DES MOINES AREA
TRANSIT DEVELOPMENT PROGRAM UPDATE

August 1975

Prepared for the Central Iowa Regional Association of Local Governments and the Metropolitan Transit Authority
by

DE LEUW, CATHER & COMPANY • Engineers and Planners • Chicago

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FINANCIAL 6-0424 • AREA CODE 312

September 18, 1975 OUR REF. 2558-00

Central Iowa Regional Association of Local Governments
104 1/2 E. Locust Street
Des Moines, Iowa 50309

Re: Des Moines Transit Development Program Update

Gentlemen:

On October 21, 1974 we were authorized to proceed with a study of the public transit service provided to the cities of Des Moines, Clive, Urbandale, West Des Moines, and Windsor Heights by the Des Moines Metro Transit Authority. The study was to evaluate existing transit service and to prepare a five-year Transit Development Program. This is our report.

The study analyzes the basic characteristics of the current transit system, presents transit service improvement alternatives and a recommended program. A complementary five-year capital and operating program is also presented. The methodology utilized in reaching the various projections and conclusion is described in detail.

The full and competent co-operation of the staffs of the Central Iowa Regional Association of Local Governments and the Des Moines Metro Transit Authority is greatfully acknowledged. We appreciate having been afforded this opportunity to serve you.

Very truly yours,

DE LEUW, CATHER & COMPANY

William C. Nevel
Project Director

TABLE OF CONTENTS

TABLE OF CONTENTS (continued)

APPENDICES

LIST OF TABLES

LIST OF TABLES (continued)

LIST OF FIGURES

Chapter I

INTRODUCTION

Based on recommendations made in a technical study initiated in 1969, the cities of Des Moines, Clive, Urbandale, West Des Moines and Windsor Heights arranged for the public takeover, funding and operation of the failing Iowa Regional Transit Corporation (IRTC). This action assured the preservation of basic transit service in the area—a vital source of mobility for those without access to an automobile and for those too old, too young, or physically unable to drive a car. It also enabled the continuation of a transportation system which efficiently utilizes land resources and alleviates a portion of the congestion, air pollution, and urban sprawl attributable to the private automobile.

In recent months, the dramatic increases in gasoline prices and in the cost of new cars have created a potential new market among those who are not transit dependents, but who are interested in more economical transportation. However, these persons will be persuaded to use public transportation only if reasonably systematic and convenient service is offered. Such demands pose a considerable challenge to the Des Moines Metropolitan Transit Authority (MTA), the public agency charged with the responsibility for operation of the system.

The Urban Mass Transportation Administration (UMTA) of the U.S. Department of Transportation furnishes planning, capital and, more recently, operating assistance for public transportation entities. To obtain Federal funding for many types of projects, UMTA requires that the metropolitan planning organization for the project area formulate a Transit Development Program (TDP). This program must relate to the overall "on-going regional comprehensive and transportation planning such that the relationships among individual transit projects, regional transit and transportation systems and overall regional development are consistent."* The TDP is thus an integral element of the area's overall regional comprehensive planning process. A TDP which encompasses at least a five-year period must include:

*Source: UMTA, External Operating Manual, August 1972, p. IIE-5.

- Inventory and evaluation of existing conditions.
- Anticipated operations and capital improvements.
- Estimates of costs and methods of financing.
- Schedule of priorities.
- Implementation responsibilities.
- Transit system coordination.
- Transit management and operations improvements.
- Procedure(s) for annual update of the TDP.

In accordance with these requirements, the Central Iowa Regional Association of Local Governments (CIRALG) and the MTA are now concerned with the evaluation and updating of previous technical studies and other investigations related to public transportation in the Des Moines area, and the formulation of a comprehensive Transit Development Plan and Program for the area.

The overall objectives of such a program are to provide the framework for efficient improvement and expansion of the transit system in order to attract more riders from a broader spectrum of the population, and to result in effective coordination of MTA service with the comprehensive planning objectives of the local governments.

This report presents the results of efforts undertaken jointly by the CIRALG and the MTA, assisted by De Leuw, Cather & Company, consulting engineers retained by CIRALG to conduct the investigations and formulate recommendations basic to a five-year development program for the Des Moines public transit system.

During the course of this study discussion meetings were held with a number of other governmental agencies and citizen groups representing the five member communities. These discussions provided a channel through which the concerns and ideas of local citizens became input in the development of this report. Those agencies and groups included:

- Des Moines Plan and Zoning Department
- Des Moines Department of Traffic and Transportation
- Transportation Sub-Committee of the Council of Clive
- Transportation Committee of Urbandale
- Transportation Committee of Windsor Heights
- Citizens Transit Committee of West Des Moines
- Citizens Advisory Sub-Committee for the Des Moines Urban Area Transportation Committee
- Des Moines Urban Area Transportation Technical Sub-Committee

TRANSIT STATUS STATEMENT

Public Acquisition and Funding

For more than 100 years, mass transit service had been furnished by private operators, most recently the Iowa Regional Transit Corporation (IRTC). Due to decreasing revenues through the 1950's and increasing deficits in the 1960's, the company was forced to discontinue service on June 11, 1973 instead of renewing a ten-year operating franchise granted by the city of Des Moines on May 13, 1963.

Prior to abandoning private service, steps were taken to assure the continuance of service through public funding and management. During the first five months of 1973 representatives of Des Moines, Clive, Urbandale, West Des Moines, and Windsor Heights established the MTA.

Special legislation was required, which was passed on May 26, 1973, to permit the establishment and acquisition of mass transit systems by political subdivisions of the state. This legislation permitted the city of Des Moines, in conjunction with the four other municipalities, to form a multimunicipal public agency to own and operate the public transit system.

The Des Moines MTA was created by the participating governments of the five municipalities on June 1, 1973, following ratification of an inter-governmental agreement with Polk County and the State of Iowa.

The agreement enabled these municipalities, through the MTA, to:

- Undertake the establishment or acquisition of an urban mass transit system;
- Operate and improve transit service;
- Maintain service schedules, routes, and fares;
- Acquire or lease real property and easements for transit;
- Accept gifts or grants, contract for assistance and contract out service;
- Provide a budgeting system on a pro rata basis;
- Hire and maintain employees; and
- Exercise all powers available to the MTA under existing law.

The enactment of state legislation and the approval of the intergovernmental agreement permanently established public participation in mass transit policy-making and operations throughout the service area. Public ownership of the

existing bus system assets was accomplished through an UMTA capital grant of $958,920 (No. IA030012 submitted July 30, 1973) and $239,730 contributed by the member communities. For the next six months the system was operated by contractual agreement between the newly formed MTA and the IRTC. On December 16, the MTA acquired the tangible assets of the bus system and became the sole operator of the system. To assist the MTA in operation of the system, a consulting contract was effected between the MTA and the IRTC's maintenance supervisor until March 1, 1974.

Recent Changes

Since March 1974, the MTA has retained professional personnel to manage the system including an operations manager, accountant, executive director, and a marketing manager. In addition, the MTA has retained legal counsel and a certified public accounting firm.

A number of substantial service changes have occurred since March 1, 1974 including:

- the Implementation of five express routes serving the western area of Des Moines and the communities of Clive, Urbandale, West Des Moines, and Windsor Heights.

- the Initiation of the Metro Center downtown shuttle route and the Metro West crosstown route. (Metro West service was subsequently dropped because of low patronage and considerable financial losses.)

- Introduction of a streamlined schedule format.

- Expansion of fare policies including monthly passes, daily trip tickets, and an unrestricted identification card for senior citizens, permitting them to ride at a reduced rate of 35 cents.

- Changes to the Clark/East 6th-9th route to provide service to two retirement homes.

