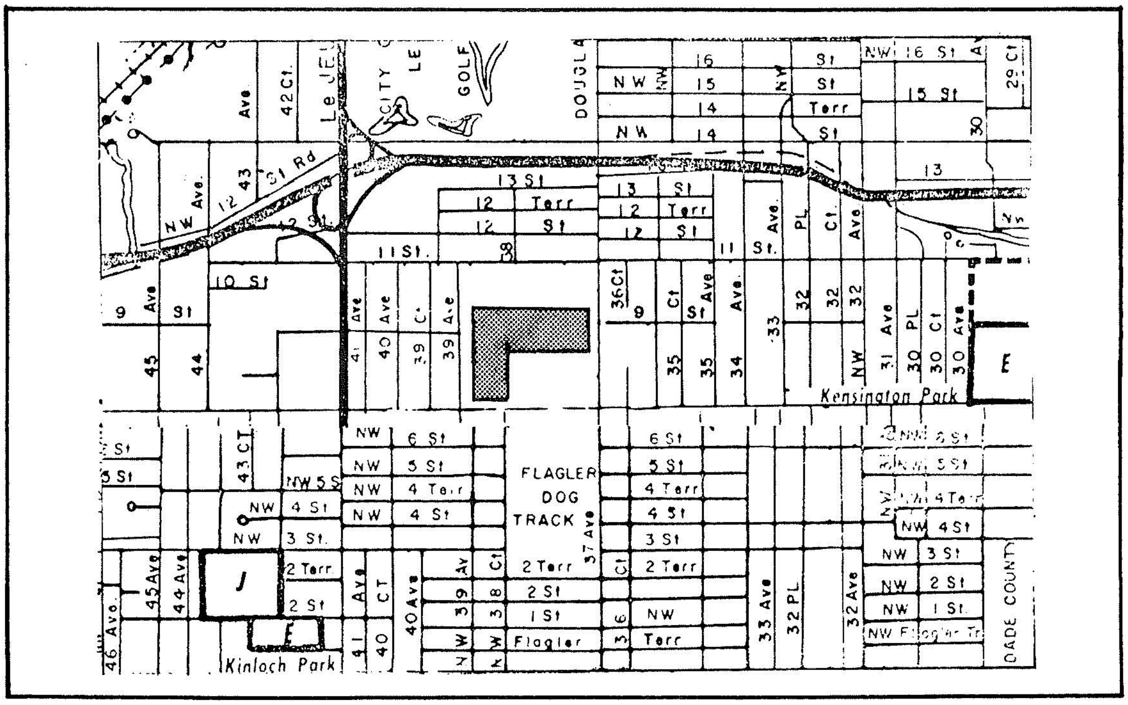


Increased market potential is due to general increase in population and development of South Bay Area and access to proposed expressways. The center would affect Dadeland and Cutler Ridge slightly. See map above.

The Hollywood Mall: This Broward County center is located at Hollywood Boulevard and Park Road one-half mile west of I-95. The 1985 gross leaseable area is forecast at 600,000 square feet with an effective driving time of 20.5 minutes and an average trade area radii of 5.5 miles. Sales were not calculated because only a part of the trade area will be in the Miami Urban Area. The balance will be in Broward County.

Central Plaza: The center is located in the City of Miami at the intersection of Douglas Road and N. W. 7th Street. Size is expected to increase to 577,500 square feet from 330,000 square feet. This is assuming that an air-conditioned mall will be built to over-come expansion problems created by the L-shaped center.

The 730,000 square foot parking area in 1963 is considered more than adequate for such expansion. Forecasts are based

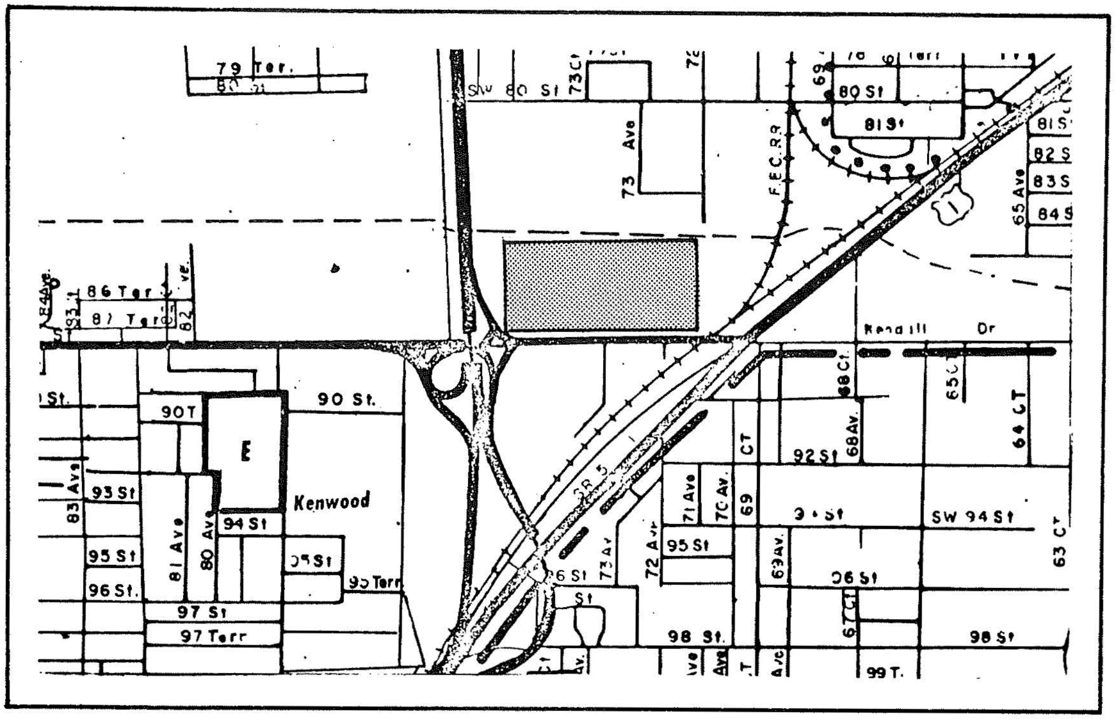


upon the fact that a considerable population increase is expected and both the LeJeune and East-West Expressway exits will be within one-half mile of the Central Plaza.

With this increase in size, sales will almost total $49 million compared with almost $12 million in 1963. The model forecasts sales of $83.91 per square foot in 1985 compared with $35.57 in 1963.

The radii of the trade area will extend to an average of 7.5 miles, a considerable increase from the 3.25 radii in 1963. Effective driving time will average 20 minutes compared to 12.6 minutes in 1963 reflecting the more extensive trade area from which the center would draw patrons.

Dadeland Mall: This center is located in the unincorporated section of the Miami Urban Area north of Kendall Drive between the Palmetto Bypass and the South Dixie Highway. Expansion is forecast at 503,500 square feet from 373,000 in 1963.

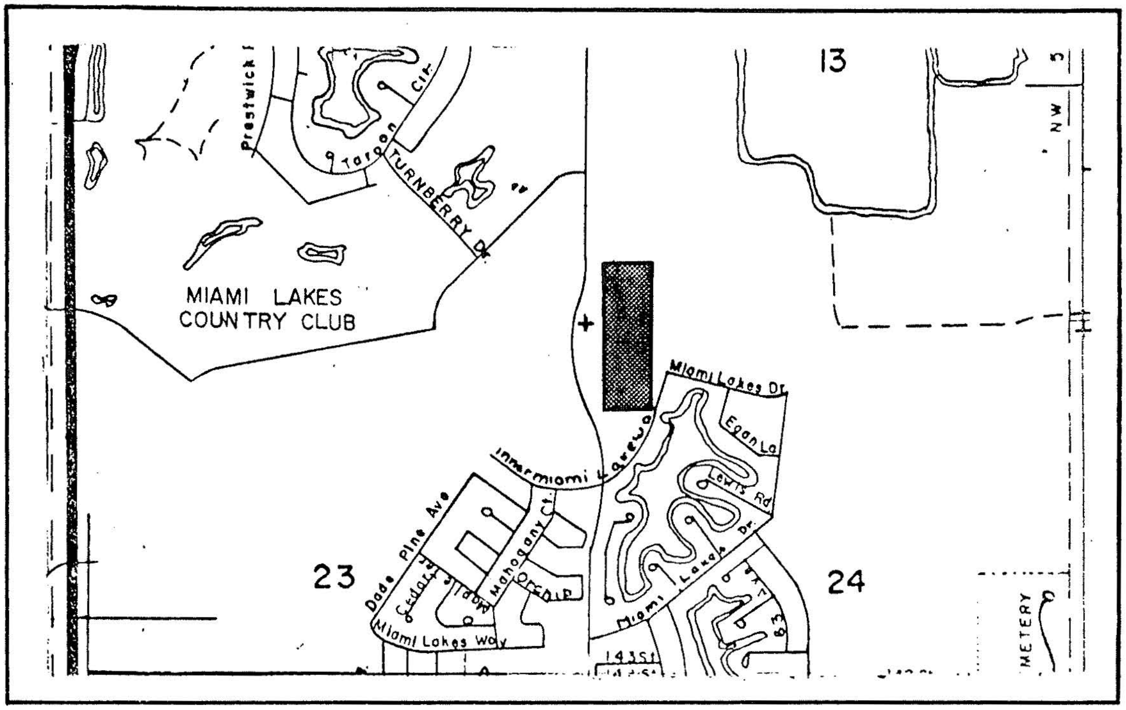


The model forecast sales of \$82.74 per square foot assuming a moderate 35% expansion from 1963 when the rate was \$46.25. Total sales are expected to reach almost \$42 million in 1985 compared with about \$17 million in 1963.

Effective driving time is expected to increase to 18.3 minutes from 14.2 minutes with the distance of the trade area extending to a 7.5 average radii compared with 6 miles in 1963.

<u>The Miami Lakes Shopping Center</u>: This is proposed along Ludlam Road north of the Miami Lakes Drive intersection to serve the population growth forecast in the northwest part of the Miami Urban Area. The proposal is based on the Miami Lakes Master Plan which indicates a site of approximately 70 acres for a regional shopping center.

The forecast market potential is excellent in this area and the accessibility will increase with the Opa-locka Expressway. Size is forecast at 500,000 square feet with an average sales of \$62.40 per square foot. Total sales are forecast at around \$31 million. But the shopping area may develop as a community center before



becoming a regional center, particularly since the population forecast for this area was reduced by the 1968 revision.(1)

The trade area that the Miami Lakes Shopping Center will serve is expected to be along both the Palmetto Bypass and the Golden Glades Expressway. This center will affect the trade area of Palm Springs Mile, but not to a significant degree.

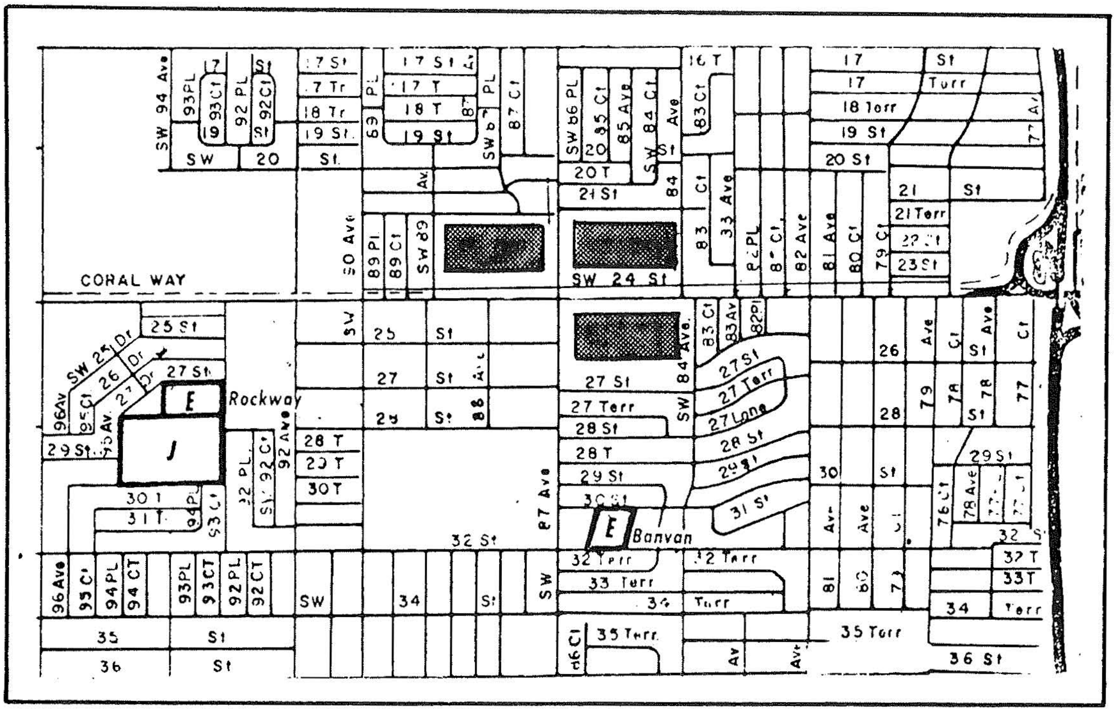
Effective driving time is forecast at 18.2 minutes with a trade area radii of 8.5 miles.

The Westchester Shopping Center: This includes Coral Way, and will expand to the southeast corner of the intersection at Coral Way and Galloway Road.

Minimal expansion of 20% to 367,800 square feet is forecast for 1985 from 306,500 square feet in 1963. On this basis, the model forecast sales of $58.69 per square foot in 1985 compared with $36.22 in 1963. Sales totaled around $11 million for shopping

(1) See page 35

and convenience goods and are expected to be between $21 and $22 million in 1985. The sales rate is slightly below average because Westchester is on the edge of the urban area.

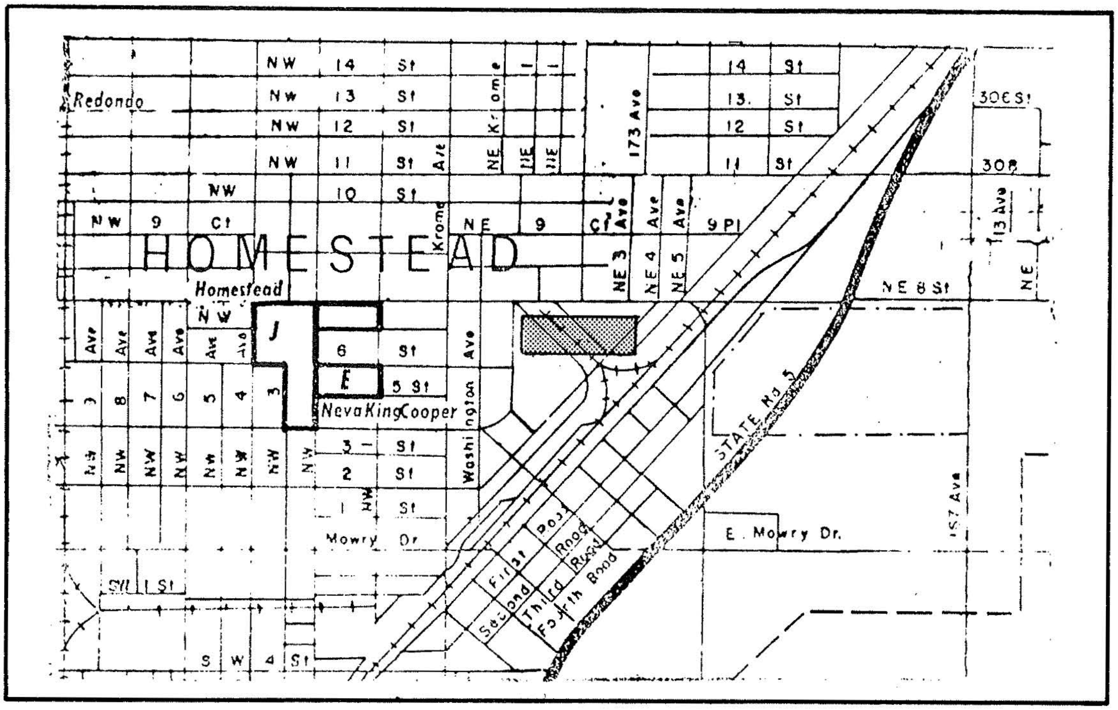


Small expansion is expected primarily because of the increased size expected for the trade area of the Central Plaza which competes heavily on the east side of the Westchester Shopping Center trade area.

Effective driving time likely will increase to 15.2 minutes from 12.6 minutes. Radii of the trade area probably will increase only half a mile to 5.5 miles in 1985 from a 5-mile average in 1963.

Homestead Plaza: This center probably will be located in the city of Homestead, south of Campbell Drive between English Street and N. Flagler Avenue. This represents an expansion of an existing community shopping center to a regional shopping center.

The master plan for the Homestead Plaza calls for the addition of a 126,500 square foot major department store and a total area of 300,000 square feet in 1985.

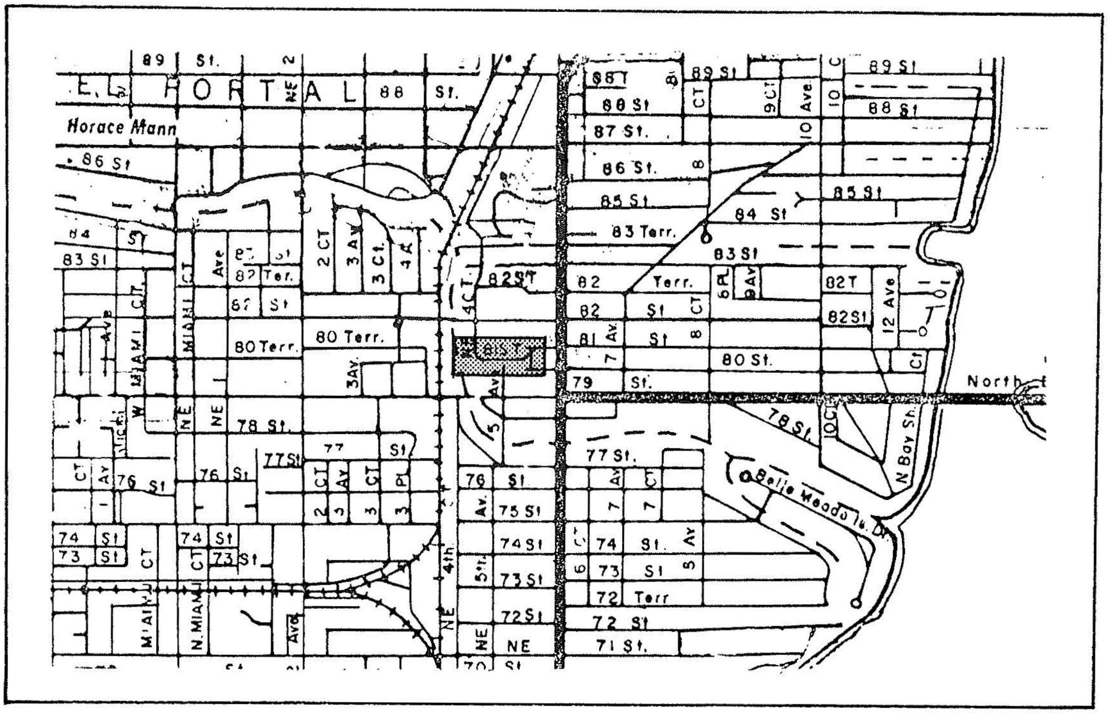


The model forecasts sales at $51.33 per square foot on the basis of this expansion. Sales probably will total around $15 million. The sales per square foot would be the lowest, but the center is in an area of low density where the population still has room to increase. In addition, patrons from Monroe County, who will reflect 7 to 10% of total sales, are not included in the model.

Effective driving time is forecast at 13.7 minutes with a trade radii averaging 6 miles.

Biscayne Plaza: This center is located in the City of Miami at the intersection of Biscayne Boulevard and N. E. 79 Street. The model indicates that the 1985 size will be the same as 1963; that is, 300,000 square feet.

Better accessibility to and expansion of surrounding shopping centers is expected to increase competition. The land use of Biscayne Plaza likely will gradually convert to office and professional usage creating a community rather than regional shopping center.



Retail sales of shopping and convenience goods, on this basis, likely will increase to $10,700,000 from $9,471,000 in 1963. Shopping goods represented 53.2% of the total shopping and convenience goods purchased at the center in 1963, or $5,039,000.

Sales probably will increase $4.10 per square foot to $35.67 from $31.57. This is not a feasible rate of earning for a regional shopping center. The 24,000 square feet occupied by the largest tenant in 1963 was small for a regional center. The second story of the center contains 45 office units.

Parking space totaled 900,000 square feet in 1963, an index of 6 spaces per 1,000 square feet of the gross leaseable area, or a total of 1,700 spaces. This represented a deficit of 100 spaces.

Average estimated driving time to the center was forecast at 13.7 minutes in 1985 compared with 13.4 minutes in 1963. The average radii of the trade area likely will be slightly lower; 4.5 miles instead of 4 miles in 1963.

There were 1,400,000 per person shopping trips in 1963 with each trip representing an average sale of $6.72.

COMMUNITY SHOPPING CENTERS

Thirty-two community shopping centers are expected to be located in the commercial framework of the Miami Urban Area for 1985. This includes the Biscayne Plaza Shopping Center.(1) The locations were not tested by the model, but were forecast to complete the cobweb picture of the area in which regional and community shopping centers were interrelated with the business districts as part of the commercial framework. (See Figure 8.)

The 32 community centers include 17 centers existing in 1964, the conversion of the Biscayne Shopping Center to a community shopping center, and the addition of 14 new centers.

New locations were selected because: They would become an integral part of the cobweb pattern; there was a market potential based upon an analysis of the personal income; and sometimes locations were part of recognized master plans of the centers.

The forecast for community shopping centers is flexible and may fluctuate as much as a mile in any direction. In addition, other community shopping centers may develop because the range in size is so great for community shopping centers. A center may serve one market area or two centers of smaller size may serve the same area. (See Figure 11.)

Biscayne Village, forecast as a community center for 1985, may become a regional center sometime after 1985.

The following are approximate locations for 15 market areas estimated for community shopping centers:

1. Honey Hill Drive at N. E. 10 Avenue
2. N. W. 188 Street at N. W. 69 Avenue
3. N. W. 90 Street at N. W. 97 Avenue
4. Flagler at West 77 Avenue
5. Kendall Drive at S. W. 107 Avenue
6. Kendall Drive at S. W. 137 Avenue
7. Richmond Heights Area
8. Franjo Road at Old Cutler Road
9. S. W. 232 Street at S. W. 87 Avenue
10. S. W. 216 Street at S. W. 137 Avenue
11. S. W. 268 Street at S. W. 137 Avenue
12. Biscayne Village, U. S. 1 and N. E. 195 St.

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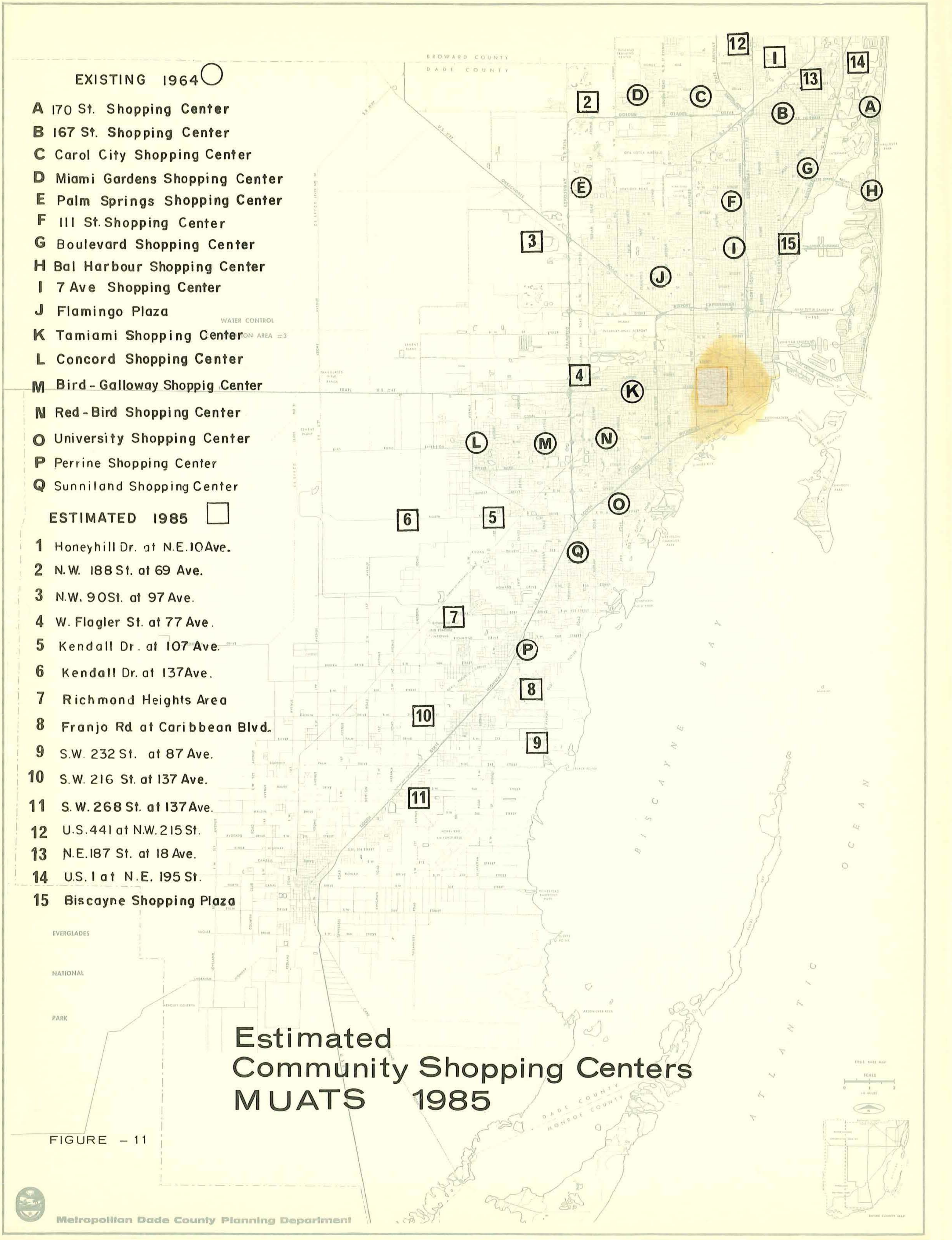
(1) The 1963 Biscayne Plaza Shopping Center is expected to be a community shopping center in 1985.



Estimated
Community Shopping Centers
MUATS 1985

FIGURE – 11

13. U. S. 441 and N. W. 215 Street
14. N. E. 187 Street and N. E. 18 Avenue
15. Biscayne Plaza, Biscayne Boulevard and N. E. 79 Street

The 17 community centers existing in 1963 that are expected to continue as community centers in 1985 are:

1. Bal Harbour Shopping Center
2. 7 Avenue Shopping Center
3. Flamingo Plaza
4. Tamiami Shopping Center
5. Concord Shopping Center
6. Bird-Galloway Shopping Center
7. 170 Street Shopping Center
8. Perrine Shopping Center
9. Sunniland Shopping Center
10. 167 Street Shopping Center
11. Carol City Shopping Center
12. Miami Gardens Shopping Center
13. Palm Springs Shopping Center
14. 111 Street Shopping Center
15. Boulevard Shopping Center
16. Red-Bird Shopping Center
17. University Shopping Center

BY-PRODUCTS

The market potential model, although developed in response to a specific planning problem, also will have a more general application.(1)

(1) Market Potential Model and Its Application to a Regional Planning Problem, by T. R. Lakshamanan and Walter G. Hansen, p. 3&4.

The results of the model provide important information to be considered when the General Land Use Master Plan and transportation networks are reviewed. Future highway network proposals will be able to take into consideration the location of the regional and community shopping centers developed by the model. However, consideration must be given to the fact that the application of the model was based on the 1960 forecast of 2½ million people in 1985 rather than the 1968 revised figures forecasting 1,955,000 people in 1985.

The model will provide a basis for revision of the commercial structure if there are any changes in income distribution or the transportation system. The model also can be used to develop the location and size of other parts of the commercial structure.

GLOSSARY

ABBREVIATION

CBD - Central Business District

EDT - Effective Driving Time

GLUMP - General Land Use Master Plan

GLA - Gross Leasable Area

MUATS - Miami Urban Area Transportation Study

MUA - Miami Urban Area

SYMBOLS

C - personal consumption of Keynesian economic theory.

b - marginal propensity to consume in Keynesian economic theory.

t - a percentage tax factor used in the consumption model for this report.

Y - gross national product or gross national income in Keynesian economic theory.

Y_a - total proportional estimate of income for the Miami Urban Area for the year $_a$.

y_a^{tz} - median income for traffic zone ^{tz} and the year $_a$.

h_a^{tz} - resident households for traffic zone ^{tz} and year $_a$.

Y_a^{tz} - proportional estimate of income for traffic zone ^{tz} and year $_a$.

r_t - total trade area radius.

SYMBOLS (continued)

r_n - radius of the concentric circle that is derived by: $r_n = r_t \log n$.

sc_n - regional shopping center whereby $_n$ denotes the number of the center.

$p_a^{sc}n$ - patronage factor for shopping center ^{sc}n and a year $_a$. This notation is used with respect to a single traffic zone.

$S_{p\ a}^{tz}$ - sum of the patronage factors for all the shopping centers for a specific traffic zone.

$P_a^{sc}n$ - revised patronage factor for shopping center ^{sc}n for year $_a$.

$I_a^{sc}n/^{tz}$ - allocation of the proportional income estimate for shopping center ^{sc}n by traffic zone ^{tz} for year $_a$.

$SI_a^{sc}n$ - sum of the allocation of proportion income estimates for shopping center ^{sc}n for year $_a$.

TR_a - total retail sales of convenience and shopping goods for the Miami Urban Area for year $_a$.

f_1 - total retail sales for shopping and convenience goods as a percent of the proportional estimate of income.

TCR_a - total retail sales of convenience and shopping goods for regional shopping centers in the Miami Urban Area for year $_a$.

TI_a - total allocation of proportional incomes for the Miami Urban Area for year $_a$.

f_2 - total retail sales of convenience and shopping goods for regional shopping centers as a percent of the total allocation of proportional incomes in the Miami Area.

F_a - "Control Factor" for year $_a$.

R_a^{sc} - retail sales for shopping center ^{sc} for year $_a$.

APPENDIX I. - MUATS BACKGROUND STUDIES

Study Design for MUATS

Economic, Population Land Use Projections

Community Attitudes for Transportation Planning

Laws and Ordinances

Goals for Transportation

Implementation of the Plan

Continuing Program for Transportation Planning

Transit Cost Allocation Model Development

Present Transit Service

Corridors for Transit Improvement

Route, System Design and Cost Estimate

Forms of Mass Transportation

Evaluation of Alternate Transit Plans

APPENDIX II. - SHOPPING CENTER SIZE - DRIVING TIME RATIO, 1964

$$\frac{\text{Driving Time}}{\text{Direct Distance}} = \text{Friction Factor}$$

$$\text{Friction Factor} \times r_t = \text{EDT}$$

Given:

1. EDT by Regional Shopping Center
2. D.T. by Sector
3. A.D. by Sector

$$r_t = \frac{\text{EDT}}{\text{F.F.}}$$

$$r_t = \frac{\text{EDT}}{(\frac{\text{DT}}{\text{AD}})}$$

DRIVING TIME - determined by the quotient of distance by speed as given by the Link-Node Network. The result was factored by .60 to give an answer in minutes for this report. The derivation is illustrated below:

Given by Link-Node Network:

1. SPEED - in miles per hour
2. DISTANCE - in miles

Thus:

$$\frac{\text{DISTANCE}}{\text{SPEED}} = \text{Driving Time (hours)}$$

$$\frac{\text{miles } /1}{\text{miles } /\text{hr.}} = \text{Driving Time (hours)}$$

$$\frac{\text{hour}}{1} = \text{Driving Time (hour)}$$

$$\text{hour } .60 = \text{Driving Time (minutes)}$$

DIRECT DISTANCE - the straight line between two locations.

FRICTION FACTOR - travel restriction measured in minutes per mile, which results from average driving time for a given distance. The derivation is illustrated below:

Given:

1. Driving time by sector - in minutes
2. Direct distance by sector - in miles

Thus:

$$\frac{\text{DRIVING TIME}}{\text{DIRECT DISTANCE}} =$$

$$\frac{\text{minutes}}{\text{miles}} = \text{Friction Factor}$$

EFFECTIVE DRIVING TIME - the estimated driving time for a given distance. The derivation is illustrated below:

$$\text{Friction Factor} \cdot r_t = \text{Effective Driving Time}$$

APPENDIX III. - ASSIGNING PATRONAGE FACTORS, 1964.

The logarithmic circle theory was used to assign patronage factors to traffic zones. If the traffic zone had a sum of patronage factors greater than one, factors were proportionately reduced to equal a sum of one.

The following table demonstrates the method of recording the patronage factors by traffic zone for the shopping centers.

Patronage Factors for Shopping Center by Traffic Zones

Shopping Center / Traffic Zone	sc_1	sc_2	sc_3	sc_4
tz	.90 (.58)	.45 (.29)	.20 (.13)	----

Since the sum of the patronage factor for the traffic zone (Sp_a^{tz}) must be equal to or less than one, the above sum of 1.55 must be proportionally reduced to a sum of one. This process was accomplished by dividing each patronage factor for the individual shopping center ($P_a^{sc}n$) by the sum of the patronage factors for the traffic zone as follows:

$$P_a^{sc}n = \frac{P_a^{sc}n}{S_{pa}}$$

The adjusted patronage factor was derived by use of the above formula and was used later to distribute the disposable income of the traffic zone.

APPENDIX IV - ALLOCATION OF PROPORTIONAL ESTIMATE OF INCOME, 1964

The process of distributing the proportional estimate of income for each traffic zone was the product of the patronage factor for each shopping center ($P_a^{sc_n}$) times the proportional estimate of income (Y_a^{tz}). The formula for the allocation of proportional estimate of income table was:

$$P_a^{sc_n} \cdot Y_a^{tz} = I_a^{sc_n/tz}$$

This process yielded the allocation of the proportional estimate of income for each traffic zone by shopping centers for the year a noted ($I_a^{sc_n/tz}$). The following sample table demonstrated the method of recording the allocation of the proportional estimates of income for each shopping center.

Allocation of Proportional Estimates of Income to Shopping Center by Traffic Zones

Shopping Center / Traffic Zone	sc_1	sc_2	sc_3	sc_4
tz_1	$I_a^{sc_1/tz_1}$		$I_a^{sc_3/tz_1}$	
tz_2		$I_a^{sc_2/tz_2}$	$I_a^{sc_3/tz_2}$	$I_a^{sc_4/tz_2}$
tz_3	$I_a^{sc_1/tz_3}$	I^{sc_2/tz_3}	I^{sc_3/tz_3}	
Totals	$SI_a^{sc_1}$	$SI_a^{sc_2}$	$SI_a^{sc_3}$	$SI_a^{sc_4}$

The total for each shopping center in the sample table was denoted ($SI_a^{sc_n}$) and derived by the sum of the allocations recorded for the subject shopping center as follows:

$$I_a^{sc_n/tz_1} + \ldots + I_a^{sc_n/tz_n} = SI_a^{sc_n}$$

APPENDIX V. - DEVELOPING CONTROL FACTOR

The derivation of the control factor was a two step process. Step one: to derive the total retail sales for shopping and convenience goods for the Miami Urban Area as a percent of the proportional estimate of income. Step two: to dervive the proportion of the above retail sales serviced by regional shopping centers. The control figure for the first step was the total retail sales of convenience and shopping goods for the Miami Urban Area, noted (TR). This was divided by the total proportional estimate of income (Y_a) to give a percentage factor (f_1):

$$\frac{TR_a}{Y_a} = f_1$$

The control figure for the second step was the total retail sales of shopping and convenience goods for the subject shopping centers noted (TCR_a). This control figure was divided by the sum of the totals of the allocation of proportional incomes:

$$SI_a^{sc}1 + \ldots + SI_a^{sc}n = TI_a.$$

The above figure represented the total allocation of proportional incomes (TI_a) for the Miami Urban Area. The resulting second factor was derived as follows:

$$\frac{TCR_a}{TI_a} = f_2$$

The control factor was the product of the above two factors:

$$f_1 \cdot f_2 = F_a.$$

The control factor noted (F_a), was subsequently used to adjust the total allocation of proportional incomes by shopping centers ($SI_a^{sc}n$). This resulted in retail sales for shopping and convenience goods by shopping center ($R_a^{sc}n$):

$$F_a \cdot SI_a^{sc}n = R_a^{sc}n \cdot$$

APPENDIX VI - TESTING AND ADJUSTING CONTROL FACTOR

First Test

The total 1964 retail sales of convenience and shopping for the Miami Urban Area (TR_{64}) was \$1,005,161,000. The total 1964 proportional estimate of income for the Miami Urban Area (Y_{64}) was \$1,928,152,000. Thus, f_1 was derived as 52.130%. The total 1964 retail sales of convenience and shopping goods for regional shopping facilities (TCR_{64}) was \$139,545,000. The total 1964 allocation of proportional incomes for the Miami Urban Area (TI_{64}) was \$881,629,000. Thus, f_2 was derived as 15.828%. The product of f_1 and f_2 yields the control factor, 8.251%. The elements and results of the control factor for the first test are illustrated below. The dollar amounts are represented in thousands.

$$f_1 = \frac{TR}{Y_a} = \frac{\$1,005,161}{\$1,928,152} = 52.130\%$$

$$f_2 = \frac{TCR}{TI_a} = \frac{\$139,545}{\$881,629} = 15.828\%$$

$$F_{64} = f_1 \cdot f_2 = 52.130 \cdot .15828 = 8,251\%$$

The product of the control factor (F_{64}) and the allocation of proportional income ($SI_a^{sc}n$) is represented in the following table.

Results of the First Test

Shopping Center	$SI_a^{sc}n$ Allocation of Proportional Income to Shopping Center	$R_a^{sc}n$ Allocation of Income after Factoring by 8.251%	Variance from Actual Sales
Central	\$224,091.5	\$18,490.1	+58.1%
Westchester	158,702.5	13,094.8	+18.0%
Dadeland	194,971.4	16,087.4	- 6.9%
Cutler Ridge	69,878.6	5,765.8	-45.3%
163rd Street	517,678.1	42,714.3	+19.9%
Palm Springs Mile	166,535.9	13,741.1	-14.3%
Northside	296,809.0	24,490.1	-10.7%
Biscayne	62,545.2	5,160.7	-44.7%

The result of the first test showed an average variance from the actual sales of 27.2%. An analysis of the individual shopping center results, revealed that a travel restriction should be considered in approximating driving time. The most striking examples were Central Plaza and Biscayne Plaza which varied 58.1% and 44.7% respectively from actual sales. A further adjustment considering travel restriction would decrease the variance of the above two shopping centers.