Steps were also taken to improve the capital assets of the system. In June 1974 a contract was awarded to General Motors for the purchase of 25 new, 51-passenger air conditioned coaches. These were delivered to the MTA in January 1975 and subsequently put into service.

The existing garage and office facility was refurbished including installation of overhead doors, general painting and maintenance, and repairs to the heating, cooling and ventilating systems.

At the same time, plans were being made for construction of a badly needed replacement for the present maintenance, storage, and office facility. During March of 1974, five sites were analyzed by the Des Moines Traffic and Transportation Department and the Des Moines City Plan and Zoning Commission as possible locations for the new MTA facility. Following that analysis, CIRALG retained an architectural firm to undertake a final feasibility study and preliminary design for a facility at Southwest Ninth and Morgan Street. The report was presented to the MTA Board in October 1974, and in November, the Board adopted the Southwest Ninth and Morgan Street site for the new maintenance office facility.

Previous Studies

Over the past three years, several studies have been directed toward the improvement of public transit in the Des Moines area. An Interim Short-Range Transit Plan for the Des Moines Urban Area was prepared in 1972 by the Central Iowa Regional Planning Commission. The report called for a reduced Sunday and evening service; new coaches and maintenance facilities; express routes; a demonstration route connecting the model cities area with an industrial development center; and express service between Des Moines and the Area XI Community College to the north.

The Des Moines Area Transit Study (DATS), was submitted to the Central Iowa Regional Planning Commission in June 1972. It was later revised by the Des Moines Plan and Zoning Commission and submitted to CIRALG in July 1973. The study included descriptions of the current system, ridership characteristics and results of both employee parking and general attitude surveys as well as recommendations for public acquisition of the system, fare reductions, improved service to industrial areas, several express routes, and increased service frequency over a three-phase improvement program. The study also called for capital improvements including garage and maintenance facilities, transit coaches, and fare boxes.

In November of 1974, the Transportation Systems Division of General Motors submitted a report* outlining the need for better maintenance facilities and procedures along with a restructured parts inventory control program.

LIMITED STUDY PURPOSE

The Des Moines metropolitan area is faced with an immediate need to update and augment work accomplished during previous studies to meet UMTA requirements for a five-year transit development program. Such a plan is required to insure continued financial assistance from Federal agencies.

The purpose of this study is limited to the preparation of a five-year development plan update based largely on previous work. This study is not intended to provide all the data and analyses leading to a long-term restructuring of the Des Moines transit system. Such a long-term program would require a further commitment of time and resources.

HISTORY OF TRANSIT IN DES MOINES

The first form of public transit in Des Moines was the horse-drawn street car which began operating in 1868. Consolidation and electrification of the city's three

*Immediate Action Program, Bus Fleet, Maintenance, Inventory and Transportation Improvement Assistance for Des Moines Metropolitan Transit Authority, GM Transportation Systems, September 1974.

separate car companies were completed in 1889. By 1911 the electric traction system had expanded to 103 vehicles operating over 79 route-miles. Another major expansion occurred in 1938 along with the conversion to trackless trolley operations. By 1951 transit service covered a total of 100 route-miles and included 171 electric trolley coaches.

In 1954 the IRTC acquired the service from the Des Moines Street Railway Company and continued to operate electric trolleys until 1964. Construction of I-235 through the city severed most of the trackless trolley lines, prompting the company to switch to diesel coaches earlier than anticipated. This investment, along with a strong downward trend in ridership, led to the IRTC's financial decline. When its franchise expired in 1973, the company announced its intention to abandon service. Subsequently, the Des Moines Metropolitan Transit Authority was formed to preserve transit service for the area.

TRANSIT GOALS AND OBJECTIVES

A set of policies and specific planning objectives guiding the future development of transportation systems within the Des Moines metropolitan area has been approved by the Transportation Technical Sub-Committee.* While these relate to all forms of transportation, four policies specifically address the role of transit, and are quoted below.

A. Improve transit systems in the region.

   Objectives:

   a. To provide more effective transit service for the user.
   b. To ensure effective local and "feeder" service.
   c. To provide satisfactory service for those "captive" riders who must use mass transit.
   d. To help reduce traffic congestion.
   e. To develop ridership patterns and a public acceptance of mass transit.

*Adopted etc.

B. Provide local as well as metropolitan transit facilities in the Des Moines area.

Objectives:

a. To provide efficent local service.
b. To permit use of public transportation for an entire trip.
c. To free the metropolitan system for fast, express service.
d. To promote the development of major centers.

C. Provide high-quality express and local transit service to the Des Moines downtown area and to the diversified centers.

Objectives:

a. To help promote the development of major centers
b. To reduce street and parking congestion in areas of concentrated activity.
c. To provide an alternative means of transportation to the automobile.

D. Combine mass transit service with major new community developments and redevelopments.

Objectives:

a. To help promote desired developments.
b. To provide an expanded choice of housing location and type for people dependent on transit.
c. To increase the range of opportunity of transit "captives" for employment, shopping, and entertainment.

Chapter II

THE STUDY AREA

The study area consists of the urban portions of the Des Moines metropolitan region located in Polk County in central Iowa. This area is bounded by Camp Dodge and the Town of Ankeny to the north, Capital Heights and Pleasant Hill to the east, the Warren County line (Greenfield Plaza) to the south, and Interstates 35 and 80 to the west. In 1970, the population of this area was approximately 254,000.

Des Moines is situated at the junction of the Racoon and Des Moines Rivers which divide the city into three roughly equal areas and which form the only major travel barriers within the region. I-235, which bisects Des Moines, is not a significant barrier to area travel patterns since all major arterials cross the highway.

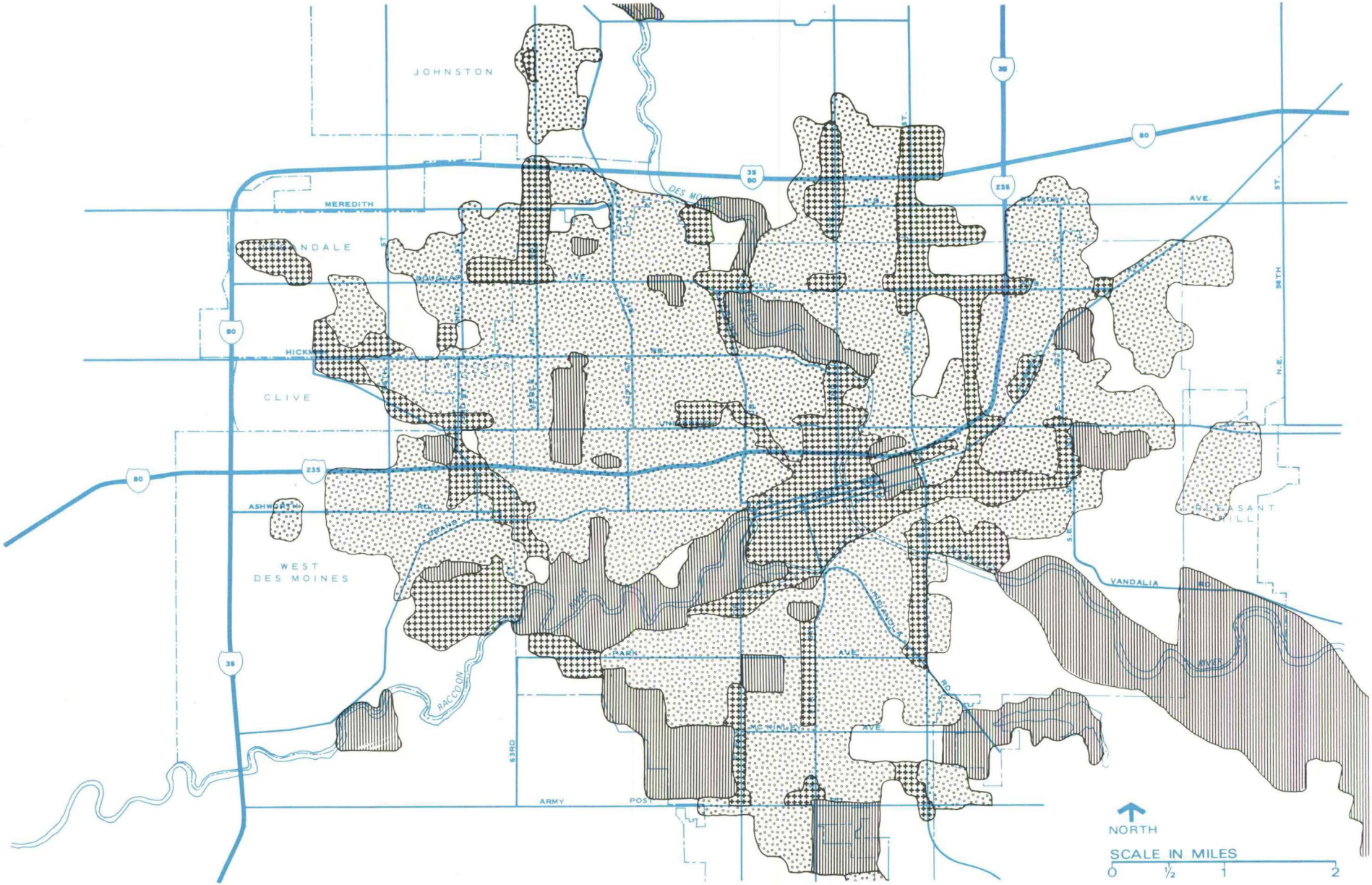
Some of the major landmarks in the region include the Iowa State Capitol, Drake University, Camp Dodge, the Fort Des Moines Army Post, and the Des Moines Municipal Airport. These sites, along with the state fairgrounds and the Waterworks Park, occupy major tracts of land.