Second Test

The second test incorporated five additional considerations into the basic procedure as originally tested. These five adjustments were: (1) The adjustment of the initial trade areas to comply to travel restriction resulted in the following radii:

Shopping Center	Radii
Biscayne Plaza	4.0 miles
163rd Street Shopping Center	7.5 miles
Central Plaza	3.5 miles
Dadeland Mall	6.5 miles
Cutler Ridge Shopping Center	7.5 miles
Westchester Shopping Center	5.0 miles
Palm Springs Mile	7.0 miles
Northside Shopping Center	7.0 miles
Hollywood Mall[1]	5.0 miles

(2) The assumption that the trade area could be divided into eight equal sectors. Each sector may be factored with respect to the adjustments being incorporated in the second test.[1]

(3) The first adjustment utilized the sector theory increasing patronage factors for sectors where there was no competition from other regional shopping centers. This adjustment was done in three areas: 1. To the SSW and WSW sectors of Cutler Ridge Shopping Center, 2. to the WSW and WNW sectors of Westchester and 3. to the WSW and WNW sectors of Palm Springs Mile. The Cutler Ridge trade area was further adjusted to a distance of r_t log 50 in the SSW and WSW sectors. The basis for this

(1) Hollywood Mall was included by mistake, because it was not operational in Spring 1964.

extension was information concerning trip attractions for shopping and convenience goods.(1)

(4) The patronage factors were reduced where natural or man made barriers were a hinderance to travel. The two major adjustments of this type were: 1. south of the Miami International Airport with respect to Palm Springs Mile and 2. northeast of the Miami River with respect to Central Plaza.

(5) The patronage factors were reduced for traffic zones comprising the CBD and business districts. This adjustment was carried out throughout the Miami Urban Area, because residents in CBDs are by-in-large within walking distance of shopping facilities. The following center trade area:

Biscayne Plaza - The patronage factors were reduced by .20 to the SSE and SSW sectors as per Factor (1). The patronage factors were increased by .10 to the WNW sector as per Factor (1). The patronage factors in traffic zones 139, 140, 141, 142, 159, 160, and 161 were reduced by .10 as per Factor (5).

163rd Street Shopping Center - The patronage factors were decreased by .10 to the ENE as per Factor (3). The addition of competition to the north from Hollywood Mall was added to the model. (This was later found in error and eliminated.) The patronage factors for traffic zones 213, 159, 160, 161, 543, 544, 139, 140, 141, and 142 were decreased by .10 as per Factor (5).

Central Plaza - The patronage factors northeast of the Miami River were increased by .10 as per Factor (4). The patronage factors for traffic zones 322, 323, 325, 326, 327, 44, 293, 294, 295 and 299 were decreased by .10 as per Factor (5).

Dadeland Mall - The patronage factors to the SSW sectors were increased .10 as per Factor (1). The patronage factors in traffic zones 322, 323, 324, 325, 326, 327, 44, 45, 355, 356, 357 and 358 were reduced by .10 as per Factor (5).

---

(1) Mel Conner & Associates, Inc., Dade County Productions and Attractions Abbreviations listing, Gravity Model Run, Home based person trips for shopping and convenience goods.

Cutler Ridge - The patronage factors were increased by .10 to the NNE sector as per Factor (1). The patronage factors were increased by .50 to the WSW and SSW sectors as per Factors (1) and (3). The WSW and SSW sectors were extended to r_t log 50 with a patronage factor of .50. The basis of adjustment is the great amount of trip attractions from that area coupled with easy accessibility via U. S. Highway #1.

Westchester - The patronage factors were increased by .20 to the WSW and WNW sectors as per Factor (3). The patronage factors for traffic zones 322, 323, 324, 325, 326, 327, 355, 356, 359 and 358 were decreased by .10 as per Factor (5).

Palm Springs Mile - The patronage factors were decreased by .10 south of the Airport Expressway as per Factor (4), and the traffic zones south of the Miami International Airport were eliminated from the trade area as per Factor (4). The patronage factors for traffic zones 292, 293, 294, 295, 299, 213, 141, 142, 139, and 140 even decreased by .10 as per Factor (5).

Northside Shopping Center - The area south of Miami International Airport was eliminated from the trade area as per Factor (4). The patronage factor for traffic zones 213, 159, 160, 161, 139, 140, 141, 142, 292, 293, 294, 295 and 299 plus the Miami CBD were decreased by .10 as per Factor (5).

The preliminary table for the proportional estimate of income (Y_a^{tz}) for Spring 1964 was used in this test. The second table of patronage factors was constructed with respect to the adjustments made in the trade areas discussed above. The second table for the Allocation of Proportional Income Estimates was constructed. The sums of the allocation of proportional incomes ($SI_a^{gc}n$) were derived for each shopping center. The next step involved deriving the control factor.

The elements and results of the control factor for the Second Test are illustrated below, and follow the same procedure as discussed in the First Test.

$$f_1 = \frac{TR_a}{Y_a} = \frac{1,005,161}{1,928,152} = 52.130\%$$

$$f_2 \ \frac{TCR_a}{TI_a} = \frac{139,545}{762,240.0} = 18.307\%$$

$$F_{64} \ f_1 \cdot f_2 = 52.130 \cdot 18.307 = 9.543\%$$

The final step was to factor the allocation of proportional incomes ($SI_a^{sc}n$) by the control factor.

Results of the Second Test

Shopping Center	$SI_a^{sc}n$ Allocation of Proportional Income to Shopping Center	$R_a^{sc}n$ Allocation of Income after Factoring by 9.543%	Variance from Actual Sales
Central Plaza	$ 135,873.2	$ 12,967.0	+ 10.4%
Westchester	135,337.4	12,915.9	+ 16.5%
Dadeland Mall	208,820.0	19,928.7	+ 15.5%
Cutler Ridge	75,374.4	7,193.3	- 31.4%
163rd Street	309,745.1	29,560.4	- 17.0%
Palm Springs Mile	172,844.1	16,495.3	+ 3.1%
Northside	338,718.7	32,325.5	+ 16.3%
Biscayne Plaza	85,477.7	8,157.5	- 13.8%

The results of the second test yielded an average variance of 15.5% which is a 43% improvement over the 27.2% average variance of the first test. An analysis of the individual shopping centers indicated the most volatile factor to be the estimate of the trade areas. The answer to this problem was deemed too important to be based on personal value judgment. A correlation to a Link-Node Network was established in the following two tests. This was done to eliminate the personal value judgment inherent in the preceding two tests.

Third Test

The purpose of the third test was to establish a relationship between the Link-Node Network and the trade area radius (r_t). This attempt was based on the fact that the consensus of market research technique uses driving time as a determinant for the trade area. A secondary consideration, is the availability of a 1985 Dade County Link-Node Network. This test adjusted the radii of the trade areas for the four northern most shopping centers. It was intended to establish a high correlation between the estimated and actual retail sales. Once a correlation has been established, a relationship between driving time and the facilities within each shopping center will be determined.

The following adjustments were made to correct the trade areas of the four northernmost centers:

(1) Reduce the trade area of Northside to 6.5 miles, as in the first test.

(2) Reduce the patronage factors of Northside in the SSE sector as per Factor (3) from the second test.

(3) Reduce the patronage factors of Westchester in the ENE and ESE sectors as per Factor (3) from the second test.

(4) Eliminate Hollywood Mall from the influence of 163rd Street Shopping Center, since it was not operational in Spring 1964.

The above adjustments yielded a new set of trade areas as follows:

Shopping Center	Radii
Biscayne Plaza	4.0 miles
163rd Street Shopping Center	7.5 miles
Central Plaza	3.5 miles
Dadeland Mall	6.5 miles
Cutler Ridge Shopping Center	7.5 miles
Westchester Shopping Center	5.0 miles
Palm Springs Mile	7.0 miles
Northside Shopping Center	6.5 miles

The same adjustments were made to the trade area as in the second test, with the exception of adjustment (2) and (3) on the preceding page. The preliminary table for the proportional estimate of income (Y_a^{tz}) for Spring 1964 was used once again. The third table for the patronage factors was constructed with respect to the adjustments from the second test and adjustments (2) and (3) on the preceding page. The third table for the allocation of Proportional Income Estimates was constructed and the sums of the allocations ($SI_a^{sc}n$) were derived for each shopping center. The next step was to derive the control factor.

The elements and results for the third test are illustrated below, and follow the same procedure as discussed in the first test.

$$f_1 = \frac{TRa}{Ya} = \frac{1,005,161}{1,928,152} = 52.130\%$$

$$f_2 = \frac{TCRa}{TIa} = \frac{139,545}{759,378} = 18.376\%$$

$$F_{64} = f_1 \cdot f_2 = 52.130 \cdot 18.376 = 9.579\%$$

The next step was to apply the control factor to the allocation of proportional incomes by shopping center ($SI_a^{sc}n$).

Results of Third Test

Shopping Center	$SI_a^{sc}n$ Allocation of Proportional Income to Shopping Center	$R_a^{sc}n$ Allocation of Income after Factoring by 9.5797	Variance from Actual Sales
Central Plaza	$ 142,709.9	$ 13,671.1	+ 16.5%
Westchester	131,249.9	12,573.3	+ 13.5%
Dadeland Mall	210,722.6	20,186.5	+ 17.0%
Cutler Ridge	75,374.4	7,220.6	- 31.7%
163rd Street	333,713.9	31,968.7	- 10.3%
Palm Springs Mile	175,177.4	16,781.4	+ 4.9%
Northside	284,162.3	27,221.8	- 2.1%
Biscayne	103,590.8	9,923.7	+ 4.8%

The results of the third test yielded an average variance of 12.6% which is a 19% improvement over the 15.5% average variance resulting from the second test. The comparison of the variances of the northernmost shopping centers shows an average variance in the second test of 12.6%, and an average variance of only 5.5% in this test. This was an improvement of 56% over the variances of the second test. This vast improvement led to the fourth test which adjusts the southernmost shopping centers.

Fourth Test

The purpose of the fourth test was to adjust the radii of the southernmost centers to establish a high correlation between the estimated and actual retail sales. The combined results of this and the third test will be used to project the trade area radii (r_t) for 1985. The most valuable result of these findings will be the control factor, to be used in the 1985 projection.

To facilitate the correction of the trade areas for the southernmost centers the following adjustments were made:

(1) Reduce the trade area of Dadeland to 6.0 miles.

(2) Reduce the trade area of Central to 3.25 miles.

(3) Adjust the patronage factors for Westchester in the ENE and ESE sectors to a 90-70-50-30-10 sequence from the center as per Factor (3) from the second test. Also, adjust the patronage factors down .10 south of U. S. Highway #1 as per Factor (4) from the second test.

(4) Reduce the patronage factors for Central by .10 to the SSE sector as per Factor (3) from the second test.

The application of the above adjustments yielded a new set of trade areas as follows:

Shopping Center	Radii
Biscayne Plaza	4.0 miles
163rd Street Shopping Center	7.5 miles
Central Plaza	3.25 miles
Dadeland Mall	6.0 miles
Cutler Ridge	7.5 miles
Westchester Shopping Center	5.0 miles
Palm Springs Mile	7.0 miles
Northside Shopping Center	6.5 miles

The same adjustments were made to the trade areas as were made in the third test with the exception of adjustments (3) and (4) above. The preliminary table for the proportional estimate of income (Y_a^{tz}) for Spring 1964 was again utilized. The fourth table for the patronage factors was constructed with respect to the combined adjustments made in the second, third and fourth tests. The fourth table for the Allocation of Proportional Income Estimates was constructed and the sums ($SI_a^{sc}n$) derived for each shopping center. Once again the control factor was derived.

The elements and results for the fourth test are illustrated below, and follow the same procedure as discussed in the first test.

$$f_1 = \frac{TRa}{Y_a} = \frac{1,005,161}{1,928,152} = 52.130\%$$

$$f_2 = \frac{TCR_a}{TI_a} = \frac{139,545}{749,378} = 18.621\%$$

$$F_{64} = f_1 \cdot f_2 = 52.130 \cdot 18.621 = 9.707\%$$

The final step was to apply the control factor to the allocation of proportional incomes by shopping centers. ($SI_a^{sc}n$)

The results of the fourth test yielded an average variance of 8.4% (See page 22.) which is a 33% improvement over the 12.6% average variance resulting from the third test. The comparison of the variances of the southernmost shopping centers shows an average variance in the third test of 19.7% and an average variance of only 11.1% for this test. This is an improvement of 44% from the previous test.

APPENDIX VII - SHOPPING CENTER SIZE - DRIVING TIME RATIO, 1985

Least Squares Correlation

y	x	x^2	xy	yc
620	20.5	420.2	12,710	598
455	17.5	306.2	7,962	467
452	16.1	259.2	7,277	405
343	14.2	201.6	4,871	322
310	12.6	158.7	3,906	252
281	13.4	179.5	3,765	287
256	12.6	158.7	3,226	252
221	14.9	222.0	3,293	353
2,938	121.8	1,906.4	47,010	

2,938 = 8a + 121.8b (121.8 ÷ 8 = 15.225 x 2,938 = 44,731)

47,010 = 121.8a + 1,906.4b

44,731 = 121.8a + 1,854.4b (121.8 x 15.225 = 1,854.4)

47,010 = 121.8a + 1,906.4b

-2,279 = 0 - 52.0b

2,279 = 52.0b

b = 43.83

2,938 = 8a + 121.8 (43.83)

2,938 = 8a + 5,338

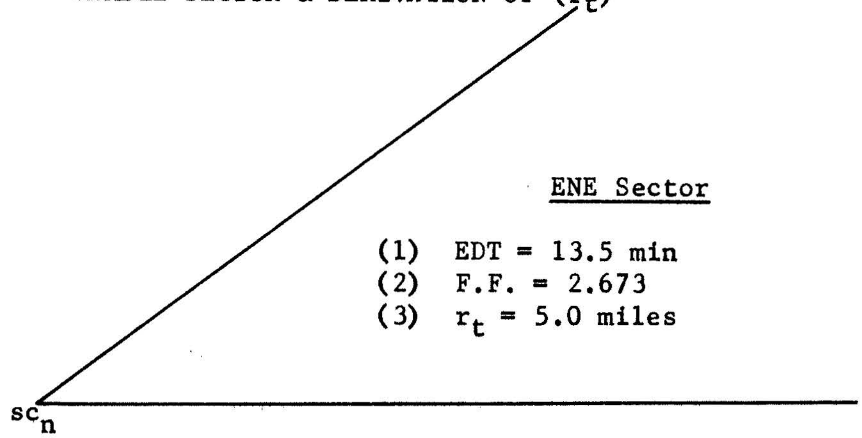
$$-2,400 = 8a$$

$$-300 = a$$

$$y_c = -300 + 43.83x$$

APPENDIX VIII. - DERIVING DRIVING RADII FOR TRADE AREA SECTOR, 1985

SAMPLE SECTOR & DERIVATION OF (r_t)



(1) Derived from the Facilities - Driving Time Ratio, with the sizes of centers approximated.

(2) Derived from the Link-Node Network #3 - 1985.

(3) $\frac{\text{EDT}}{\text{F.F.}} = \frac{13.5}{2{,}673} = r_t$

APPENDIX IX. - DERIVING INCOME FOR TRADE AREAS, 1985

After the trade area radii are set for the proposed shopping centers the method of estimating retail sales is the same used in the 1964 tests of the model.

(1) The Proportional Estimate of Income by traffic zone - 1985 were derived, (Y_{85}^{tz}).

(2) Patronage Factors for Shopping Centers by Traffic Zone were determined ($P_{85}^{sc}n$).

(3) The Proportional Income Estimate for Shopping Centers by Traffic Zone was allocated, ($I_{85}^{sc_n/tz_1}$).

The final step was to apply the control factor developed as a result of the fourth test. Thus, the total allocations of proportional income to shopping centers ($SI_{85}^{sc}n$) are factored by F_{64} or 9.707.

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PUBLIC TRANSIT MASTER PLAN
TECHNICAL MEMORANDUM NO. 1

TRANSIT COST ALLOCATION MODEL DEVELOPMENT

MIAMI URBAN AREA TRANSPORTATION STUDY
METROPOLITAN DADE COUNTY, FLORIDA

transportation

Transit Technical Memorandum 1

TRANSIT COST ALLOCATION MODEL DEVELOPMENT

MIAMI URBAN AREA TRANSPORTATION STUDY

Metropolitan Dade County Planning Department

Prepared by

SIMPSON & CURTIN
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JULY 1967

FOREWORD

This is the first of several technical reports relating to the analysis of present and prospective public transit development within the context of the Miami Urban Area Transportation Study. These reports will be prepared as major work phases are completed to present technical details of study findings and methodology, so that the Technical Advisory Committee and other interested persons are aware of procedures and progress of analyses being conducted by the Metropolitan Dade County Planning Department and its consultant, Simpson & Curtin, in this transportation study. This report describes procedures to be employed in estimating the maintenance and operating costs of future public transit systems being developed to satisfy projected travel demands.

An in-depth analysis of present cost accounts of the Metropolitan Dade County Transit Authority has yielded a formula for relating route operating characteristics, including vehicle miles of service, vehicle hours of service, peak vehicle needs and passenger revenue to the average cost of route operation. The application of this cost allocation model to a future set of transit operating circumstances will permit an estimate of operating costs for each alternate system to be combined with capital cost. The comparison of total cost to system revenues will gauge feasibility.

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REVENUE-COST ANALYSIS

In order to make intelligent decisions as to the direction in which community efforts towards transportation facility improvements should be channeled, it is necessary to estimate the degree of use of all the elements of a proposed transportation network related to the expenditures required to achieve that use. The development of areawide transportation plans and the location of specific facilities require estimates of the number of trips that will use each facility—transit and highways—for the future design year.

The transportation study processes already in progress have developed an extensive data bank which provides an in-depth understanding of present transit usage, travel patterns, characteristics of riders and the related socio-economic characteristics which affect transit use. These data are being employed in the modal split-traffic assignment process to develop future estimates of transit facility use for any set of system circumstances.

The "other side" of the revenue and traffic analyses for area transportation studies—the cost of travel—has been very carefully tabulated in terms of capital facilities recommended for the transportation facilities master plan. When considering improved transit service and possible rapid transit developments, previous studies have made meticulous estimates of the cost of capital facilities while completely overlooking the expense involved in operating the transit system.

Transit systems currently in operation spend only 5¢ to 10¢ of their revenue dollar on capital costs. The other 90-95% of annual costs go towards the day-to-day operation of the system. Transit companies which operate fixed rapid transit facilities sometimes devote as much as one-third of their operating expenses to the amortization of these capital facilities—the great bulk of expense still goes to operating the system.

The mass transit analysis being conducted for the Miami urban area transportation study will devote planning attention and prepare subsequently cost estimates for the "10% item"—capital costs. This memorandum, however, fully develops the companion analysis necessary for the proper calculation of the "90% item"—the cost of operating any of the transit system alternatives to be tested. Revenues and operating costs of the Metropolitan Dade County Transit Authority (MTA) are analyzed by sub-accounts to develop a "cost allocation model" for application to routes of test transit networks.

MTA PATRONAGE AND SERVICE

MTA operated more than 11.7 million miles and carried almost 50 million passengers in the fiscal year ending September 30, 1965. The system provides four types of service including seven Miami-to-Miami Beach routes, an additional 24 routes which enter downtown Miami (29E and 29W counted as two routes), six crosstown routes which *do not* enter downtown Miami and special and chartered services. Where possible, it will be useful to examine the system in terms of these four service categories.

As shown in Table 1, the Miami-Miami Beach routes accounted for about 24% of total miles and about 23% of total hours in the fiscal year ending September 30, 1965, but produced more than 29% of the system's passenger revenue. The downtown Miami routes were responsible for about 68% of total miles and 69% of total hours, generating a somewhat less-than-proportional 65% of passenger revenue. The crosstown category is clearly the weakest among the regularly scheduled routes, accounting for about 7% of both miles and total hours but only 4% of passenger revenue.

Using passenger revenue *per mile* as a measure of productivity, the superior performance of the Miami-Miami Beach routes over the downtown and crosstown routes is more evident. The $.7983 per mile generated by the Beach routes is about 26% higher than the $.6324 per mile generated by the downtown routes, and is almost 92% higher than the $.4164 per mile produced by the crosstown routes.

The advantage of the Beach routes is even more pronounced in terms of a second measure of productivity, average revenue *per hour*. Again, as shown in Table 1, the Beach routes generated $8.8501 per hour, which was about 33% higher than the $6.6597 per hour recorded for the downtown routes and almost double the $4.5020 per hour produced by the crosstown routes. These results are a reflection of higher average speeds on the Beach routes and relatively slow operation on the crosstown routes.

It is interesting to note that although the special and miscellaneous bus services are very productive in terms of revenue per mile ($1.2447), they are no more productive than the downtown routes in terms of revenue per hour ($6.6683). This results from the fact that long layovers at chartered outings, the Orange Bowl, Hialeah, etc., inflate the hours-operated total in this category.

Individual transit routes are ranked by revenue per mile and compared with the system average (excluding special services) in Table 2. Six of the nine most productive routes are Miami-Miami Beach routes (C, S, M, Axx, K, L), and their production of from 76¢ to $1.11 per mile helps push up the system average to 66¢ so that only six downtown routes exceed the average

TABLE 1

TRANSIT PATRONAGE AND SERVICE PROVIDED MTA SYSTEM

BY TYPE OF SERVICE

Fiscal Year Ended September 30, 1965

	Passenger Revenue	Miles Operated	Hours Operated	Revenue Per Mile	Revenue Per Hour
Miami - Miami Beach (7 routes)	$2,269,660 (29.17%)	2,843,257 (24.25%)	256,455 (23.17%)	$.7983	$8.8501
Crosstown (6 routes)	$ 320,620 (4.12%)	769,985 (6.57%)	71,216 (6.43%)	$.4164	$4.5020
Downtown Miami (24 routes)	$5,065,917 (65.13%)	8,010,643 (68.33%)	760,678 (68.73%)	$.6324	$6.6597
Special and Miscellaneous	$ 122,750 (1.58%)	98,620 (0.85%)	18,408 (1.67%)	$1.2447	$6.6683
S Y S T E M	$7,778,947 (100%)	11,722,505 (100%)	1,106,757 (100%)	$.6636	$7.0286

TABLE 2

MTA SYSTEM

PASSENGER REVENUE PER MILE

ROUTES LISTED IN RANK ORDER AND RELATED TO SYSTEM AVERAGE

Fiscal Year Ended September 30, 1965

Route Passenger Revenue per Mile	Route Category	Route Designation and Name	Route Passenger Revenue per Mile as Percent of System Average
$1.1095	Miami-Miami Beach	C - Mt. Sinai Hospital	168%
1.0213	Downtown	21 - Liberty City	155
.8784	Miami-Miami Beach	S - Bay Harbor	133
.8347	Miami-Miami Beach	M - MacArthur Causeway Limited	127
.7950	Downtown	26 - N. W. 7th Avenue	121
.7929	Miami-Miami Beach	A - (XX) N. W. 3rd Ave. and 13th St.	120
.7781	Downtown	5 - N. W. 2nd Avenue - Westchester	118
.7674	Miami-Miami Beach	K - Surfside	116
.7564	Miami-Miami Beach	L - Venetian Causeway - Little River	115
.7499	Downtown	11 - Miami Shores, W. Flagler	114
.7332	Downtown	24 - N. W. 46th Street	111
.7159	Downtown	14 - Coconut Grove - Hileah	109
.6516	Downtown	12 - Miami Shores, N. E. 2nd Ave.	99
.6504	Downtown	3 - Grapeland Heights	99
.6502	Downtown	15 - N. W. 27th Avenue	99
.5845	Downtown	23 - N. W. 22nd Avenue	89
.5758	Downtown	4 - Coral Way - N. W. 12th Ave.	87
.5730	Miami-Miami Beach	T - Tuttle Causeway Limited - Surfside	87
.5726	Downtown	1 - South Miami	87
.5721	Downtown	19 - N. W. 7th Street	87

TABLE 2

MTA SYSTEM

PASSENGER REVENUE PER MILE

ROUTES LISTED IN RANK ORDER AND RELATED TO SYSTEM AVERAGE

Fiscal Year Ended September 30, 1965

(Continued)

Route Passenger Revenue per Mile	Route Category	Route Designation and Name	Route Passenger Revenue per Mile as Percent of System Average
$.5526	Downtown	30 - Miami Springs	84%
.5263	Downtown	25 - Miami Shores	80
.5189	Downtown	6 - Hialeah Limited	79
.4936	Downtown	B - Key Biscayne	75
.4908	Downtown	28 - Coconut Grove	74
.4905	Crosstown	27 - Civic Center Crosstown	74
.4836	Downtown	29E - East Hialeah	73
.4738	Downtown	18 - Civic Center - Mercy Hospital	72
.4685	Crosstown	R - Biscayne Point - Normandy Shore	71
.4455	Downtown	17 - Dinner Key	68
.4341	Crosstown	37 - 17th Avenue Crosstown	66
.4160	Downtown	29W - Palm Springs	63
.3888	Downtown	100 - Park Ride - Airport	59
.3786	Downtown	16 - South Dixie Express	57
.3521	Crosstown	0 - Meridian Avenue	53
.3506	Crosstown	34 - Le Jeune Road	53
.3433	Crosstown	2 - Richmond Heights	52
$.6592		SYSTEM AVERAGE (Less Special Services)	100%

(21, 26, 5, 11, 24, 14). All six crosstown routes (27, R, 37, 0, 34, 2) are found among the bottem 12 routes on the list. In all, 25 routes out of the total 37 routes produced revenue per mile at less than the average rate in the fiscal year ending September 30, 1965.

The ranking of the 37 transit routes in passenger revenue per hour and the comparison of each with the system average appears in Table 3. In general, the Miami-Miami Beach routes are the fastest in the system, and the same six Beach routes which are among the top nine in revenue per mile also account for six of the first seven positions in the revenue per hour ranking. They produced revenue in the range of $8.21 to $11.41 per hour; the system average in the 1964-65 fiscal period (excluding special services) was $7.03 per hour, and only seven of the downtown routes were able to exceed the average (21, 11, 26, 1, 5, B, 14). The crosstown routes are by far the slowest in the MTA system and all are found at the bottom of the revenue per hour ranking.

TABLE 3

MTA SYSTEM

PASSENGER REVENUE PER HOUR

ROUTES LISTED IN RANK ORDER AND RELATED TO SYSTEM AVERAGE

Fiscal Year Ended September 30, 1965

Route Passenger Revenue Per Hour	Route Category	Route Designation and Name	Route Passenger Revenue per Hour as Percent of System Average
$11.41	Miami-Miami Beach	C - Mt. Sinai Hospital	162%
9.19	Miami-Miami Beach	S - Bay Harbor	131
9.03	Miami-Miami Beach	K - Surfside	128
8.90	Miami-Miami Beach	M - MacArthur Causeway Limited	126
8.67	Downtown	21 - Liberty City	123
8.52	Miami-Miami Beach	L - Venetian Causeway - Little River	121
8.21	Miami-Miami Beach	A (XX) N. W. 3rd Avenue and 13th St.	117
8.00	Downtown	11 - Miami Shores, W. Flagler	114
7.83	Downtown	26 - N. W. 7th Avenue	111
7.77	Downtown	1 - South Miami	110
7.72	Downtown	5 - N. W. 2nd Avenue - Westchester	110
7.61	Downtown	B - Key Biscayne	108
7.29	Downtown	14 - Coconut Grove - Hialeah	104
6.82	Miami-Miami Beach	T - Tuttle Causeway Limited - Surfside	97
6.75	Downtown	24 - N. W. 46th Street	96
6.70	Downtown	15 - N. W. 27th Avenue	95
6.69	Downtown	12 - Miami Shores N. E. 2nd Avenue	95
6.31	Downtown	3 - Grapeland Heights	90
6.21	Crosstown	2 - Richmond Heights	88
6.14	Downtown	23 - N. W. 22nd Avenue	87

TABLE 3

MTA SYSTEM

PASSENGER REVENUE PER HOUR

ROUTES LISTED IN RANK ORDER AND RELATED TO SYSTEM AVERAGE

Fiscal Year Ended September 30, 1965

(Continued)

Route Passenger Revenue Per Hour	Route Category	Route Designation and Name	Route Passenger Revenue per Hour as Percent of System Average
$5.85	Downtown	30 - Miami Springs	83 %
5.78	Downtown	19 - N. W. 7th Street	82
5.77	Downtown	4 - Coral Way - N. W. 12th Avenue	82
5.77	Downtown	6 - Hialeah Limited	82
5.76	Downtown	16 - South Dixie Express	82
5.73	Downtown	29E - East Hialeah	81
5.61	Downtown	25 - Miami Shores	80
5.36	Downtown	28 - Coconut Grove	76
5.25	Downtown	100 - Park Ride - Airport	75
4.99	Crosstown	R - Biscayne Point - Normandy Shore	71
4.78	Downtown	29W - Palm Springs	68
4.75	Downtown	18 - Civic Center - Mercy Hospital	68
4.65	Downtown	17 - Dinner Key	66
4.38	Crosstown	34 - Le Jeune Road	62
4.34	Crosstown	37 - 17th Avenue Crosstown	62
3.99	Crosstown	27 - Civic Center Crosstown	57
3.33	Crosstown	0 - Meridian Avenue	47
$7.04		SYSTEM AVERAGE (Less Special Services)	100%

TREND OF MTA PATRONAGE AND SERVICE

1963 TO 1965

The trend of patronage and service in the three full fiscal years of MTA operation is shown in Table 4. The picture that emerges from these data is one of impressive gains in passengers and revenue coupled with relatively stable levels of service.

In the years since MTA operation, there has been a marked divergence in the trend of transit riding in the Miami area as compared with the national trend. Table 4 illustrates comparative statistics for MTA trends and all United States motor bus passengers.

In the 1963-1965 period, total passengers on MTA rose by more than 6%, while the "U. S." total remained stable. Similar conclusions may be drawn for revenue passengers–MTA up 3.01%, U. S. down 0.05%. The number of miles operated in the United States has increased only slightly in this period (0.34%), while MTA actually added 141,586 miles in their first full year of operation.

In the 1963-1965 period, total MTA passengers rose by more than 6% and revenue passengers by more than 3%. In the same period, total miles declined by about 1.5% and total hours by slightly more than 2%. It is interesting to note that the declines in both miles and hours occurred in the 1964-1965 fiscal period, while both total passengers and revenue passengers rose sharply in that same period. As the result of these developments, the three most important measures of productivity–passengers per mile, revenue per mile and revenue per hour–each improved significantly as shown in Table 4. Passengers per mile increased by almost 8%, revenue per mile by almost 6% and revenue per hour by more than 6%, in the 1963-1965 span.

Figure 1 graphically illustrates the divergence in trends between the MTA system and the national average. This chart has been updated to include the latest 1966 revenue passengers for the MTA system (these data are not yet available for the national average). More dramatic increases in transit use are evident in the 1966 figures, which show a 7.4% gain over 1965, bringing the level of annual revenue passengers to within 2.5% of the 1954-1958 reference period. This type of growth picture is extraordinary and is a highly significant indicator of the vigorous growth in Dade County.

TABLE 4

TREND OF TRANSIT PATRONAGE AND SERVICE PROVIDED

MTA SYSTEM AND TOTAL U. S. SURFACE TRANSIT

1963 to 1965

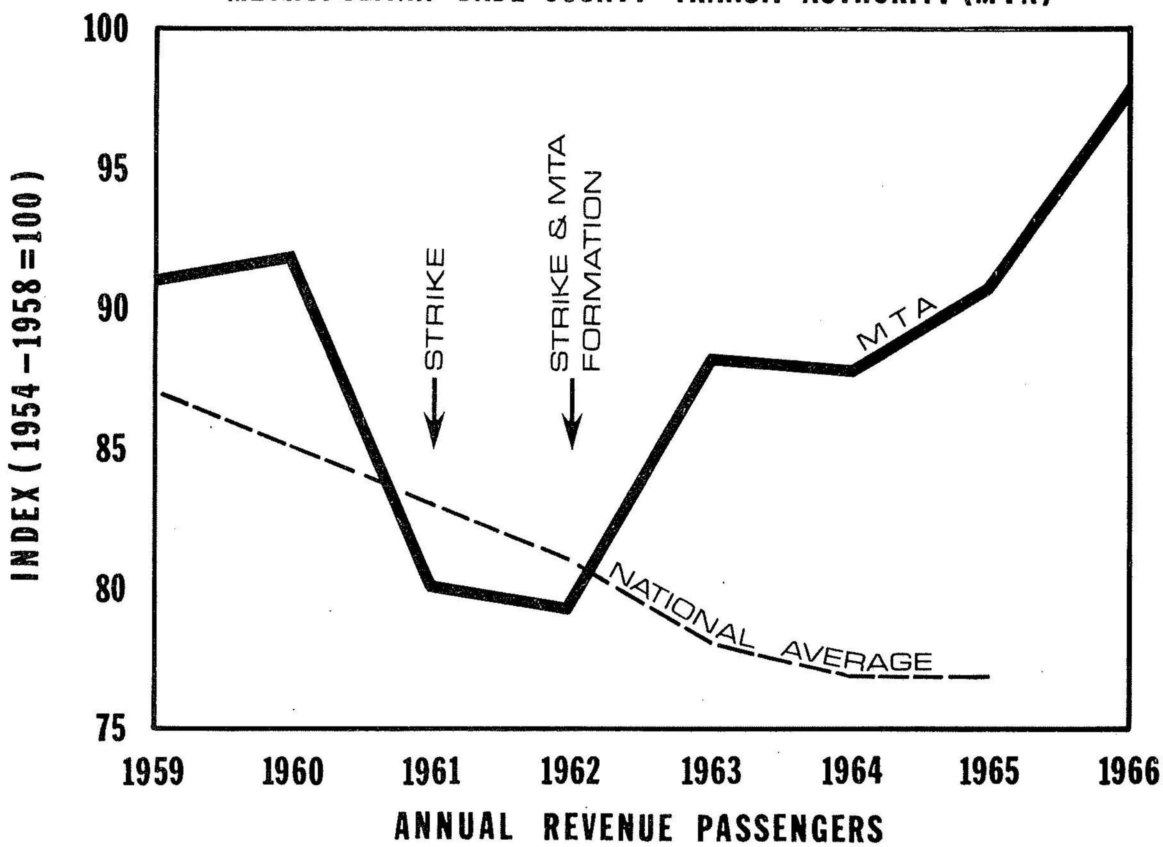
		Fiscal Year Ending			Percent Change		
		1963	1964	1965	1963-64	1964-65	1963-65
Total Passengers	MTA	46,919,688	48,050,775	49,837,488	+ 2.41%	+ 3.72%	+ 6.22%
	U.S.	5,822 *	5,813	5,814	- 0.02	0.0	- 0.01
Revenue Passengers	MTA	41,416,986	41,258,948	42,664,085	- 0.38	+ 3.41	+ 3.01
	U.S.	4,752 *	4,729	4,730	- 0.05	0.0	- 0.05
Revenue	MTA	7,475,017	7,519,046	7,778,947	+ 0.59	+ 3.46	+ 4.07
	U.S.	985.8 *	1010.3	1036.3	+ 2.48	+ 2.57	+ 5.12
Miles	MTA	11,906,796	12,048,382	11,722,505	+ 1.19	- 2.70	- 1.55
	U.S.	1523.1 *	1527.9	1528.3	+ 0.32	+ 0.03	+ 0.34
Hours	MTA	1,131,050	1,134,535	1,106,757	+ 0.31	- 2.45	- 2.15
Total Passengers per Mile	MTA	3.94	3.99	4.25	+ 1.27	+ 6.52	+ 7.87
Revenue per Mile	MTA	62.78¢	62.41¢	66.36¢	- 0.59	+ 6.33	+ 5.70
Revenue per Hour	MTA	$6.61	$6.63	$7.03	+ 0.30	+ 6.05	+ 6.35

* United States totals by calendar year, motor bus passengers in millions -- MTA totals by fiscal year ending September 30th.

FIGURE 1

TREND OF TRANSIT TRAFFIC

METROPOLITAN DADE COUNTY TRANSIT AUTHORITY (MTA)



LEVEL AND TREND OF OPERATING COST

The details of MTA operating expenses in fiscal 1965 are shown in Table 5. The analysis shows the cost for each item of expense in cents per mile, relates each item to total cost in percentage terms, and shows annual percent changes in cost per mile in the two periods since the fiscal year ending September 30, 1963.

Aggregate operating costs in the 1964-65 fiscal period amounted to 50.05¢ per mile. Transportation expenses dominated overall costs at 27.48¢ per mile or about 55% of the total. Maintenance cost averaged 7.56¢ per mile, accounting for 15% of the total. Cost in the general and miscellaneous category totalled 5.48¢ per mile or about 11% of the total while garage expenses aggregated 4.93¢ per mile or about 10% of the total. Finally, cost resulting from injuries and damages totalled 3.63¢ per mile for the system as a whole, or about 7% of overall per-mile costs.

The largest single item of cost in the 1964-65 fiscal period was transportation personnel salaries (superintendents and drivers), at 26.96¢ per mile. The other outstanding items were coach maintenance (4.92¢), injuries and damages (3.63¢) and fuel and other garage expenses (2.16 and 2.62¢, respectively).

Total operating costs per mile have increased at the average rate of 3.29% per year since the fiscal year ending September 30, 1963. Transportation costs have increased at the average rate of 2.85% per year while total maintenance cost increased by only 0.67% per year and total garage costs actually declined by 0.30% per year in the last two fiscal periods. On the other hand, costs per mile in the injuries-and-damages and general-and-miscellaneous categories have been increased significantly—at rates of 11.73% per year and 9.57% per year, respectively—resulting in the 3.29% annual increase in overall operating costs per mile.

Salaries of drivers and transportation superintendents have been increasing at the rate of 3.01% per year while salaries of clerks have gone up by 2.65% per year. Coach maintenance has increased by 0.41% per year, although in the last year, the rise was more than 5%. Fuel expenses have declined by almost 1% per year, while "other" garage costs per mile have gone up by 1.17% annually. As noted above, cost per mile of injuries-and-damages have been increasing at the average rate of 11.73% per year. The unpredictable nature of the injuries-and-damages item is evidenced by the fact that cost per mile in this category rose by almost 33% in the 1963-64 period then declined by almost 7% in the more recent 1964-65 period.

TABLE 5

LEVEL AND TREND OF OPERATING COST PER VEHICLE MILE

MTA SYSTEM

ANALYSIS BY MAJOR CATEGORIES AND ITEMS OF COST

Category or Item	Fiscal Year Ended September 30, 1965 Cost per Mile	Fiscal Year Ended September 30, 1965 Percent of Total Cost	Annual Percent Change in Cost Per Mile 1963-1964	Annual Percent Change in Cost Per Mile 1964-1965	Annual Percent Change in Cost Per Mile Two-Year Average
Transit Authority	.14¢	0.28%	-0-	-0-	-0-
Engineering	.12¢	0.24%	-11.76%	-20.00%	-14.71%
Garage					
Fuel	2.16	4.32	- 6.22	+ 2.37	- 0.97
Lubricants	.15	.30	- 6.67	+ 7.14	-0-
Other	2.62	5.23	+ 3.13	- 0.76	+ 1.17
Total	4.93¢	9.85%	- 1.41%	+ 0.82%	- 0.30%
Transportation					
Superintendence and Drivers	26.96	53.87	+ 1.73	+ 4.21	+ 3.01
Other	.52	1.04	-10.53	+ 1.96	- 4.39
Total	27.48¢	54.91%	+ 1.46%	+ 4.17%	+ 2.85%
Bus Card Advertising	.71¢	1.42%	+ 9.68%	+ 4.41%	+ 7.26%
Advertising	-	-	-100.00%	-0-	-50.00%
Injuries and Damages	3.63¢	7.25%	32.65%	- 6.92%	+11.73%
General and Miscellaneous					
Management Fee	1.71	3.42	+19.40	+ 6.88	+13.81
Salaries of Clerks	1.59	3.18	+ 6.62	- 1.24	+ 2.65
General Office	.18	.36	+33.33	+12.50	+25.00
General Law	.07	.14	-0-	+600.00	+300.00
Rent - Office	.32	.64	+87.50	+ 6.67	+50.00
Employees' Welfare	.86	1.72	+ 8.96	+17.81	+14.18
Insurance	.16	.32	-17.65	+14.29	- 5.88
Storeroom Labor	.11	.22	-0-	+10.00	+ 5.00
Miscellaneous	.27	.54	+25.00	-10.00	+12.50
Audit	.07	.14	+350.00	-0-	+175.00
Information and Promotion	.14	.28	+43.75	-30.43	-12.50
Salaries of Management	-	-	-100.00	-0-	-50.00
Total	5.48¢	10.94%	+ 7.61%	+ 4.38%	+ 9.57%

TABLE 5

LEVEL AND TREND OF OPERATING COST PER VEHICLE MILE

MTA SYSTEM

ANALYSIS BY MAJOR CATEGORIES AND ITEMS OF COST

(Continued)

Category or Item	Fiscal Year Ended September 30, 1965: Cost per Mile	Fiscal Year Ended September 30, 1965: Percent of Total Cost	Annual Percent Change in Cost Per Mile: 1963-1964	Annual Percent Change in Cost Per Mile: 1964-1965	Annual Percent Change in Cost Per Mile: Two Year Average
Maintenance					
Superintendence	1.16	2.32	- 0.91	+ 6.42	+ 2.73
Buildings, etc.	.20	.40	-0-	-0-	-0-
Coaches	4.92	9.83	- 4.11	+ 5.35	+ 0.41
Tires and Tubes	.78	1.56	- 2.50	-0-	- 1.25
Shop and Garage	.03	.06	+33.33	-25.00	-0-
Service Car Equipment	.02	.04	-33.33	-0-	-16.67
Miscellaneous Shop	.25	.50	- 7.69	+ 4.17	- 1.93
General and Miscellaneous	.20	.40	+11.76	+ 5.26	+ 8.83
Total	7.56¢	15.11%	- 3.08%	+ 4.56%	+ 0.67%
SYSTEM	50.05¢	100.00%	+ 3.53%	+ 2.94%	+ 3.29%

FORMULA FOR ALLOCATION OF COSTS TO INDIVIDUAL ROUTES

The point of departure from which to assess the impact of changes in the existing network of transit routes serving the Miami area is the present pattern of revenues and expenses on the routes of the MTA system. Route revenues are readily obtainable from the records compiled by MTA on the present system and may be developed from traffic estimates being prepared for several future systems. Determination of route operating costs, however, requires additional analysis.