EXISTING LAND USE

Des Moines, the region's central city, has expanded from the river junction towards the nearby suburban towns. The region is characterized by low density and wide dispersion. Seventy-four percent of the study area's 105,800 acres is either vacant or devoted to agricultural use.

The extent and nature of the urbanized development within the Des Moines metropolitan area is illustrated in Figure 1. The generalized land use categories presented are residential, non-residential, and public.

FIGURE 1



LEGEND

- RESIDENTIAL USE
- NON-RESIDENTIAL USE
- MAJOR PUBLIC USE

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EXISTING GENERALIZED LAND USE

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Residential

As shown on Figure 1, largest residential population and land area is located in the west and northwest sectors. The north and northeast sectors and the southern sector are the second and third most populous, respectively.

Non-Residential

The region's largest non-residential area is the Des Moines Central Business District (CBD) and the adjacent government-commercial-wholesale district which stretches eastward from the State Capitol complex along Dean Avenue. The second largest non-residential area extends northward along a corridor between Second Avenue and I-235. The remaining non-residential areas are scattered throughout the region along major arterial streets, railroad tracks, and at major intersections.

Public

Principal areas of public use include the airport; state fairgrounds; State Capitol complex northeast of the CBD; waterworks; city parks and cemeteries; Federal hospitals and installations; and various conservation and flood control areas, some of which are open for public recreation.

POPULATION

In 1970, the population of the Des Moines urbanized area was 253,759. Approximately 79 percent of this total (201,404 persons) reside within the city of Des Moines, and about 16 percent (40,183 persons) reside in the four suburbs immediately west of the city. The remainder of the population is scattered throughout surrounding Polk County in both rural and small suburban settings.

As indicated in Table 1, the population has shifted away from the central city while significant growth has occurred in the suburbs. Figure 2 illustrates the present

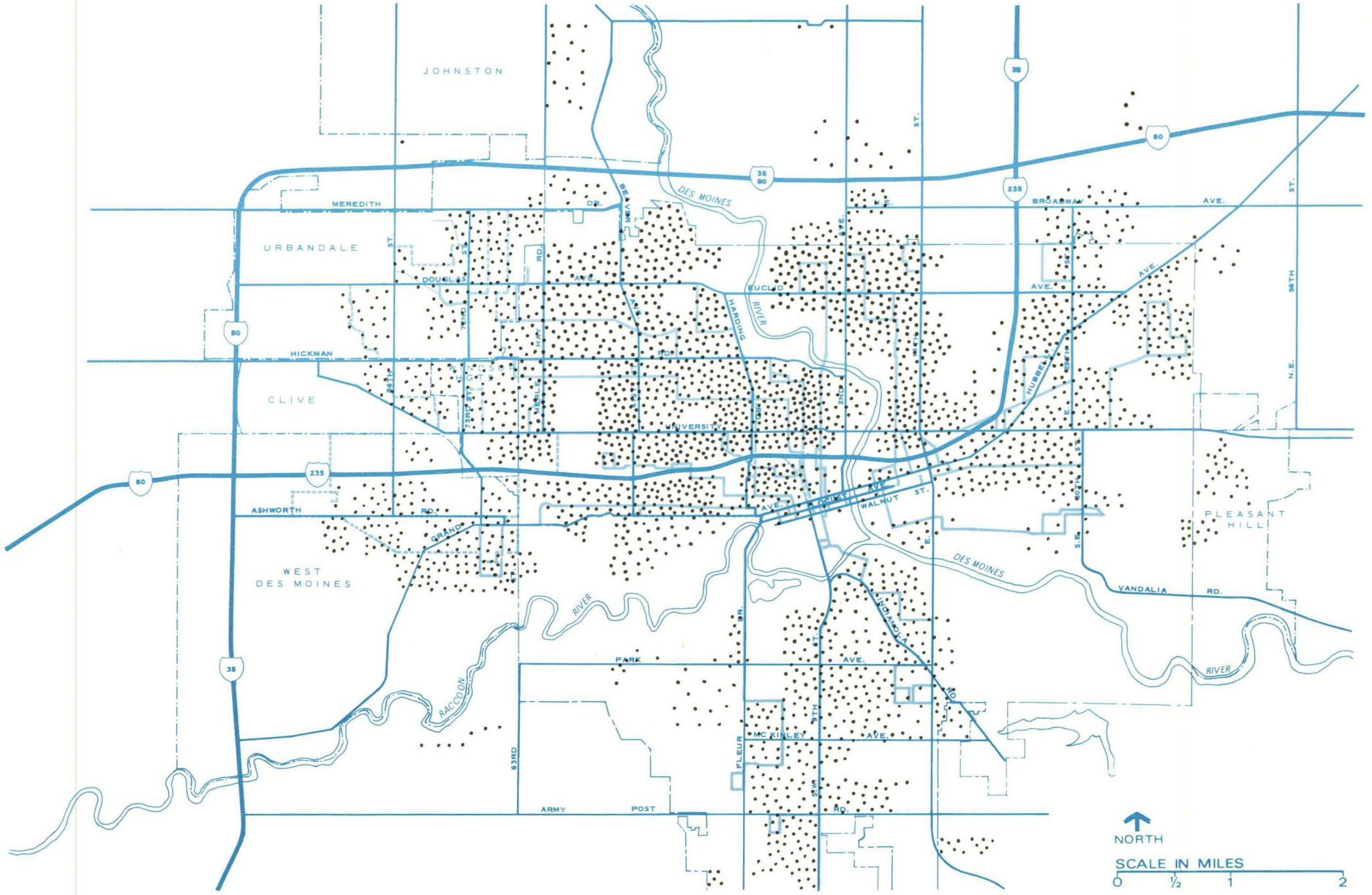
Table 1

DES MOINES URBANIZED AREA POPULATION
1960-1970

Area	Population 1960	Population 1970	Percent of Total	Percent Change
Des Moines	208,982	201,404	79.3	- 3.7
Clive	752	3,005	1.2	+399.6
Urbandale	5,821	14,434	5.7	+248.0
West Des Moines	11,949	16,441	6.5	+ 37.6
Windsor Heights	4,715	6,303	2.5	+ 33.7
Other	8,896	12,172	4.8	+ 36.8
Total	241,115	253,759	100.0	+105.2

Source: U. S. Census.