A study has been made of the detailed operating expense accounts of the MTA leading to a classification of each operating expense item within one of several categories as the basis for allocation to individual lines. A consideration of the nature of various operating costs has resulted in the identification of four major elements which have been used to allocate particular expense items. These four elements are: vehicle hours, vehicle miles, peak vehicle needs and passenger revenue.

This "four-variable" formula is calibrated in this memorandum and compared to the "MTA" formula which has been developed by the transit authority using three of these four elements—vehicle hours, vehicle miles and passenger revenue. One additional "two-variable" formula is developed using only vehicle hours and vehicle miles. The premise behind this comparative investigation is that, for planning purposes, the simpler the formula, the easier the application, if a sufficient degree of accuracy can be maintained.

Vehicle Hours

The wages of drivers and transportation superintendents represent by far the largest single element of cost in the MTA system, having accounted for about 54% of the total cost per mile in fiscal 1965. Employees engaged in operating vehicles are paid on an hourly basis—allocation of this wage expense would be most properly made on the basis of hours of service on each of the lines. This is best estimated by the aggregate vehicle hours operated on each line and this is the basis which has been used to allocate the wages of transportation personnel.

One other important classification has been allocated on a vehicle hour basis: employees' welfare expense. While costs in this category are attributable to all classes of employees, the bulk of the amount is directly assignable to the largest group of workers, namely, the operating force. Hence, these non-payroll labor costs have been allocated in the same fashion as the main portion of direct wages and are assigned to individual routes on the basis of vehicle hours.

Data were obtained from several bus systems throughout the United States to statistically test the relationship between transportation expenses and vehicle hours of service. A linear relationship exists between these two variables (see Figure 2) with a significant degree of correlation. The coefficient of correlation indicates that more than 96% of the variation of transportation expenses is attributable to vehicle hours operated.

Vehicle Miles

Many costs are related directly to the miles of operation on each route. Garage expenses such as fuel, lubricants and other costs are direct functions of the number of miles operated. Figure 3 illustrates this relationship for several transit properties—a straight line is developed with a significant degree of correlation. Maintenance of revenue equipment is also directly related to the vehicle miles operated (Figure 4); this includes costs such as tires and tubes, maintenance of coaches and maintenance superintendence. Engineering expense has also been assigned to individual routes on the basis of vehicle miles operated.

Passenger Revenue

Operating costs resulting from injuries and damages have been assigned to individual routes on the basis of the percentage relationship of passenger revenue to the total of all routes in the system. Essentially, accident costs are a function of exposure and could therefore be allocated on vehicle miles or perhaps vehicle hours of service. It is believed, however, that either of these bases could introduce some distortion and that passenger revenue is a better yardstick. If vehicle miles were used as the foundation of allocating accident costs, it would mean that relatively fast lines (such as the Miami-Miami Beach lines) which operate entirely or very largely outside the most heavily congested areas would bear a disproportionate share of accident expense. While vehicle hours would to some degree overcome this problem, passenger revenue is deemed to be a more appropriate basis because it tends to reflect the extent of operation of the line in more heavily congested areas. In addition, passenger revenue is a direct measure of exposure to claims for injury to passengers on the transit vehicles.

Peak Vehicle Needs

Many individual expense items do not vary as functions of any of the foregoing allocators. Thus, for example, the cost resulting from providing storage facilities for vehicles is a function of the *number* of vehicles required to operate the line rather than the number of miles or hours of service provided. Therefore, various maintenance expenses have been allocated on the basis of the percentage relationship of the peak hour vehicle needs on each line to the system-wide peak hour vehicle needs; these expenses include maintenance of buildings, fixtures, grounds, shop and garage, service car equipment, miscellaneous shop expense, and general and miscellaneous maintenance.

FIGURE 2

RELATIONSHIP BETWEEN TRANSPORTATION EXPENSES AND VEHICLE HOURS OPERATED

SEVERAL U.S. BUS OPERATORS 1965

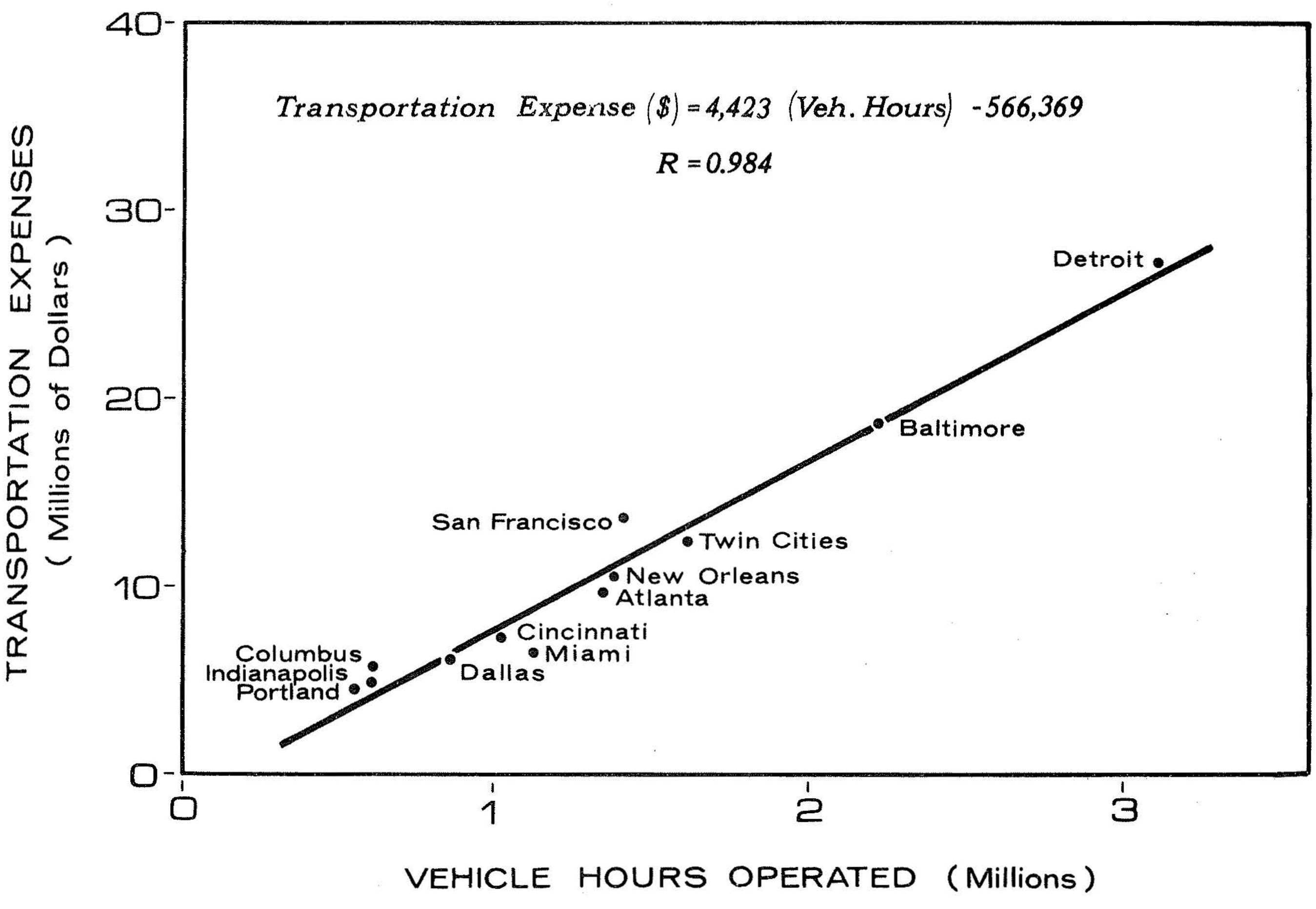


FIGURE 3

RELATIONSHIP BETWEEN OPERATING GARAGE EXPENSES AND VEHICLE MILES OPERATED

SEVERAL U.S. BUS OPERATORS 1965

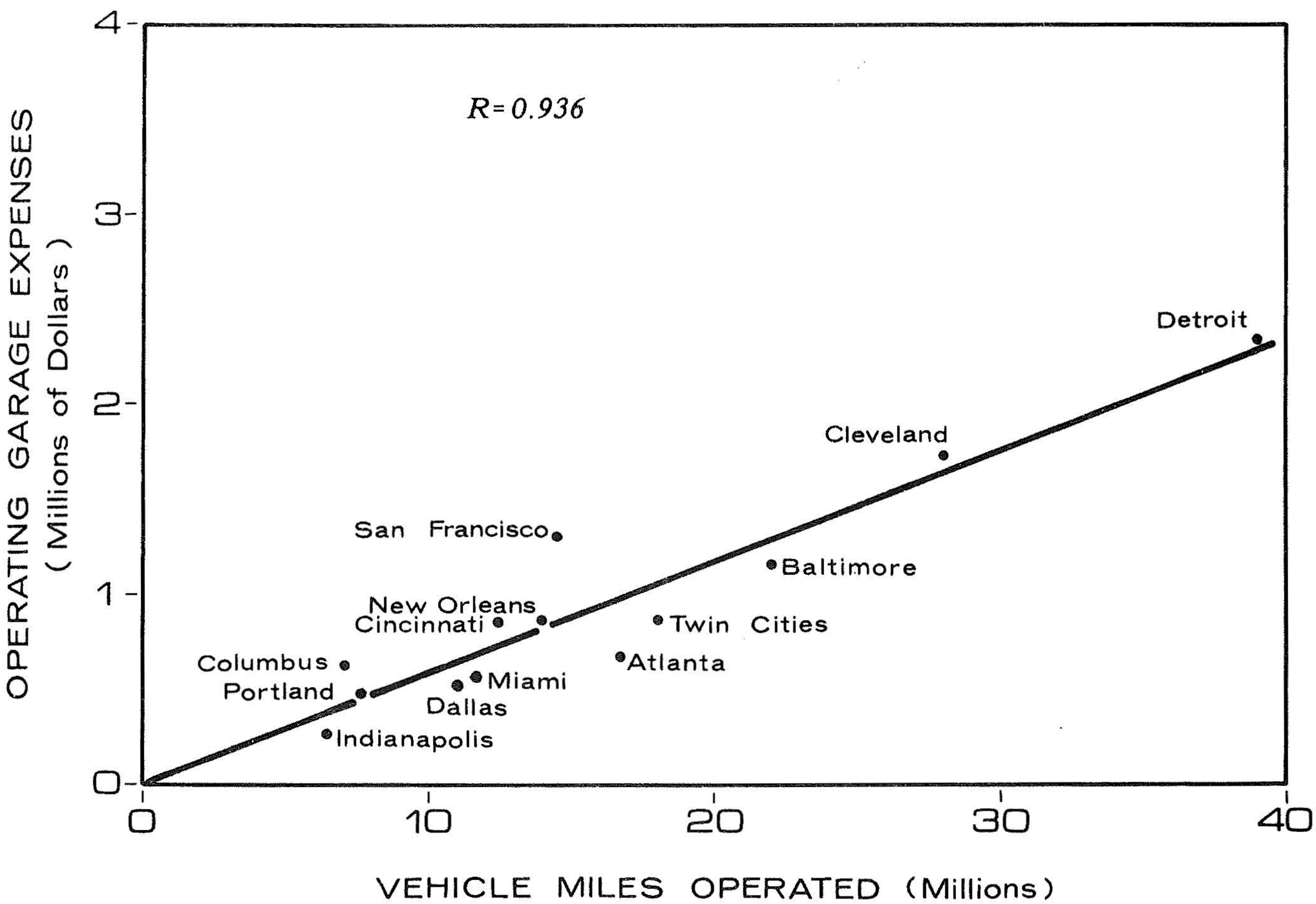
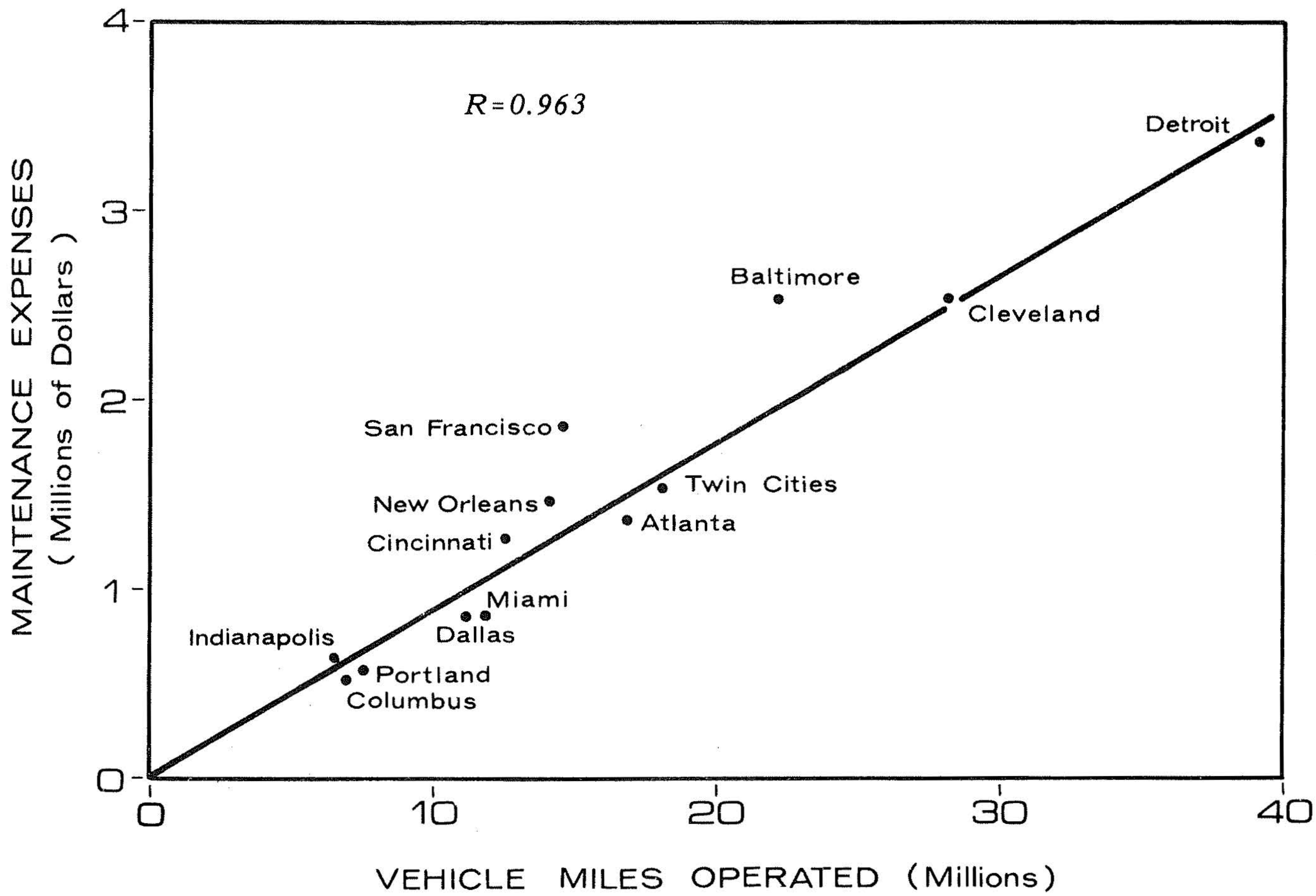


FIGURE 4

RELATIONSHIP BETWEEN MAINTENANCE EXPENSES AND VEHICLE MILES OPERATED

SEVERAL U.S. BUS OPERATORS 1965



A number of broad overhead expense items have also been assigned to the individual routes on the basis of peak hour vehicle needs. These include general office costs and the salaries of general office clerks and officials, and in fact, all general and miscellaneous expenses with the exception of employees' welfare expense. Advertising and transit authority expense have also been assigned on the basis of peak hour vehicle needs on each line, since these are not items which will vary significantly with changes in volume of service provided on the individual routes.

Application of Allocation Formulas to MTA System

The classification of each operating expense item into one of the four allocation variables is reflected in Table 6. This table aggregates all of the operating expense accounts to which charges were made in the fiscal year ending September 30, 1965 under its appropriate cost allocator.

TABLE 6

"FOUR-VARIABLE" COST ALLOCATION

Basis of Allocation	Total Cost Allocated	Percent of Total Cost	Unit Cost	
Vehicle Miles	$1, 710, 783. 92	27. 9%	14. 59	cents per mile
Vehicle Hours	$3, 322, 110. 60	54. 3%	3. 0017	dollars per hour
Passenger Revenue	$ 449, 727. 98	7. 3%	5. 781	percent of passenger revenue
Peak Vehicles	$ 640, 509. 20	10. 5%	2, 521. 69	dollars per vehicle
TOTAL	$6, 123, 131. 70	100. 0%		

Taking all classes of service together, including special and miscellaneous, the "four-variable" formula resulted in the apportionment of 54.3% of aggregate cost on the basis of vehicle hours, 27.9% on a vehicle mile basis, 10.5% allocated on the basis of peak vehicle needs, and the remaining 7.3% as a function of passenger revenue.

Table 6 also indicates the relative weight of each variable on a unit basis. The route costs attributable to vehicle miles result in an aggregate cost of 14.59¢ per mile. Route costs attributable to vehicle hours of operation yield a unit cost of $3.0017 per hour.

The "four-variable" analysis results in the following cost allocation formula:

$$C = 0.1459M + 3.0017H + 0.0578R + 2521.69V$$

Where:

C = Average daily cost of route operation
M = Average daily vehicle miles of service on route
H = Average daily vehicle hours of service on route
R = Average daily passenger revenue on route
V = Peak vehicle needs on route

The results of the application of each of the three formulas to MTA route operating statistics are illustrated in Table 7. Route operating costs range from a low of $.3547 on Route 2, which is a relatively high-speed (22.6 mph) peak hour operation serving Richmond Heights, to a high of $.6511 on Route C—one of the major Miami-Miami Beach routes.

Comparison of operating cost by routes indicates close agreement between all of the calculation methods. Generally, the smallest routes (in terms of vehicle miles operated) have the largest percent differences. Table 8 summarizes the differences between these formulas through the use of the percent route mean square error for each class of service. In total, none of the formulas exceeds 11% difference with any of the others. The largest percent difference by category occurs in the crosstown routes, which have been previously shown to be at the low end of the revenue producing scale. This close agreement between formulas is to be expected since—as Table 6 illustrates—more than 80% of the operating costs are attributable to vehicle miles and vehicle hours under any of the calculation methods.

Obviously, the "four-variable" analysis should result in present day operating costs which may be considered more accurate measures than the "two-variable" formula which uses only vehicle hours and vehicle miles. However, when applied to a future set of circumstances, the "four-variable" formula requires that peak vehicle needs be estimated for each route. The estimating process required to obtain this variable on a route basis introduces estimating problems which may, in fact, produce peak vehicles at a lower level of accuracy than the final formula itself.

TABLE 7

ROUTE COST PER MILE COMPARISON

THREE FORMULAS

Route	Annual Vehicle Miles	Annual Vehicle Hours	"2" Variable Cost per Mile	"4" Variable Cost per Mile	MTA Cost per Mile	Percent Difference: "2" Variable Compared to MTA	Percent Difference: "4" Variable Compared to MTA	Percent Difference: "2" Variable Compared to "4" Variable
1-South Miami	336,044	24,757	$.4600	$.4527	$.4521	+ 1.75%	+ .13%	+ 1.61%
2-Richmond Heights	54,810	3,028	.4047	.3776	.3547	+14.10	+ 6.46	+ 7.18
3-Grapeland Heights	209,837	21,629	.5483	.5410	.5419	+ 1.19	- .16	+ 1.35
4-Coral Way-N. W. 12th Ave.	342,834	34,195	.5383	.5374	.5242	+ .78	+ 2.52	+ .17
5-N. W. 2nd Avenue - Westchester	735,996	74,140	.5413	.5618	.5485	- 1.31	+ 2.42	- 3.65
6-Hialeah Limited	629,488	56,587	.5087	.4938	.5018	+ 1.38	- 1.59	+ 2.93
11-Miami Shores, W. Flagler	669,202	62,717	.5202	.5459	.5226	- .46	+ 4.46	- 4.71
12-Miami Shores, N E 2nd Ave.	299,150	29,150	.5314	.5351	.5379	- 1.21	- .52	- .69
14-Coconut Grove - Hileah	630,311	61,929	.5338	.5542	.5339	- 0	+ 3.80	- .07
15-N. W. 27th Avenue	392,700	38,098	.5301	.5261	.5231	+ 1.34	+ .57	+ .76
16-South Dixie Express	64,388	4,232	.4362	.4826	.4059	+ 7.46	+18.90	- 9.61
17-Dinner Key	145,689	13,944	.5262	.4936	.4973	+ 5.81	- .74	+ 6.60
18-Civic Center-Mercy Hospital	286,388	28,540	.5380	.5252	.5132	+ 4.83	+ 2.28	+ 2.44
19-N. W. 7th Street	174,487	17,284	.5362	.5341	.5349	+ .24	- .15	+ .39
21-Liberty City	424,780	50,063	.5927	.6062	.6298	- 5.89	- 3.75	- 2.23

TABLE 7

ROUTE COST PER MILE COMPARISON

THREE FORMULAS

(Continued)

Route	Annual Vehicle Miles	Annual Vehicle Hours	"2" Variable Cost per Mile	"4" Variable Cost per Mile	MTA Cost per Mile	Percent Difference: "2" Variable Compared to MTA	Percent Difference: "4" Variable Compared to MTA	Percent Difference: "2" Variable Compared to "4" Variable
23-N. W. 22nd Avenue	342,781	32,641	$.5247	$.5170	$.5103	+ 2.82	+ 1.31	+ 1.49
24-N. W. 46th Street	169,265	18,380	.5648	.5589	.5693	- .79	- 1.83	+ 1.06
25-Miami Shores	311,135	29,185	.5205	.5065	.4996	+ 4.02	+ 1.38	+ 2.76
26-N. W. 7th Avenue	335,365	34,054	.5437	.5267	.5662	- 3.97	- 6.68	+ 3.22
27-Civic Center Crosstown	90,911	11,187	.6083	.5991	.5912	+ 2.89	+ 1.34	+ 1.54
28-Coconut Grove	264,166	24,181	.5137	.4968	.4884	+ 5.18	+ 1.72	+ 3.40
29E-East Hialeah	201,437	16,987	.4920	.4771	.4644	+ 5.94	+ 2.73	+ 3.12
29W-Palm Springs	241,027	20,955	.4999	.4728	.4657	+ 7.34	+ 1.52	+ 5.73
30-Miami Springs	425,524	40,192	.5224	.5266	.5045	+ 3.55	+ 4.38	- .80
34-Le Jeune Road	210,227	16,831	.4792	.4545	.4364	+ 9.81	+ 4.15	+ 5.43
37-17th Avenue Crosstown	92,561	9,253	.5390	.6345	.5102	+ 7.60	+24.36	-15.05
100-Park Ride - Airport	247,431	18,323	.4612	.4212	.4343	+ 6.19	- 3.02	+ 9.50
A(XX)-N. W. 3rd Ave. & 13th St.	106,862	10,323	.5288	.6469	.5584	- 5.44	+15.85	-18.26
B-Key Biscayne	131,318	8,515	.4335	.4075	.4549	- 4.70	-10.42	+ 6.38
C-Mt. Sinai Hospital	336,825	32,760	.5308	.5469	.6511	-18.48	-10.00	- 2.94

TABLE 7

ROUTE COST PER MILE COMPARISON

THREE FORMULAS

(Continued)

Route	Annual Vehicle Miles	Annual Vehicle Hours	"2" Variable Cost per Mile	"4" Variable Cost per Mile	MTA Cost per Mile	Percent Difference: "2" Variable Compared to MTA	Percent Difference: "4" Variable Compared to MTA	Percent Difference: "2" Variable Compared to "4" Variable
K-Surfside	539,686	45,850	$.4939	$.4873	$.4957	- .36	- 1.70	+ 1.35
L-Venetian Causeway - Little River	580,705	51,584	.5055	.4910	.4894	+ 3.29	+ .51	+ 2.95
M-MacArthur Causeway Limited	315,354	29,576	.5204	.5156	.5451	- 4.51	- 5.41	+ .93
O-Meridian Avenue	62,377	6,604	.5567	.5245	.5205	+ 6.95	+ .77	+ 6.14
R-Biscayne Point-Normandy Shore	259,099	24,313	.5206	.5033	.4933	+ 5.53	+ 2.03	+ 3.44
S-Bay Harbor	466,005	44,531	.5257	.5268	.5571	- 5.64	- 5.44	- .21
T-Tuttle Causeway Limited-Surfside	497,720	41,831	.4912	.4769	.4859	+ 1.09	- 1.85	+ 3.00
X-	5,459	663	.6034	.5814	.6595	- 8.51	-11.84	+ 3.78
TOTAL	11,629,344	1,089,012						
Percent Root Mean Square Error						5.93%	7.26%	5.48%

TABLE 8

FORMULA RESULTS COMPARED

by

SERVICE CLASS

Service Class	Percent Root Mean Square Error "2" Variable Compared to MTA	 "4" Variable Compared to MTA	 "2" Variable Compared to "4" Variable
Miami-Miami Beach	8.82%	10.42%	7.88%
Crosstown	7.36%	10.82%	8.63%
Downtown	3.65%	4.20%	3.98%
SYSTEM TOTAL	6.00%	6.29%	5.98%

To obtain peak vehicle needs on a route basis, the analyst must estimate at least the round-trip running time on the route, the maximum load point volume on the route, the peak hour-peak direction volume past the maximum load point and the vehicle load factor (percent occupancy of the bus). The many assumptions necessary to an estimate of peak vehicle needs, therefore, increase the desirability of using a route cost estimating method which relies on as few variables as possible yet still maintains a suitable level of accuracy.

The conclusion to be drawn from the analysis in Tables 7 and 8 is that for long-term planning projections, a simplified operating cost formula such as the "two-variable" allocation is more than adequate and probably desirable because of the need to estimate only miles and hours of service on each route. For short-range service improvements and detailed fiscal planning, a more accurate allocation formula such as the "four-variable" method or the MTA formula is more appropriate.

ROUTE OPERATING RESULTS

Table 9 summarizes the end result of the allocation of expenses compared to route revenue. This table expresses the results of route operations in terms of the revenue per mile, cost per mile, margin per mile (profit and loss), revenue per hour, operating costs per hour, and margin per hour.

The most profitable class of service is the Miami-Miami Beach routes which yield \$.2693 per mile or \$2.99 per hour. The best of these routes is Route C, which operates from downtown Miami via the MacArthur Causeway and Collins Avenue with a terminal at Mt. Sinai Hospital. It is interesting to note that none of these routes operates at a loss.

By contrast, none of the crosstown routes operates at a profit. As a group, these routes lose 7.16¢ per mile, or 76¢ per hour.

The largest group of routes is the 24 routes serving downtown Miami from points on the mainland. These routes show mixed operating results but are profitable operations in total—three-quarters of the routes operate in the black.

Figure 5 illustrates the geographical distribution of the operating results on each route. Profitable routes are depicted in black using different designations for varying degrees of profitability.

Several major corridors of profitable operation are evident from this chart. The Miami-Miami Beach routes indicate favorable operating results all along the beach. A similar "corridor of profitability" extends north from the Miami CBD and includes Routes 11, 26, 5, 4 and 21. Several routes serving downtown Miami from the south and west also indicate favorable operating results.

Red routes on Figure 5 are primarily in the crosstown category.

Planning Application

The cost allocation methodology developed in this report will be utilized to determine the future cost of modifications in surface bus routes. This operating cost in combination with capital and operating expenses for grade-separated rapid transit facilities to be analyzed in the transportation study testing process will yield the total community cost resulting from a number of transit alternatives. Projected system costs will be measured against anticipated revenues, derived in other study phases, to measure financial feasibility of alternative solutions to the public transit problem.

TABLE 9

ROUTE OPERATING RESULTS

MTA SYSTEM

Fiscal Year Ended September 30, 1965

Route		Operating Results per Mile: Revenue	Cost	Margin per Mile	Operating Results per Hour: Revenue	Cost	Margin per Hour
		Downtown Routes					
1	- South Miami	$.5726	$.4521	$.1205	$7.77	$6.14	$1.63
3	- Grapeland Heights	.6504	.5419	.1085	6.31	5.26	1.05
4	- Coral Way - N. W. 12th Ave.	.5758	.5242	.0516	5.77	5.26	0.51
5	- N. W. 2nd Ave. -Westchester	.7781	.5485	.2296	7.72	5.44	2.28
6	- Hialeah Limited	.5189	.5018	.0171	5.77	5.58	0.19
11	- Miami Shores, W. Flagler	.7499	.5226	.2273	8.00	5.58	2.42
12	- Miami Shores, N. E. 2nd Ave.	.6516	.5379	.1137	6.69	5.52	1.17
14	- Coconut Grove - Hialeah	.7159	.5339	.1820	7.29	5.43	1.86
15	- N. W. 27th Avenue	.6502	.5231	.1271	6.70	5.39	1.31
16	- South Dixie Express	.3786	.4059	(.0273)	5.76	6.17	(0.41)
17	- Dinner Key	.4455	.4973	(.0518)	4.65	5.20	(0.55)
18	- Civic Center - Mercy Hospital	.4738	.5132	(.0394)	4.75	5.15	(0.40)
19	- N. W. 7th Street	.5721	.5349	.0372	5.78	5.40	0.38
21	- Liberty City	1.0213	.6298	.3915	8.67	5.34	3.33
23	- N. W. 22nd Avenue	.5845	.5103	.0742	6.14	5.36	0.78
24	- N. W. 46th Street	.7332	.5693	.1639	6.75	5.24	1.51
25	- Miami Shores	.5263	.4996	.0267	5.61	5.33	0.28
26	- N. W. 7th Avenue	.7950	.5662	.2288	7.83	5.58	2.25
28	- Coconut Grove	.4908	.4884	.0024	5.36	5.34	0.02
29E	- East Hialeah	.4836	.4644	.0192	5.73	5.51	0.22
29W	- Palm Springs	.4160	.4657	(.0497)	4.78	5.36	(0.58)
30	- Miami Springs	.5526	.5045	.0481	5.85	5.34	0.51
100	- Park Ride - Airport	.3888	.4343	(.0455)	5.75	5.86	(0.11)
B	- Key Biscayne	.4936	.4549	.0387	7.61	7.02	0.59
TOTAL		$.6324	$.5190	$.1134	$6.66	$5.47	$1.19

TABLE 9

ROUTE OPERATING RESULTS

MTA SYSTEM

Fiscal Year Ended September 30, 1965

(Continued)

Route	Operating Results per Mile: Revenue	Operating Results per Mile: Cost	Operating Results per Mile: Margin per Mile	Operating Results per Hour: Revenue	Operating Results per Hour: Cost	Operating Results per Hour: Margin per Hour
Crosstown Routes						
2 - Richmond Heights	$.3433	$.3547	$(.0114)	$6.21	$6.42	$(0.21)
27 - Civic Center Crosstown	.4905	.5912	(.1007)	3.99	4.80	(0.81)
34 - Le Jeune Road	.3506	.4364	(.0858)	4.38	5.45	(1.07)
37 - 17th Avenue Crosstown	.4341	.5102	(.0761)	4.34	5.10	(0.76)
R - Biscayne Point - Normandy Shore	.4685	.4933	(.0248)	4.99	5.26	(0.27)
0 - Meridian Avenue	.3521	.5205	(.1684)	3.33	4.92	(1.59)
TOTAL	$.4164	$.4837	$(.0673)	$4.50	$5.23	$(0.73)
Miami - Miami Beach Routes						
A (XX) N. W. 3rd Avenue and 13th Street	$.7929	$.5584	$.2345	$8.21	$5.78	$2.43
C - Mt. Sinai Hospital	1.1095	.6511	.4584	11.41	6.69	4.72
K - Surfside	.7674	.4957	.2717	9.03	5.83	3.20
L - Venetian Causeway - Little River	.7564	.4894	.2670	8.52	5.51	3.01
M - MacArthur Causeway Limited	.8347	.5451	.2896	8.90	5.81	3.09
S - Bay Harbor	.8784	.5571	.3213	9.19	5.83	3.36
T - Tuttle Causeway Limited - Surfside	.5730	.4859	.0871	6.82	5.78	1.04
TOTAL	$.7982	$.5289	$.2693	$8.85	$5.86	$2.99

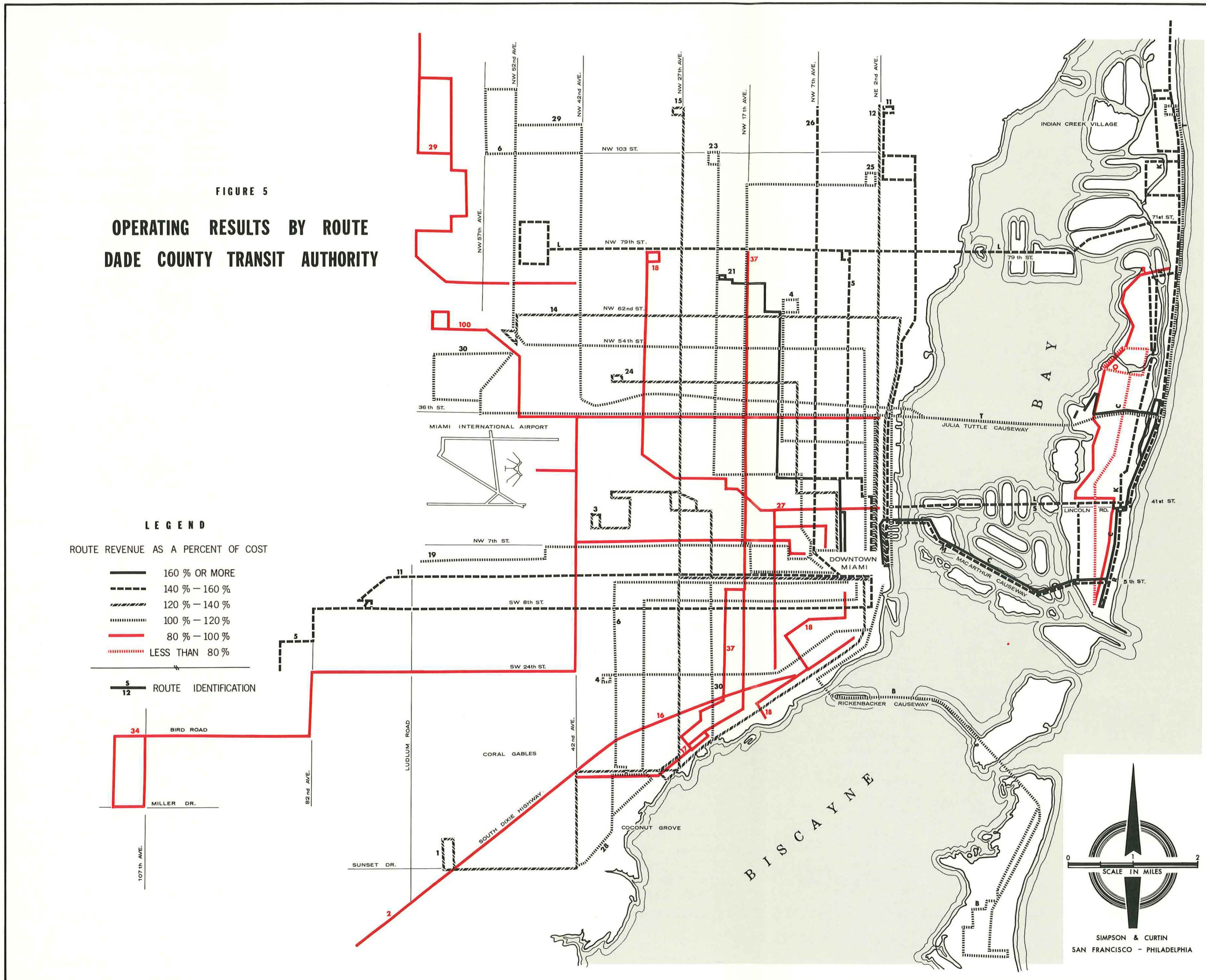


FIGURE 5

OPERATING RESULTS BY ROUTE
DADE COUNTY TRANSIT AUTHORITY

METROPOLITAN DADE COUNTY PLANNING ADVISORY BOARD

Emil J. Gould, Chairman

Paul Losner, Vice Chairman

Mrs. Harold Kendall

Jay Morton

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METROPOLITAN DADE COUNTY DEPARTMENT OF PLANNING

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Gladys Wardenga, Clerk Typist

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PUBLIC TRANSIT MASTER PLAN
TECHNICAL MEMORANDUM NO. 2

EVALUATION OF PRESENT TRANSIT SERVICE

MIAMI URBAN AREA TRANSPORTATION STUDY
METROPOLITAN DADE COUNTY, FLORIDA

transportation

TITLE:	*Miami Urban Area Transportation Study: Evaluation of Present Transit Services*
AUTHOR:	Simpson & Curtin, Transportation Engineers
SUBJECT:	Present Transit Operations Improvements
DATE:	August 1968
LOCAL PLANNING AGENCY:	Metropolitan Dade County Planning Department
SOURCE OF COPIES:	Clearinghouse for Federal Scientific and Technical Information, Washington, D. C. Metropolitan Dade County Planning Department 1351 N. W. 12 Street, Miami, Florida 33125 Simpson & Curtin, Transportation Engineers 1405 Locust Street, Philadelphia, Pa. 19102 HUD Regional Office Library, Region III, 645 Peachtree, Seventh Building Atlanta, Georgia 30323
HUD PROJECT NO:	Florida P-30
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ABSTRACT:

This interim report examines transit operations in light of nine measures for establishing service standards. Over the years, the transit industry has established reasonable goals and standards as defined by the following criteria:

Availability – Transit service within one-quarter mile except in sparse areas is reasonably accessible. Dade County transit routes conform to this standard.