FIGURE 2



NOTE:
1 DOT = 100 PERSONS
(1970 CENSUS)

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POPULATION DISTRIBUTION - 1970

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population distribution throughout various sectors of the study area, and shows changes in population characteristics between 1960 and 1970.

Figures 3, 4 and 5 show the residential concentrations of the elderly, low income families, and minority groups, respectively. While all three groups reside near the central core of Des Moines, the area of elderly concentration extends north to Aurora Avenue and west to Merle Hay Road. Lower income families are located to the north and east of the downtown area, while minority groups are concentrated around the central area to the north and east.

OVERALL TRAVEL PATTERNS

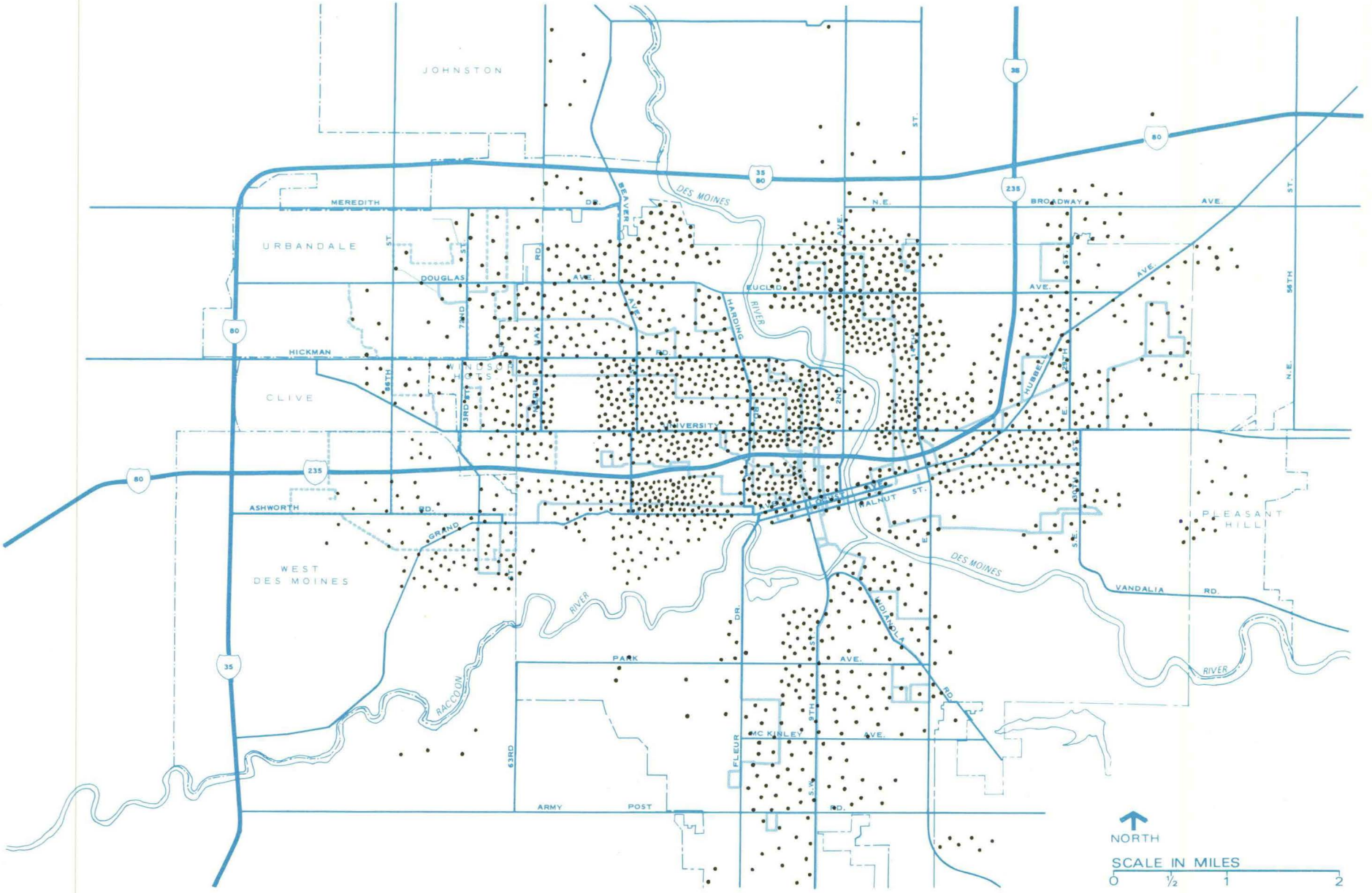
The most recent data on travel patterns are from comprehensive surveys of travel patterns conducted in 1964.* Those surveys showed that 94 percent of the 917,000 daily person trips were auto-oriented, while six percent utilized transit. The percentage of transit use has dropped significantly since 1964 as the number of transit passengers has decreased by more than 45 percent.

For trips within the study area, approximately 12 percent had origins and/or destinations in the central business district, 28 percent in the northeast sector, 14 percent in the south sector, and 47 percent in the northwest sector. The greatest number of travel movements occurred in the northwest sector which has the highest concentration of population.

Principal east-west travel corridors include Douglas Avenue-Euclid Avenue, University Avenue, I-235, Grand Avenue and Ingersoll Avenue; principal north-south corridors include Fleur Drive, Southwest Ninth, Merle Hay Road, Harding Road, and East Fourteenth Street.

*Figures as published in the initial Metropolitan Plan Concept 1990-2000, Des Moines and Environs, Central Iowa Regional Planning Commission, February 1972.

FIGURE 3



NOTE:
1 DOT = 20 PERSONS
(1970 CENSUS)

ELDERLY DEFINED AS
THOSE AGE 60 OR OLDER

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DISTRIBUTION OF ELDERLY - 1970