Direct Service – The proportion of riders who must transfer to complete their journeys is a measure of the extent to which travel desires are satisfied. Miami's percentage of transfer riders is within acceptable limits (less than 20%). However, O-D studies indicate some major unserved travel movements.

Volume of Service – Service provided should relate to passenger volumes carried. New service has been adequately matched to the increase in riding which has been experienced in recent years.

Frequency of Service – Service should operate as frequently as possible within economic limits and headways beyond twenty minutes should be publicly advertised to acquaint riders. Local practice measures well on both these counts.

Loading Standards – Peak bus loads should approach, but not exceed, 150% of vehicle seating capacity. Loading falls within this maximum except for a few isolated instances.

Dependability – On-time performance is important to maintain efficiency and minimize passenger waiting times. Analysis of street observations shows improvement needed in this aspect of operations.

Speed of Operation – Scheduled transit speeds generally fall in the 10-12 mph range. The average scheduled speed of 12½ miles per hour is better than industry norms.

Accommodation Service – Routes which cannot at least cover out-of-pocket costs should be evaluated for their service to the community. Exceptional operating statistics by route are maintained which permit a continuing analysis of each route in relation to its cost.

Rate of Fare – Miami Transit fares are among the lowest in the country.

EVALUATION OF PRESENT TRANSIT SERVICE

Prepared For

The Metropolitan Dade County Planning Department for
The Miami Urban Area Transportation Study
702 Justice Building
1351 N. W. 12th Street
Miami, Florida 33125

By

Simpson & Curtin
Transportation Engineers
1405 Locust Street
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August 1968

The preparation of this report was financed in part through an urban planning grant from the Department of Housing and Urban Development, under the provisions of Section 701 of the Housing Act of 1954, as amended.

FOREWORD

This is the second of five technical reports related to the analysis of present and prospective public transit developments within the context of the Miami Urban Area Transportation Study and leading to the preparation of a public transit master plan. MUATS is a joint effort of Metropolitan Dade County and the State of Florida in cooperation with the United States Department of Transportation's Bureau of Public Roads and the United States Department of Housing and Urban Development. Other elements of the MUATS program include metropolitan master plans for streets and highways, terminal facilities, airports, waterports and waterways.

These five reports present results of major study phases to advise the MUATS Technical Advisory Committee and other interested persons of technical details, findings, and methodology of analyses of work which is being conducted by the Metropolitan Dade County Planning Department and its consultant, Simpson & Curtin, on the public transit master plan study. Technical Memorandum No. 2 reviews the service and operating statistics of the Metropolitan Transit Authority (MTA) and the Coral Gables Municipal Bus System (CGMBS) for the purpose of evaluating transit services in relation to transportation goals and standards of the Miami urban area. Metropolitan Transit Authority operations are specifically reviewed in the light of nine criteria for evaluating quality of transit service.

Appendix A provides a list of other technical memoranda included in this series.

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(continued)

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INTRODUCTION

Even the most efficient transit operation will not satisfy the diverse travel desires and demands of everyone. Some people may expect the same degree of convenience in buses that they enjoy in their private cars - - when a person leaves home by automobile, the car is at his doorstep and there is no walking or waiting before his trip can begin. The private car gives direct point-to-point service from home to destination. Obviously, transit cannot furnish this quality of service short of going into the taxicab business.

Mass transportation service is a compromise of individual needs in that it provides the best practicable service for the greatest number of people within the economic limits of the fare. Thus, the yardsticks which have been developed over the years for the evaluation of transit service are directly related to the economic feasibility of providing that service.

Experience of the transit industry has evolved a set of empirical standards for measuring the quality of transit service, based on public acceptance and the performance of the industry as a whole. These standards are generally recognized by the industry itself, as well as by regulatory agencies throughout the country.

Adequacy of transit service may thus be determined by evaluating each of the following elements in terms of reasonable and commonly accepted standards:

> Availability - How far must patrons walk to reach transit service - - i.e., how completely does the service cover the community?
>
> Direct Service - Do present lines provide direct service for the main flow of travel? Is there need for additional direct service?

Volume of Service - Is adequate service operated to accommodate riders without extravagant surplus miles?

Frequency of Service - How long do people have to wait for a bus?

Loading Standards - What standards of passenger loading are used in developing transit schedules?

Dependability - How much of the scheduled transit service is actually operated each day? What is the system record for on-time performance?

Speed of Operation - How long does it take to reach a particular destination? Is the service fast and direct?

Accommodation Service - What low-patronage accommodation service does the system provide?

Rate of Fare - How does the fare structure compare with that in other like communities?

EXISTING TRANSIT SERVICES

Mass transit service in Metropolitan Dade County is provided jointly by the Metropolitan Transit Authority (MTA) and the Coral Gables Municipal Bus System (CGMBS). The former serves 90% of Dade County, including parts of Coral Gables. The latter serves Coral Gables but also provides service in the county (Figure 1). Although two systems are providing service to Dade County, they are essentially coordinated as one urban transit system from an administrative standpoint.

Gray Lines operates several buses in the north beach area in direct competition with MTA. Its service is so minor, however, that it is considered comparable to jitneys which also serve a limited population.

MTA and CGMBS do not compete with one another in any manner but are coordinated for the mutual benefit of both. Coordination and cooperation between the two systems take many forms. The most significant forms are discussed briefly below.

1. Routes are coordinated to avoid duplication of service.

2. Schedules are coordinated to minimize transfer time required.

3. The Coral Gables Municipal Bus System cooperates with MTA in provision of terminal facilities in Coral Gables.

4. As the need for transit service is created in the newly developing residential areas west of Coral Gables, representatives of the two companies jointly plan further extension of service into these areas.

EVALUATION OF SERVICE

Availability

From the individual's standpoint, the usefulness of transit is determined by proximity of service to his home and to his desired destinations. From the standpoint of the community, this question resolves itself into how completely the transit service blankets the entire urban area.

The prevailing standard in the transit industry for an urban area is that service should be available within a distance of approximately one-quarter mile. This yardstick, based upon a reasonable five-minute walk, is satisfactory for the city proper. A wider route spacing is acceptable for thinly developed outlying areas. If residential developments are separated by open expanses of land, the determination of whether bus service is warranted should be made on the basis of the expected bus patronage in relation to the cost of the new service.

Except for the major separation, by Biscayne Bay, of heavily populated Miami Beach from Miami proper, and the limited throats across the Miami River to the southwest area of the city, there are no geographical restraints on traffic flow and the routing of MTA buses. An extensive and uniform gridiron street pattern permits wide flexibility in the establishment of transit routes.

Transit routes in Dade County meet satisfactorily the criteria for coverage of the densely populated areas of the county (Figure 1) - - public transit service is readily available to over 90% of the area population. Areas not within one-quarter mile are sparsely populated.

The 1964 MUATS origin-destination study and subsequent analysis of travel attractors have identified those areas of the county which generate the highest amounts of travel (Figure 2). MTA and CGMBS service is available in all of these areas except

No. 13 (Matheson Hammock Park) and No. 16 (Cape Florida State Park) which can hardly be considered sources of transit riding. The Homestead area (No. 24 - Homestead Air Force Base and No. 25 - Homestead Shopping Center) is now being served by a bus route on an experimental basis, with disappointing results.

Direct Service

From the rider's viewpoint, the ability to use one vehicle from origin to destination is obviously desirable, but impossible for all mass transportation passengers. The objective is to meet the travel needs of the large bulk of patrons by providing direct service along principal routes of travel.

The best measure of the directness of service is the proportion of passengers who must use more than one bus to complete their journeys. The present system meets this standard favorably - - the lines are laid out so that a large proportion of the patrons (81%) have the convenience of a single-vehicle journey. The remaining 19% transfer to a second vehicle. A transfer ratio of less than 20% is low for a system as large as that in Miami.

However, service revisions have lagged behind changing travel patterns when the proportion of passengers required to take a second or third vehicle is measured historically, as shown in the following tabulation:

Year	Percent of Revenue Passengers Using Second or Third Vehicle
1962	12.6%
1963	13.3%
1964	16.5%
1965	16.8%
1966	17.6%
1967	18.7%

In 1962, seven-eights of all riders completed their journeys without need to transfer. In 1967, only four-fifths of MTA transit patrons were afforded the same convenience. This trend of increasing inconvenience to riders has not had a discernible effect on the continued increase in total riding, but clearly indicates that the travel requirements of an increasing proportion of riders are not being met with direct, one-bus service.

The relative importance, or lack of importance, of the central business district as a traffic attraction can be seen in Table 5 of Transit Technical Memorandum No. 3[1] which shows the following distribution of person trips to and from Miami Beach as of 1964:

Travel Between	Transit	Percent	Via All Modes	Percent
Miami Beach and CBD	9,180	31.2%	20,800	9.8%
Miami Beach and Remainder (of Mainland)	20,250	68.8	191,420	90.2
Total	29,430	100.0%	212,220	100.0%

In contrast, MTA service between Miami Beach and Miami is distributed as follows:

Service Between	A. M. Peak Buses	Percent
Miami Beach and CBD	53	73.6%
Miami Beach and Remainder	19	26.4
Total	72	100.0%

(1) Simpson & Curtin, Public Transit Master Plan Technical Memorandum No. 3, "Corridors for Transit Improvements," Miami Urban Area Transportation Study, Metropolitan Dade County, Florida, July, 1968.

Although by far the largest number of person trips are non-CBD-oriented, nearly 75% of MTA transbay service is routed into the downtown area. This suggests a fertile field for the provision of direct service from Miami Beach to mainland areas other than the CBD. Verification of this approach is at hand. In February 1968, MTA inaugurated Route H between all parts of Miami Beach and North Miami Beach on the mainland. This route matches almost exactly the heavy travel movement (person trips) flowing between the 163rd Street Shopping Plaza area and all parts of Miami Beach charted in Figures 9-12 of Technical Memorandum No. 3. (In contrast, Figures 3-6 of the same study show minimal 1964 transit trips between these areas.) The satisfaction of a potential market is evidenced by the fact that Route H reached 2,500 passengers per day in June, 1968, and showed income of 66¢ per mile.

Consideration of extension of Route 11 northward appears justified on the basis of potential travel lines depicted in the previously mentioned Technical Memorandum No. 3. This route would provide direct north-south service to downtown without necessity to transfer.

Volume of Service

A useful tool in appraising the quantity of service on a transit system is examination of the relationship over a period of years between miles of service provided and volume of passenger riding. MTA has recorded significant increases in passenger volume, from almost 47 million in 1963 to almost 59.7 million in 1967, as shown in the following tabulation:

Year	Miles Operated	Passengers Carried	Miles of Service Provided per 100 Passengers Carried
1963	11,906,796	46,919,688	25.38
1964	12,048,382	48,050,775	25.07
1965	11,722,505	49,837,488	23.52
1966	13,136,696	53,880,655	24.38
1967	14,486,838	59,688,202	24.27

This pattern of increasing riding, which is contrary to the general rule in the transit industry, obviates the problem of reducing service to control costs in the face of diminishing demand which has beset other transit operations. At the same time, service increases have kept pace with the increased riding shown above.

Frequency of Service

Headway, or the interval between buses on each route, is a service standard which receives a great deal of attention from both management and transit patrons. The amount of service to be provided at various periods of the day must strike a balance between that level which will produce the most riding and the cost of added service.

It is to the Authority's advantage to operate the most frequent service possible within practical economic limits. Close headway service attracts and holds riders. On the other hand, the system can ill afford to provide a greater amount of service than patronage will support, leading inevitably to fare increases affecting all system riders. Higher fares, in turn, reduce total transit riding and lessen the usefulness of the system to the community.

Successful operation of a transit system rests largely on management's ability to gauge the frequency and quantity of service required to meet reasonable public needs and to maintain balance between the basic forces of supply and demand on each route - - while at the same time holding to a reasonable fare.

Of the MTA downtown-oriented routes, only five have peak hour headways exceeding 20 minutes (Table 1). The Miami-Miami Beach headways range from 9 to 20 minutes during peak service and do not exceed 23 minutes during the midday base period. This service is adequate and falls within acceptable limits of waiting time. During off-peak hours and for certain specialized peak hour services, headways range up to 60 minutes and, in a few instances, even longer. Such extended headways are acceptable if timing of individual runs is carefully selected to meet patronage demands and ample publicity and information are directed to potential riders.

TABLE 1

ROUTE CHARACTERISTICS

HEADWAYS AND BUSES ASSIGNED

METROPOLITAN TRANSIT AUTHORITY

		HEADWAYS			BUSES		
No.	Name	AM Peak	Midday	PM Peak	AM Peak	Midday	PM Peak
	Downtown						
1	South Miami – Dade J. C. So.	15	30	15	9	5	8
3	Grapeland Heights	27	40	27	3	2	3
4	N W 12th Ave. – Coral Way via Dnt.	12	30	17	10	4	7
5	N W 151 St. – Westchester via Dnt.	9	15	8	21	12	23
6	Hialeah Ltd. – Coconut Grove	12	30	14	17	7	15
11	North Miami – W. Flagler	11	20	13	18	10	15
12	North Miami – North Miami Beach	12	15	13	12	10	11
14	Coconut Grove – Hialeah	11	20	13	16	9	14
15	Junior College North (Dade)–183 St.	15	20	13	9	7	11
15	Shuttle from 183 St. to 208th St.						
16	South Dixie Express	3 trips		4 trips	3		4
17	Dinner Key via S W 17th Ave.	30	30	20	2	2	3
18	Jr. College North (Dade)–Mercy Hospital	25	30	30	6	5	5
19	N W 7th Street	12	20	13	8	5	7
21	Liberty City	12	15	12	8	6	8
23	Palm Springs–Hialeah via N W 22nd Ave.	14	20	20	10	7	7
24	N W 46th Street	30	30	30	3	3	3
25	Bunch Park – Miami Shores	17	30	19	9	5	8
26	Carol City – Norwood – Opa-Locka	6	15	7	21	9	20
26	Express						
27	Civic Center Crosstown	30	30	30	2	2	2
28	Coconut Grove via S W 6th St.	18	30	15	5	3	6
29	East – East Hialeah	24	60	30	9	5	9
29	West-Miami Lakes via Palm Springs	30	60	24	9	5	9
30	Miami Springs – Coconut Grove	26	30	23	7	6	8
35	Homestead Express						
B	Key Biscayne – Crandon Park	40	40	40	2	2	2
	Crosstown						
8	Airport to N W 103rd St.	75	–	75	1	–	1
31	Jr. College (Dade)–N. Dade Crosstown	60	60	60	2	2	2
32	163rd St. Shopping Center	60	60	60	2	2	2
34	Miami Beach – Junior College South	48	60	48	5	4	5
37	17th Avenue Crosstown	30	–	30	4	–	4
O	Meridian Ave. – South Shore	60	60	60	1	1	1
R	Biscayne Pt. – Normandy St.–South St.	30	30	30	4	4	4

TABLE 1

ROUTE CHARACTERISTICS

HEADWAYS AND BUSES ASSIGNED

(Continued)

METROPOLITAN TRANSIT AUTHORITY

No.	Name	HEADWAYS AM Peak	HEADWAYS Midday	HEADWAYS PM Peak	BUSES AM Peak	BUSES Midday	BUSES PM Peak
	Miami – Miami Beach						
A(XX)	N. W. 3rd Ave. & 13th Street	15	–	23	3	–	2
C	Mt. Sinai Hospital	20	20	20	6	6	6
K	Surfside	18	20	20	9	8	8
L	Hialeah – Miami Beach	10	20	12	21	11	18
M	44th & Collins–MacArthur Limited	20	20	17	5	5	6
S	Bunch Park – Miami Beach	30	40	40	14	10	10
S	194th & Collins	27	40	40			
T	Surfside via Tuttle Causeway	10	30	9	12	4	13
	Feeder Lines						
7	Goulds to South Miami	60	–	60	1	–	1
2	Richmond Heights	60	–	60	1	–	1

CORAL GABLES MUNICIPAL BUS SYSTEM

No.	Name	HEADWAYS AM Peak	HEADWAYS Midday	HEADWAYS PM Peak	BUSES AM Peak	BUSES Midday	BUSES PM Peak
4	University	20	30	20	2	1	2
5	Country Club	20	30	20	1	1	1
6	Granada	20	30	20	1	1	1
7 & 8	Miami	10	20	10	5	3	5
9	Biltmore	20	30	20	2	1	2
10	Salvadore Park	20	30	20	2	1	2
11	Baptist Hospital	90	90	90	3	3	3
12	Riveria	90	90	90	2	2	2
13	Westchester	30	30	30	3	3	3
15	Grand Avenue	15	60	15	2	1	2
16	Flagler	20	30	20	1	1	1
17	Industrial	60	60	60	2	2	2

Loading Standards

The loading standard is the criterion for scheduling service on transit routes in relation to volume of riding. The load factor is determined by counting the number of passengers per bus at the maximum load point of a particular line, then dividing that total by the seats provided. The maximum load point is that location where vehicles carry the greatest number of passengers.

An analysis has been made of passenger loads on a number of routes of the Dade County Transit Authority(2) in peak periods (Table 2). This study was based on passenger load counts made by experienced checkers employed by the Authority during a period in September and October, 1967.

A seat for every passenger cannot be provided in urban transit operation so long as the majority of workers travel at the same periods of the day. Industry standards and practice developed over the years have established 150% as a reasonable rush hour load factor - - i.e., schedules should be designed in relation to passenger demand so that the average maximum-loaded bus will carry 50% more passengers than its seating capacity. A 53-passenger bus, for example, would be carrying 79-80 passengers.

In Miami, on the days and routes checked, the loading standards on MTA inbound buses were more generous than this measure. Of the 83 buses checked during the 7:30-8:00 A. M. half-hour, only 21, or 25.3%, had standing passengers in any number and only two or three approached the accepted standard.(3) Careful analysis of riding checks would reveal potential elimination or combination of bus trips to produce more efficient utilization of equipment on the street. This is not to say that a more generous level of service is not desirable if it can be economically provided - - as MTA seems to be able to do.

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(2) Similar data not available for CGMBS.

(3) Although this analysis covers a typical portion of MTA service, it should be noted that the 150% standard is equalled or exceeded at times in other instances. Each route and time period must be considered individually.

TABLE 2

INBOUND PASSENGER LOAD CHECKS

Time Period (A.M.)	Buses	Passengers	Passengers / Bus	Percent of Capacity	Time Period (A.M.)	Buses	Passengers	Passengers / Bus	Percent of Capacity
6:00 – 6:15	24	265	11	23%	6:00 – 6:30	46	762	17	36%
6:15 – 6:30	22	497	23	49					
6:30 – 6:45	26	476	18	38	6:30 – 7:00	55	1,204	22	47
6:45 – 7:00	29	728	25	53					
7:00 – 7:15	36	1,081	30	64	7:00 – 7:30	75	2,493	33	70
7:15 – 7:30	39	1,412	36	77					
7:30 – 7:45	41	1,463	36	77	7:30 – 8:00	83	3,189	38	81
7:45 – 8:00	42	1,726	41	87					
8:00 – 8:15	39	1,477	38	81	8:00 – 8:30	77	2,922	38	81
8:15 – 8:30	38	1,445	38	81					
8:30 – 8:45	29	967	33	70	8:30 – 9:00	63	2,094	33	70
8:45 – 9:00	34	1,127	33	70					
9:00 – 9:15	27	779	29	62	9:00 – 9:30	45	1,275	28	60
9:15 – 9:30	18	496	28	60					
9:30 – 9:45	22	561	26	55	9:30–10:00	40	1,025	26	55
9:45–10:00	18	464	26	55					

The volume of service in the off-peak period (and in peak periods as well on many lines) is governed by policy considerations and passenger accommodation rather than by loading standards. While the service standards maintained by Dade County Transit Authority are generous in relation to those of other transit operations, any cuts in service should be carefully considered. Passengers will tolerate heavy spot loads on buses, and do not mind standing for short periods, but there is an increasing tendency for most patrons to expect a seat. This is true in rush hours as well as in the off-peak periods. The tailoring of service to meet riding patterns requires careful consideration of both passenger reaction and direct economic results.