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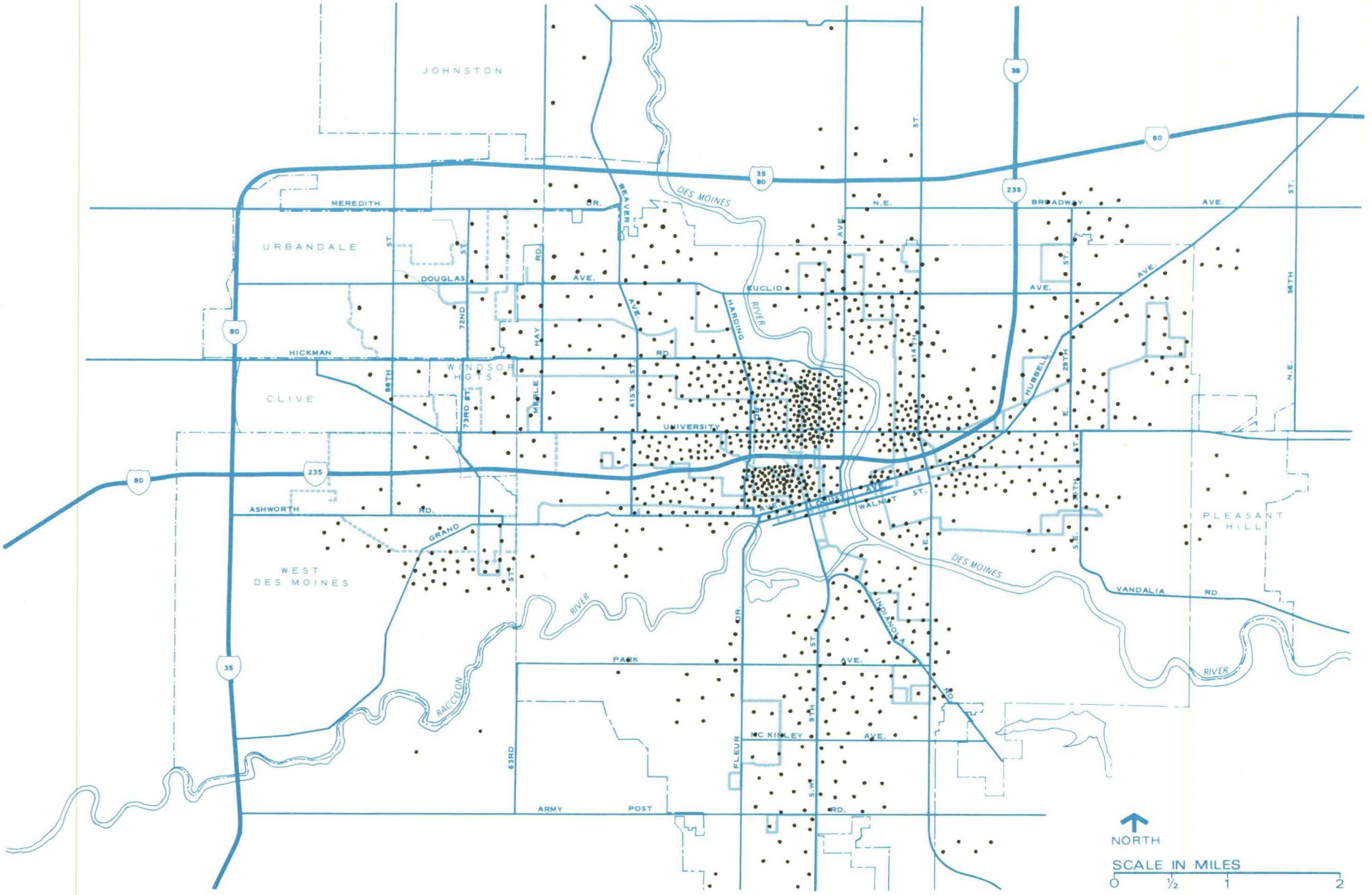
FIGURE 4



NOTE:
1 DOT = 20 PERSONS
(1970 CENSUS)

LOW INCOME DEFINED
AS BELOW POVERTY
LEVEL - 1970 CENSUS

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DISTRIBUTION OF LOW INCOME POPULATION - 1970

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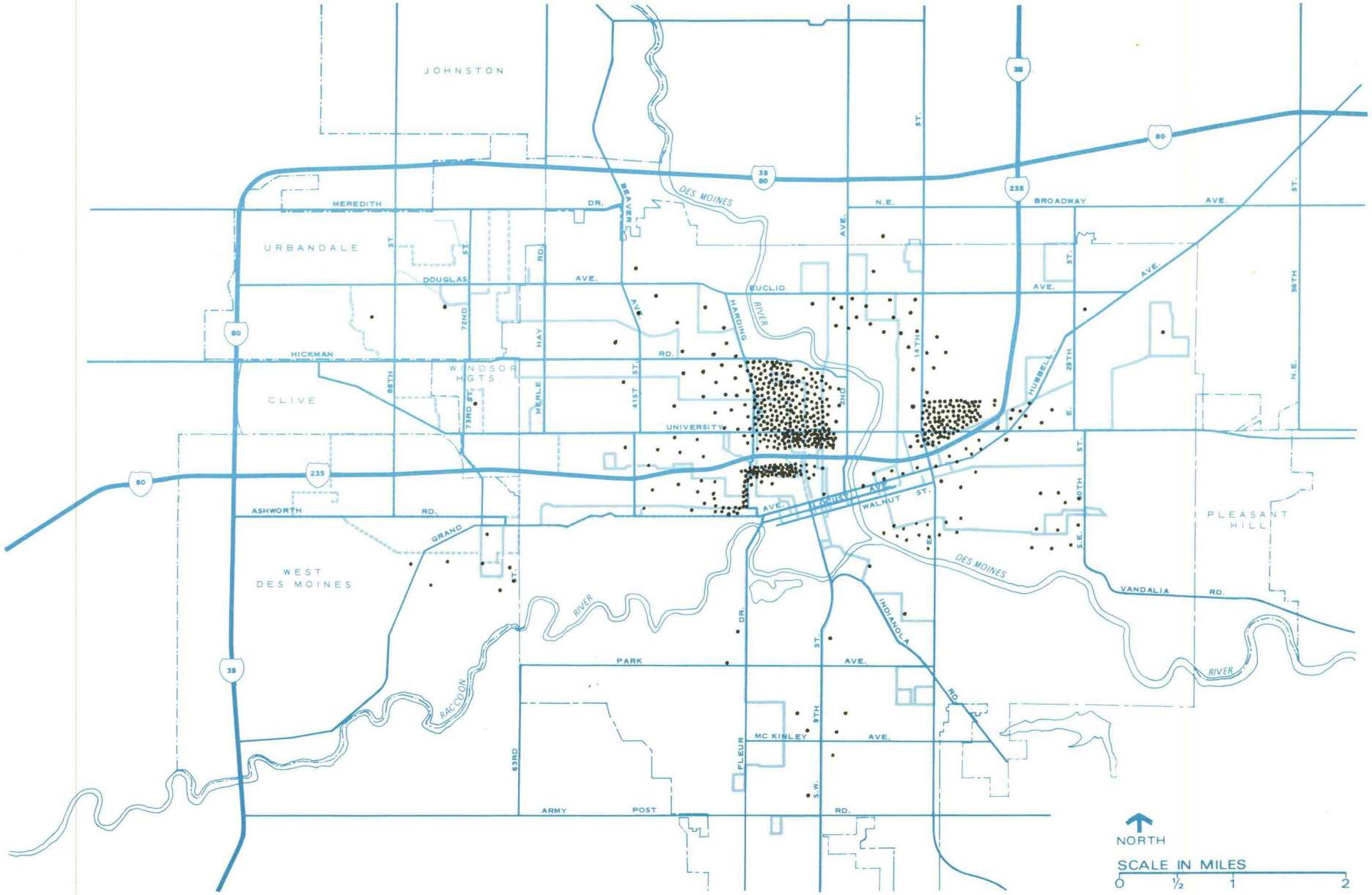
FIGURE 5



NOTE:
1 DOT = 20 PERSONS
(1970 CENSUS)

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

DISTRIBUTION OF BLACK POPULATION - 1970

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Chapter III

EXISTING TRANSIT SYSTEM

OPERATIONAL CHARACTERISTICS

Route Structure

The existing transit system consists of 16 routes covering 194.5 one-way route-miles. Most of the routes are oriented to the CBD. The seven main routes traverse the CBD and are typically about ten miles long (one-way). In the northwest part of the city, the route pattern is predominately east-west with approximately one-half-mile spacing; the entire eastern half of the city has a predominately north-south route pattern. All crosstown transit service presently operates through the CBD.

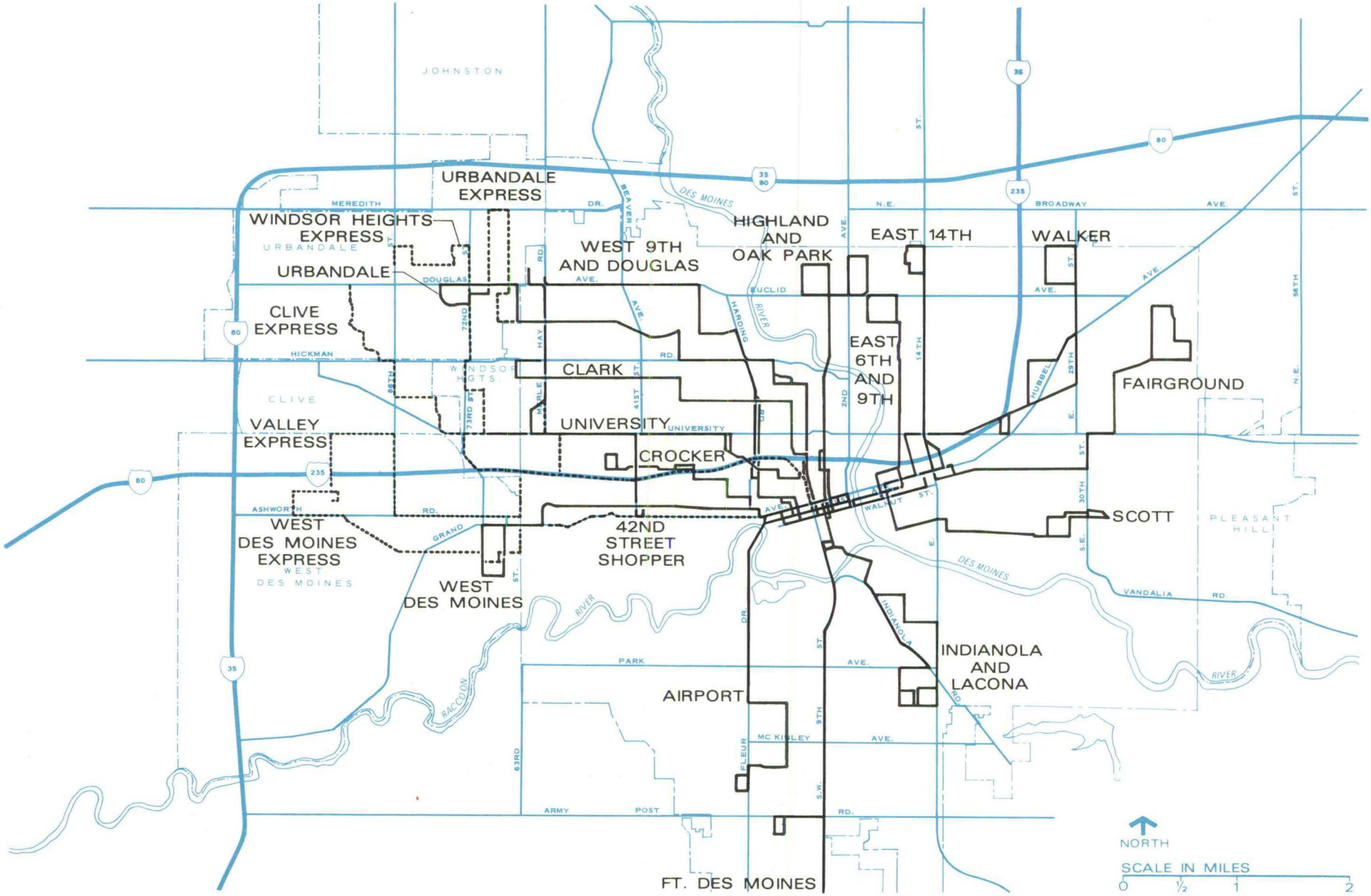
Five express routes—the Clive, Valley, West Des Moines, Urbandale, and Windsor Heights routes—serve the northwest sector of the Des Moines metropolitan area. These all utilize I-235 for express service except for the West Des Moines Express which operates on Grand Avenue, but does not pick up or discharge passengers.

In addition to the express routes, several other routes provide specialized service. The Metro Center route provides downtown shuttle service every 12 minutes from 8:00 a.m. until 4:30 p.m. It operates between the Capitol complex and the western fringe of the CBD. The 42nd Street Shopper provides off-peak service every 50 minutes to Merle Hay Plaza through the western area of Des Moines. The Area XI Community College route, which was discontinued in March 1975, made one morning and evening run between the Des Moines Area Community College and the YMCA. Figure 6 shows the existing route structure.

Scheduling

Service is provided on all major routes between approximately 5:00 a.m. and 7:00 p.m. Exceptions to this schedule include the express routes, which make only three

FIGURE 6



LEGEND

——— LOCAL ROUTE

- - - - - - - - EXPRESS ROUTE

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

EXISTING TRANSIT ROUTES

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runs per day; the West 42nd Shopper and Metro Center routes, which are primarily off-peak routes; and the Crocker route,which operates only during peak periods.

During off-peak periods, headways (time intervals between buses) vary between 25 and 60 minutes among routes. Headways decrease to between ten and 20 minutes during peak periods (6-9 a.m. and 3-6 p.m.) when more than twice as many vehicles are in service. However, headways also vary during peak periods on all the major routes except the Airport/Scott route; depending on the route, headways may range from five to 16 minutes.

The present service schedule is difficult for the new or casual MTA user to follow. Table 2 provides a brief description of all routes, their service areas, headways, and other operational information.

CAPITAL FACILITIES AND EQUIPMENT

Bus Fleet

As of November 1974, the MTA had a fleet of 81 GMC coaches. Fifty-eight of the buses were 45-passenger vehicles; the remainder were 51-passenger vehicles. Sixteen buses were the "new look" type, built after 1960.

The entire fleet (as of November 1974) averaged 18 years of age, with an average mileage of more than 500,000 miles per vehicle. Table 3 summarizes the number of buses by age, year manufactured, average mileage accumulated and average annual utilization based on figures from 1973 and 1974.

In January 1975, 25 new GMC 51-passenger coaches were purchased and put in service. The new buses were acquired through the MTA's first capital grant. The MTA is planning to sell 16 of the most unserviceable coaches. In November 1974 the Board of Directors instructed the MTA to pursue an additional capital grant for the purchase of 30 new coaches.

Table 2

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
Airport-Scott	22.0	14.0	30/60 (Scott) 30/0 (Airport)	4/1	3.7

The Scott portion of the route begins in southeastern Des Moines, a low income-low density area set among a large number of railroad tracks. Operating principally on Scott, Maury, and S.E. 6th Streets, the route passes near the State Capitol as it enters the CBD on Walnut Street.

The Airport segment of the route extends from the CBD through several medium and high income neighborhoods along Fleur Drive and S.W. 14th Street before terminating at the Des Moines Municipal Airport on the south side. The route bypasses, however, one of Des Moines' largest shopping centers located on Fleur Drive and McKinley Avenue.

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
Area XI Community College*	25.2	15.5	1 a.m. trip 1 p.m. trip	1/-	0.2
This route originates at the Y.M.C.A. in the CBD and then runs northwesterly through the Model Cities neighborhood to University Avenue and 19th Street, east on University Avenue past Mercy Hospital, and then through the north central neighborhoods along 6th Street, Euclid Avenue and E. 14th Street on its way north to the Area XI College near Ankeny.					
Clark-East 6th and 9th	21.1	13.2	10-20/35	7-8/3	11.8
The Clark portion of the route begins at 63rd Street and Hickman Avenue (the boundary between Windsor Heights and Des Moines) and serves the highly developed, middle income neighborhoods along Franklin Avenue, Drake University along Clark Street, and the low income areas along 13th and 10th Streets before entering the CBD.					