Dependability

The dependability of transit service has two principal elements. The first yardstick of dependability is determination of that proportion of scheduled service which is actually operated. Except for an occasional spot shortage of a driver or two after a "pay day" weekend, all of MTA's scheduled service is operated daily.

A more significant measure of the dependability of service is the extent to which vehicles adhere to the scheduled time on each route. As service is reduced and the intervals between buses grow longer, patrons must place greater dependence on service being operated in accordance with the timetable.

A satisfactory range of deviation from Miami "on-time" performance under present-day traffic conditions lies within the limits of one minute early and five minutes late. Information available from street checks made by MTA personnel in the fall of 1967 indicates that adherence of buses to scheduled operating times leaves much to be desired. On seven lines, the street check points coincided with scheduled time points; comparisons were made between the scheduled times and the actual passing times. Of the 69 trips analyzed on this basis, 35 or 50.7%, were within the accepted one-minute-early, five-minutes-late criteria. The percentage performance of individual lines was:

Line	Percent On Time
24	87.5%
T	77.8%
30	66.7%
L	66.7%
14	60.0%
26	28.6%

MTA service is directed on the street by a force of supervisors manning a fleet of six radio-equipped automobiles covering the entire service area. Adequate coverage is thus maintained although this supervisory force is handicapped in the use of the two-way radio equipment by the necessity to share the local police frequency and route calls through the police operator. While coded messages can be relayed to and from MTA headquarters, direct conversation and discussion of problems are impossible. A separate two-way radio facility for the transit operation is strongly recommended.

Consideration should also be given to the display of the assigned scheduled run number on each bus. This could greatly assist the supervision on the street in matching the buses as seen with designated schedule times.

Measurement of transit service on the street is a primary source of management information: Are vehicles adhering to time schedules? Are certain trips overloaded to the point of passenger inconvenience and discomfort? Is patronage on certain trips sufficient to warrant continued operation? In the absence of adequate mechanical or electronic devices to provide such "feedback," transit companies rely on analysis of regular, periodic observation data submitted by experienced street checkers who work on a full-time basis, rotating among routes.

At present, however, MTA is able to provide street checks only on a spot basis when complaints or other circumstances draw attention to particular routes or areas. Expanded checking activity is strongly recommended not only to give the schedule-making department data needed to keep service responsive to demands, but also to measure the efficacy of roving street supervision.

Speed of Operation

Two major considerations underscore the importance of transit service speed of operation: (1) attractiveness of mass transportation is dependent upon a fast and accommodating ride; (2) cost of providing service is inversely related to speed of operation (Figure 3).

The overall scheduled speed of MTA service is 12.5 miles per hour (Table 3). This relatively high scheduled speed (the average operating speed on most large properties is between 11 and 12 miles per hour) is made possible by the open layout of streets and lack of a major congested downtown area in Miami proper. At present, express operation is limited, but as use of freeways increases even higher scheduled speeds can be anticipated.

The travel time required for an intracity trip is a major influence on the traveler's choice of mode. The bus rider is conscious of automobiles passing while his bus is stopped to receive or discharge passengers. He notes also the total elapsed time for his journey in comparing the two travel modes - - usually with unfavorable results for public transit. Disregarding, for the moment, the walking time requirements (to the bus line at the origin of a typical trip, and from the parking location at the destination), some interesting comparisons can be drawn in analyzing travel speeds in the urban environment. The average scheduled speed of MTA bus service is 12.5 miles per hour. For an assumed average trip of four miles, the rider finds he will spend nearly 20 minutes on the bus portion of his journey. If, however, bus speed could be increased to 20 miles per hour, over seven minutes - - or 36% of the bus-riding time - - could be saved.

Average Speed	Elapsed Time for Four-Mile Trip
20.0 mph	12.0 minutes
15.0 mph	16.0 minutes
12.5 mph	19.2 minutes
10.0 mph	24.0 minutes

TABLE 3

ROUTE CHARACTERISTICS

SCHEDULED SPEEDS AND FINANCIAL RESULTS

JUNE, 1968

No.	Name	Scheduled Speed	Revenue Per Mile	Cost Per Mile	Net Revenue Per Mile
	Downtown				
1	South Miami – Dade J. C. South	13.9	.445	.512	–.069
3	Grapeland Heights	10.8	.443	.587	–.144
4	N W 12th Ave. – Coral Way via Dnt.	11.2	.662	.668	–.006
5	N W 151 St. – Westchester via Dnt.	11.5	.818	.681	+.137
6	Hialeah Ltd. – Coconut Grove	12.5	.583	.599	–.016
11	North Miami – W. Flagler	10.9	.783	.644	+.139
12	North Miami – North Miami Beach	11.0	.561	.580	–.019
14	Coconut Grove – Hialeah	11.5	.802	.673	+.129
15	Junior College North (Dade) – 183 St.	11.5	.651	.627	+.024
15	Shuttle from 183rd St. to 208th St.		.153	.593	–.440
16	South Dixie Express	20.8	.342	.471	–.129
17	Dinner Key via S W 17th Ave.	9.2	.469	.622	–.153
18	Jr. College North (Dade) – Mercy Hospital	11.6	.496	.598	–.102
19	N W 7th Street	11.7	.491	.609	–.118
21	Liberty City	9.3	.849	.733	+.116
23	Palm Springs – Hialeah via N W 22nd Ave.	9.9	.499	.578	–.079
24	N W 46th Street	9.3	.600	.663	–.063
25	Bunch Park – Miami Shores	11.4	.563	.581	–.018
26	Carol City – Norwood – Opa-Locka	13.6	.502	.546	–.044
26	Express	21.9	.647	.700	–.053
27	Civic Center Crosstown	9.3	.530	.692	–.162
28	Coconut Grove via S W 6th St.	12.2	.437	.568	–.131
29	East – East Hialeah	11.8	.527	.595	–.068
29	West – Miami Lakes via Palm Springs	12.2	.472	.543	–.071
30	Miami Springs – Coconut Grove	10.8	.589	.625	–.036
35	Homestead Express	22.0	.111	.385	–.274
B	Key Biscayne – Crandon Park	13.4	.493	.536	–.043
	Crosstown				
8	Airport to N W 103rd St.	11.4	.208	.591	–.383
31	Jr. College (Dade) – N. Dade Crosstown	17.0	.198	.438	–.240
32	163rd St. Shopping Center	12.8	.476	.525	–.049
34	Miami Beach – Junior College South	14.2	.343	.499	–.156
37	17th Avenue Crosstown	10.7	.381	.587	–.206
0	Meridian Avenue – South Shore	9.5	.288	.611	–.323
R	Biscayne Pt. – Normandy St. – South St.	10.2	.397	.576	–.179

TABLE 3

ROUTE CHARACTERISTICS

SCHEDULED SPEEDS AND FINANCIAL RESULTS

JUNE, 1968

(Continued)

METROPOLITAN TRANSIT AUTHORITY

No.	Name	Scheduled Speed	Revenue Per Mile	Cost Per Mile	Net Revenue Per Mile
	Miami – Miami Beach				
A (XX)	N. W. 3rd Ave. & 13th St.	12.8	.525	.619	– .094
C	Mt. Sinai Hospital	9.3	.782	.665	+ .117
K	Surfside	11.4	.638	.602	+ .036
L	Hialeah – Miami Beach	11.7	.615	.601	+ .014
M	44th & Collins – MacArthur Limited	11.0	.645	.631	+ .014
S	Bunch Park – Miami Beach	11.1	.510	.597	– .087
S	194th & Collins	10.9	.606	.628	– .022
T	Surfside via Tuttle Causeway	12.0	.480	.565	– .085
	Feeder Lines				
7	Goulds to South Miami	28.7	.317	.420	– .103
2	Richmond Heights	21.8	.387	.436	– .049

TABLE 3

ROUTE CHARACTERISTICS

SCHEDULED SPEEDS AND FINANCIAL RESULTS

YEAR 1967

(Continued)

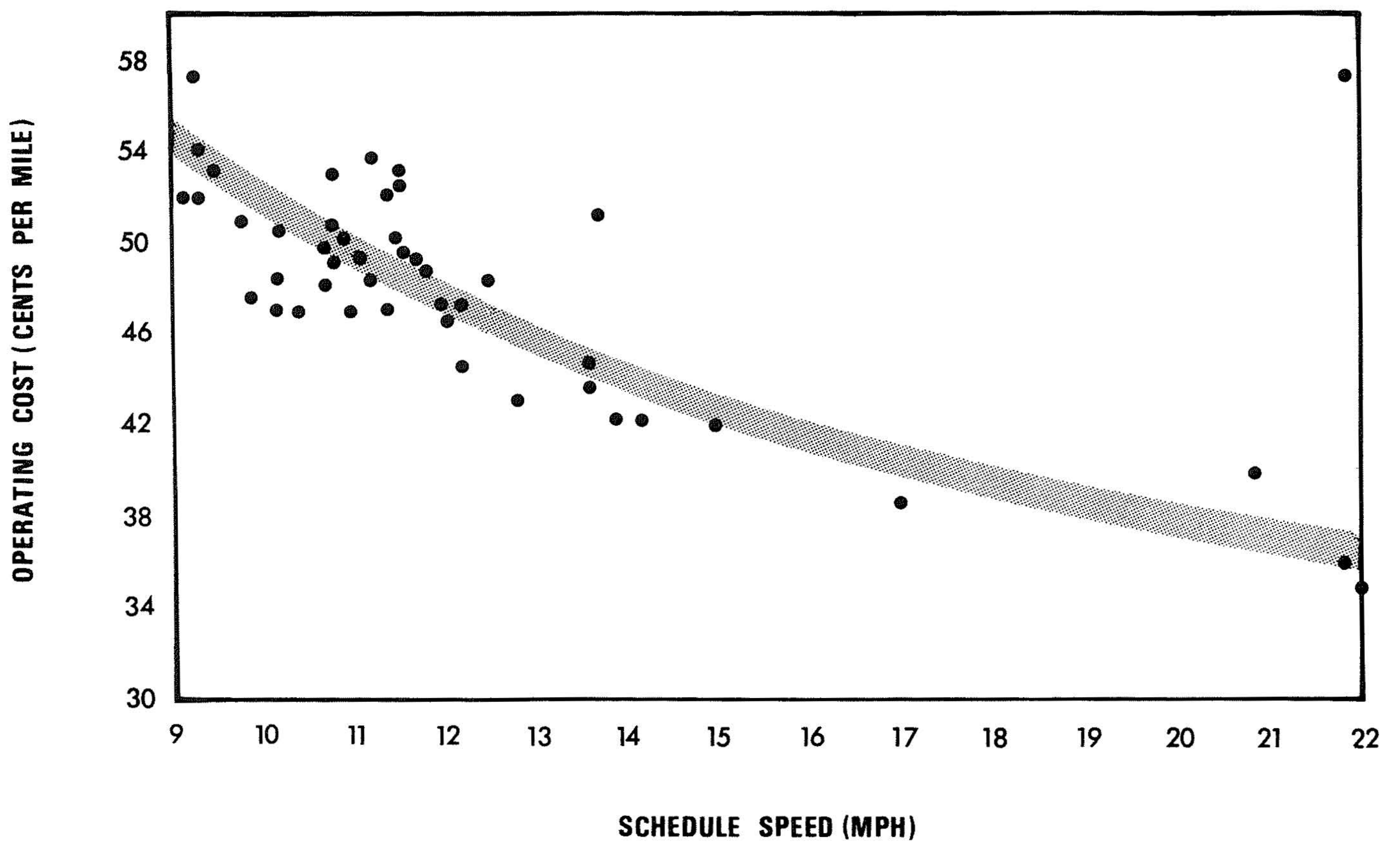
CORAL GABLES MUNICIPAL BUS SYSTEM

No.	Name	Scheduled Speed	Revenue Per Mile	Cost Per Mile	Net Revenue Per Mile
4	University	12.2	.411	.442	– .031
5	Country Club	14.1	.743	.442	+ .301
6	Granada	11.7	.206	.442	– .236
7 & 8	Miami	13.7	.732	.442	+ .290
9	Biltmore	14.6	.433	.442	– .009
10	Salvadore Park	13.5	.467	.442	+ .025
11	Baptist Hospital	18.1	.388	.442	– .054
12	Riveria	16.7	.333	.442	– .109
13	Westchester	17.1	.390	.442	– .052
15	Grand Avenue	9.8	.444	.442	+ .002
16	Flagler	10.8	.292	.442	– .150
17	Industrial	16.8	.112	.442	– .330

FIGURE 3

ROUTE COST PER MILE AND SCHEDULE SPEED

(MTA ROUTES - JUNE 1968)



Since 20 mph scheduled speeds are attained on those routes utilizing expressway facilities (No. 16 and No. 26), routing to exploit this advantage should be instituted where justified by passenger loads. On city streets, however, speeds are necessarily limited by traffic controls and congestion. Speed checks on portions of typical routes revealed overall speeds of 19.6, 14.2, 18.0, 19.8 and 13.9 miles per hour, including passenger stops and traffic delays. Even with elimination of stops for pickup and discharge of passengers, speeds attainable in these instances would represent an increase of only about 25% - - 23.8, 17.6, 26.2, 26.7 and 17.2 mph.[4]

Although scheduled speeds could be increased somewhat by wider spacing of stops with less frequent stopping, walking distances would be increased and the convenience and availability of the service would suffer. Present stated basic MTA policy is to stop at every other cross street, with a maximum stop spacing of 760 feet. It is felt that this standard is realistic, especially in view of the small overall increase in speed that might be realized.

Accommodation Service

An additional measure of good community transit service is the degree to which the management provides service "for service's sake," namely, operations which are unprofitable in themselves, but which are essential to a limited group of riders.

In an integrated transit system, some accommodation service is essential. Persons unable to drive a car or to afford taxicab service must be provided some opportunity to travel to sparsely populated sections, or in early hours of the morning when riding volume is too low to warrant regular bus operation.

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(4) These speed and delay checks were made over portions of routes outside of major congestion areas and the speeds are high in relation to overall "scheduled" speeds discussed elsewhere in this report. "Scheduled" speeds include entire routes as well as necessary layover time at the end of each trip and are significantly lower than these observed speeds.

A reasonable goal for scheduled accommodation service is that it should produce revenue sufficient to cover out-of-pocket costs incident to such operations. Out-of-pocket expenses are the direct costs required to furnish such service, including drivers' wages, fuel, oil, tires, vehicle servicing and maintenance, injuries and damages, and other direct expenses - - leaving overhead and other fixed administrative costs to be borne by the balance of the system. At current costs, direct MTA expenses are approximately 48¢ per mile.

Seventeen of the 47 routes now operated by MTA actually fall below the level for accommodation service as thus defined, in that they do not earn enough to cover direct costs (Table 3). Several other routes produce revenue only slightly above direct costs on an aggregate basis, indicating that a substantial part of the service on these lines is furnished as an accommodation. However, since most marginal services are operated at speeds above the system average, the break-even point for out-of-pocket expenses may in some instances be somewhat below 48¢ per mile. The month of June, 1968 has been used as representative of current results. It can be expected that winter months would show somewhat more favorable results due to increased school riding and increased economic activity related to the tourist season.

Rate of Fare

The MTA fare structure has been in effect without change since June, 1963. The basic 20¢ cash fare with free transfer is supplemented by additional zone charges of 5¢ and 10¢ for travel to and from the extremities of certain longer lines, and by a 10¢ Inter-Area Exchange Fare for rides involving the use of both Miami Beach and Miami Mainland buses. Other than a student fare of 10¢, no reduced rate tokens or passes are offered.

Compared with fares in the 30 largest cities, Table 4, the present basic adult cash fare of 20¢ is the lowest in the country, except for the subsidized public operations in New York, Boston and San Francisco (the New Orleans cash fare of 10¢ is the result of an atypical, specialized situation). The success of MTA in maintaining this low fare is based on the healthy upward trend of riding in the area. However, the inevitable cost-push of higher labor rates has made itself felt - - a 5¢ increase in base fares and zone and Inter-Area charges has been approved for the fiscal

TABLE 4

ADULT FARES

Transit Systems Serving Major Metropolitan Areas

January, 1968

City	Cash Fare	Token or Other Rates	Transfers
	Publicly Owned Transit Systems		
Chicago	30¢	–	5¢
Cleveland	30¢	28.00¢ (5/$1.40) $4.25 (weekly pass)	5¢
Los Angeles	30¢	–	5¢
Pittsburgh	30¢	$1.90 per week plus 10.00¢ per ride	5¢
San Diego	30¢	27.50¢ (4/$1.10)	Free
St. Louis	30¢	$3.75 (weekly pass)	5¢
Detroit	25¢	22.50¢ (4/90¢)	5¢
Oakland	25¢	20.00¢ (5/$1.00)	Free
Seattle	25¢	–	Free
Dallas	23¢	21.25¢ (4/85¢)	Free
MIAMI	20¢	–	Free except between Miami Beach–Miami mainland lines.
New York	20¢	–	No transfers except between rapid transit lines.
Boston	10¢ Surface 20¢ Rapid Transit	–	No transfers except between rapid transit lines.
San Francisco	15¢	–	Free
	Privately Owned Transit Systems		
Cincinnati	35¢	30.00¢ (5/$1.50) or $1.10 per week plus 15.00¢ per ride	5¢
Houston	30¢	25.00¢ (8/$2.00)	Free
Kansas City	30¢	–	3¢
Milwaukee	30¢	25.00¢ (6/$1.50)	Free
Atlanta	25¢	–	5¢
Baltimore	25¢	–	5¢
Buffalo	25¢	–	5¢
Minneapolis	25¢	–	Free
Philadelphia	25¢	–	5¢
Washington	25¢	24.50¢ (4/98¢)	Free
New Orleans	10¢	–	Free

year starting October 1, 1968, intending to compensate for the additional labor costs and to permit continuation of route expansion as warranted, as well as systematic renewal of the bus fleet.

The resulting 25¢ basic cash fare will still be among the lowest in the industry.

APPENDIX A

LIST OF TRANSIT TECHNICAL MEMORANDA

Transit Technical Memorandum No. 1
TRANSIT COST ALLOCATION MODEL DEVELOPMENT
July 1967

This memorandum analyzes operating expense accounts of the Metropolitan Dade County Transit Authority to develop a formula for relating route operating characteristics, including vehicle miles, vehicle hours, peak vehicle needs and passenger revenue to the average cost of route operation. This formula will be applied to future transit system alternatives to estimate operating costs for each alternate system. The memorandum also includes a revenue/cost analysis for each of the existing MTA routes.

Transit Technical Memorandum No. 2
EVALUATION OF PRESENT TRANSIT SERVICES
August 1968

This memorandum evaluates existing transit service for the purpose of establishing standards of coverage, frequency of service, directness of service, and other service characteristics to judge existing operations and establish goals for the future mass transit master plan.

Transit Technical Memorandum No. 3
CORRIDORS FOR TRANSIT IMPROVEMENTS
July 1968

This memorandum defines corridors of movement within Dade County which appear to justify improved transit service. A 67-mile grade-separated rapid transit system is developed to meet anticipated volumes of 1985 movement. Alternative systems are also developed including a "do-nothing" bus system and bus rapid transit.

Transit Technical Memorandum No. 4
FORMS OF MASS TRANSPORTATION
May 1968

This memorandum evaluates existing and new forms of mass transportation and presents details on their state of development, operating characteristics, geometric design characteristics and other facts relating to the selection of a mass transit system to meet projected travel needs in Dade County.

Transit Technical Memorandum No. 5
EVALUATION OF ALTERNATE TRANSIT PLANS
August 1968

This memorandum evaluates the future transit systems developed in Memorandum No. 3 with regard to the revenues to be derived from each alternate as compared with capital and operating expenses under each plan. In addition to revenue/cost analysis, community benefits to be derived from improved transit services are discussed.

METROPOLITAN DADE COUNTY PLANNING ADVISORY BOARD

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