*-Discontinued March 1, 1975.

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
Clark-East 6th and 9th--concluded					
The East 6th and 9th portion of the line connects the CBD and the State Capitol with the older and changing neighborhoods northward along East 9th Street to Euclid Avenue.					
Crocker	7.9	11.6	45/-	1/-	1.8
This is a single-ended route which begins with a loop just east of Waveland Park and Golf Course and serves one of the city's older residential neighborhoods along Crocker, Center and Woodland Avenue. This area is now bisected by Interstate 235. The route joins with the West Des Moines line at Ingersoll and Harding before entering the CBD.					

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
Ft. Des Moines-Walker	23.9	14.0	14-18/37	8-9/3	14.2

The Ft. Des Moines part of this route operates from the CBD to the Ft. Des Moines Army Post and serves the southern area of the city along S. W. 9th Street. This segment of the line has two termini, one at S. W. 9th and Polk County Line, and the other at S. W. 16th and Army Post Road which is served only during peak periods.

The Walker end of the route serves northeast Des Moines, a middle income, blue collar area east of the Delaware Avenue/I-235 industrial sector. The line operates to its terminus over two alternative routes; one via Easton Boulevard and E. 29th Street, the other via E. 24th and Hubble Avenue.

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
42nd Street Shopper	10.2	16.1	-/50	-/1	0.3
This route provides crosstown service in the western part of Des Moines from 42nd Street and Grand Avenue to the Merle Hay Plaza Shopping Mall. It serves primarily middle to upper income, single family home neighborhoods along 42nd Street, University Avenue, and Merle Hay Road. Service is furnished only during early afternoon hours.					
Metro Center	5.0	10.3	12/12	-/3	3.2
The Metro Center route operates as a shuttle service within the CBD and between the CBD and the State Capitol area. It primarily operates eastbound on Locust Street and westbound on Walnut Street.					

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
University-Highland-Oak Park	18.8	12.4	10-15/25	10/4	19.3

The University division (western portion of this route) begins at University Avenue and 69th Street and serves the well-developed, middle and upper income neighborhoods along University Avenue. Further east, it serves Drake University, the poorer areas along 19th Street and Woodland Avenue, and then enters the CBD.

The Highland-Oak Park division operates north on 6th Street through a mixed commercial-residential corridor and then splits into two residential branches--the 10th Street-Madison Avenue area to the west, and the Cornell-East Shawnee area to the east. Three runs each day extend north on E. 2nd Avenue to the Firestone Rubber Company.

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
Urbandale-East 14th Street	25.2	13.8	16-31/40	6/3	11.2

The Urbandale division of this route has two terminii. One at 72nd Street and Maryland Avenue in Urbandale, and the other at Merle Hay Plaza, the region's largest shopping mall. These two branches join at and traverse Urbandale Avenue which runs through the middle and upper income residential areas. The route also serves Broadlawns Hospital before turning south along Harding Road on its way to the CBD.

The East 14th Street portion serves various older neighborhoods and industrial areas along E. 14th Street. The line's northern terminus is at Aurora and E. 10th Street.

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/ Off-Peak	Percent of Total Ridership
West Des Moines-Fairground	25.6	13.7	10-15/30	10/4	19.8
The West Des Moines part of this route originates at 8th and Maple Streets in the upper income suburb of West Des Moines. It runs past a complex of senior citizen high-rises on Grand Avenue and then through the mixed residential-commercial strip along Ingersoll Avenue to the CBD. The Fairground leg of the route operates along Walnut Street past the State Capitol and State Fairground. It then runs northeasterly past Grandview Park and Golf Course on Easton Boulevard to its terminus at 40th Court and Ovid Avenue.					
West 9th-Douglas/Indianola-Lacona	22.0	13.6	15-20/35	6-7/3	11.4
The West 9th-Douglas division of this route originates at the Merle Hay Plaza Shopping Mall and runs to the CBD via Douglas Avenue, 30th Street, and West 9th Street. In addition to the mall, this route serves the middle and upper					

Table 2 (Continued)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
West 9th-Douglas/Indianola-Lacona--concluded					
income residences along Douglas Avenue, the U.S. Veterans Hospital, Broadlawns Hospital, and the Model Cities neighborhood along W. 9th Street.					
The Indianola-Lacona portion of the line splits into two branches which cover the city's southeastern sector, an area characterized by low density, moderate to poor income, single family homes. Many of the streets are either unpaved or not strong enough for heavy transit buses.					
Clive Express	40.0	29.3	1 a.m. trip inbound 2 p.m. trips outbound	1-2/-	
This route provides express service from the middle and upper income communities of Urbandale and Clive to the Des Moines CBD via I-235.					All Express 3.1
Urbandale Express	39.0	27.9	1 a.m. trip inbound 2 p.m. trips outbound	1-2/-	
This route originates in the northern and eastern areas of Urbandale and runs express to the CBD via Merle Hay Road and I-235.					

Table 2 (Concluded)

ROUTE DESCRIPTIONS AND OPERATING DATA

Route	Round Trip Miles	Speed	Headways (Minutes) Peak/Off-Peak	Equipment Requirements Peak/Off-Peak	Percent of Total Ridership
Valley Express This route begins with a loop along 35th Street and 22nd Street between University Avenue and Ashworth Road in the northern sector of West Des Moines and then runs express to the CBD via I-235.	36.4	26.0	1 a.m. trip inbound 2 p.m. trips outbound	1-2/-	All Express 3.1
West Des Moines Express This route serves the southern portion of Des Moines along Ashworth Road and Vine Street, and operates express to the CBD via Grand Avenue. No passenger stops are made east of 63rd Street in Des Moines.	37.6	26.9	1 a.m. trip inbound 2 p.m. trips outbound	1-2/-	
Windsor Heights Express This line operates through the northern and central parts of Urbandale and through Windsor Heights and runs express from 72nd Street to the CBD via I-235.	38.8	27.1	1 a.m. trip inbound 2 p.m. trips	1-2/-	

Source: Des Moines Area Transit Study and De Leuw, Cather & Company.

Table 3

BUS FLEET STATISTICS
(November 1974)

Year Manufactured	Quantity	Age (Years)	Average Miles Accumulated	Average Annual Utilization[a] (Miles)
1952	2	23	No records	3,700
1954	4	21	No records	6,500[b]
1955	43	20	546,000	21,900
1956	4	19	550,000	6,400[c]
1957	4	18	519,000	13,200
1958	8	17	422,000	22,400
1960	5	15	565,000	27,900
1961	5	14	562,000	27,200
1963	6	12	479,000	31,800

(a)-Based on figures for 1973 and first 11 months of 1974.
(b)-Excludes one bus utilized an average of 17,000 miles.
(c)-Utilization increased from average (1973) of 2,300 miles to (1974) 10,500 miles.

Source: Des Moines Metropolitan Transit Authority.

Garage and Office Facilities

Maintenance, storage, and office facilities are currently housed in a structure at 2320 High Street. The building, constructed primarily of masonry walls and timber posts and girders, was built as a trolley car barn more than 80 years ago. Necessary service changes were implemented when the system was converted to trackless trolley in 1938 and to diesel operation in 1964. The building and grounds occupy approximately 2.6 acres.

The first floor covers an area of 31,700 square feet and houses the maintenance facilities including three maintenance pits (two are 180 feet long and one is 120 feet long) and one hoist; 3,500 square feet of office area; miscellaneous storage areas; and a drivers' room and locker area. The basement area consists of a dirt floor and provides space for tire storage and repair, lubricant storage, and mechanical facilities.

Approximately 1,300 square feet on the second floor, formerly the office area, is currently unused and is in poor condition.

The structure is obsolete and inefficient; it has not been well-maintained, and is in a deteriorated condition. Although the office area was renovated in 1956, it is too small to accommodate an expanding MTA staff. Space for meetings and driver-training areas is nearly non-existent. According to an appraisal completed prior to takeover by the MTA, the building has no further economic value and has become a liability to the land. Accordingly, the MTA is planning a new structure which will be described in a later section of this report.

Shelters and Bus Stop Signs

At the present time, there are no bus stop shelters along any of the routes. Some bus stop signs are present, but they have been poorly maintained and are difficult to find and read. Most of the regular customers realize that bus stop signs are inadequate and are familiar with the "flag stop" practice under which pick-up occurs where

customer "flags" the bus. The absence of bus stop signs discourages new riders; however, the MTA is planning to install signs throughout the service area.

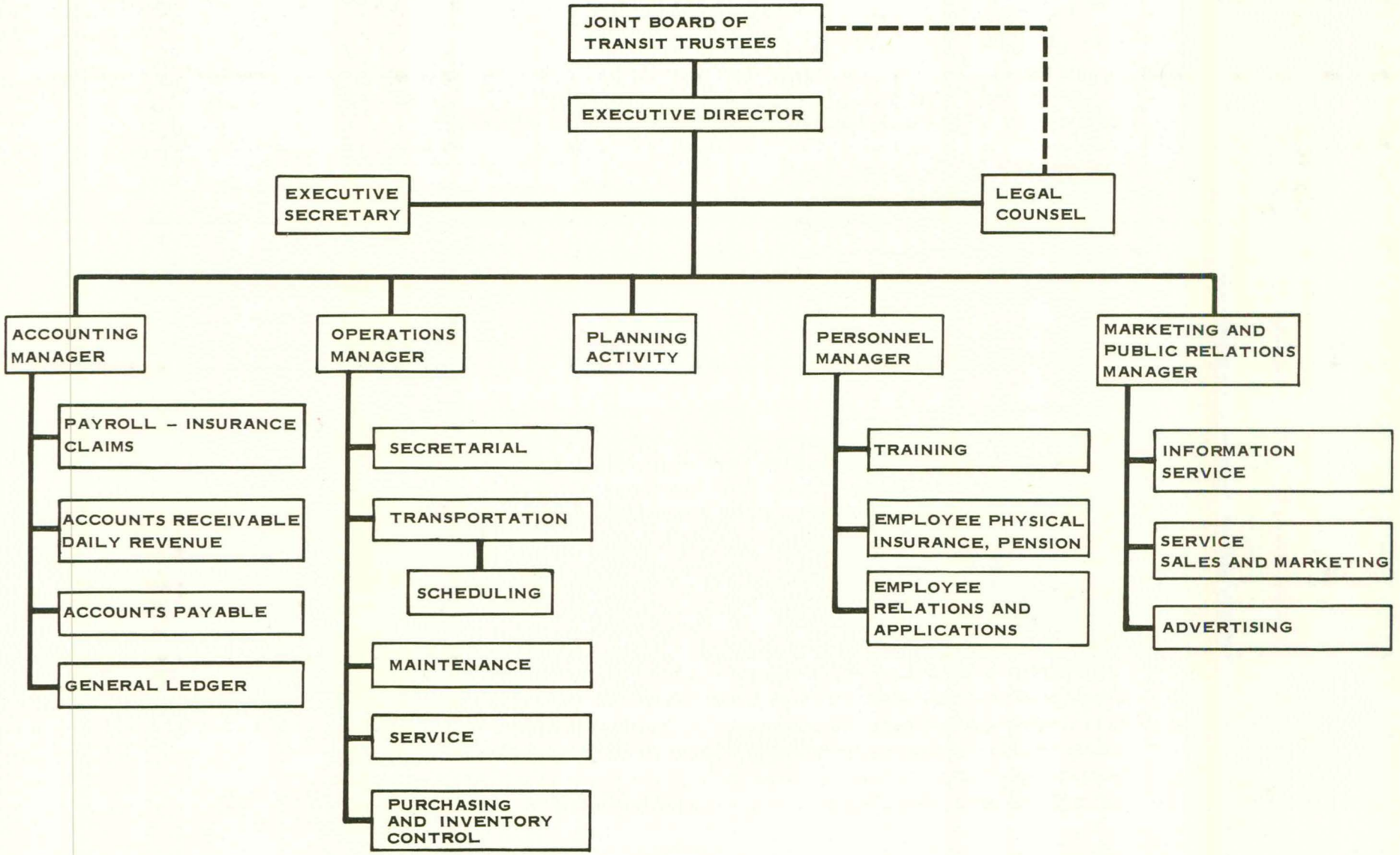
PASSENGER CHARACTERISTICS

During the first week of December 1974, two on-board passenger surveys were conducted to determine the characteristics of transit riders as well as to obtain load counts of all passengers on each bus. This information was required for making various efficiency measurements of each route and for determining overall system characteristics. In addition, the survey results provided the basis for service changes and for continued system monitoring.

To determine ridership characteristics, survey personnel handed each in-bound passenger a prepaid postage questionnaire to be completed at his convenience (See Figure 7). Many people completed and returned the form while on the bus. Approximately 5,000 questionnaires were distributed; 2,229 of these were returned in usable form, representing a sample of approximately one-third of the daily riders. To obtain passenger load counts (number of riders per bus), the survey personnel also noted the location and the number of people boarding and alighting each time the bus stopped.

The survey procedure was initially organized to cover all buses in regular passenger service over a three-day period. While 91 percent of the service was surveyed and inventoried, approximately nine percent of the service hours were not included due to surveyor absenteeism. Passenger counts presented within the report have, therefore, been adjusted to reflect this. The adjustments were made based on survey returns from buses running the same parts of the route at similar times as those periods that were missed. Survey results are described below.

FIGURE 7



DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

SYSTEM ORGANIZATION

DE LEUW, CATHER & COMPANY • CONSULTING ENGINEERS AND PLANNERS • CHICAGO

Purpose of Trip

Table 4 shows the purpose of trip by route. As would be expected, the majority (66.7 percent) of the people responding indicated their trip purpose as work or related business. The percentage was similar for all routes except the Crocker route and the express routes. The express routes operate only during peak hours and,thus, work trips represented over 80 percent of all express trips.

Eight percent of the respondents indicated school as their trip purpose, while about seven percent indicated shopping. About five percent indicated other activities such as medical and personal business. The proportions of trips in these categories are lower than was anticipated. However, the low percentage of school trips is probably due to the special school "trippers" operated by the MTA which were not included in the survey. It is also possible that, due to the survey procedures, a disproportionate amount of students failed to return questionnaires.

Fares

Table 5 presents the types of fares used on the various routes. While the rider may choose from a variety of fares, more than 69 percent of those responding indicated that they paid an adult cash fare. An additional seven percent used trip tickets or one of the passes available. Almost 22 percent of the riders paid a reduced fare; of these, 10.5 percent were elderly fares, 9.2 percent were student fares, and nearly two percent specified other. A summary of fare payments is shown below.

Summary of Fare Payment

Description		Percent Patrons Using
Cash Fare –	$ 0.50	69.3
Elderly Fare –	$ 0.35	10.5
Student Fare –	$ 0.35	9.2

Table 4

PURPOSE OF TRIP BY ROUTE
PERCENTAGE OF QUESTIONNAIRES RETURNED

Route	Trip Purpose									
	Work or Related Business	Shopping	School	Social-Recreation	Medical	Personal Business	Other	More Than One Checked	Not Reported	Total
University/ Highland - Oak Park	61.9	5.7	8.6	1.2	2.0	3.2	2.2	14.5	0.7	100.0
Clark/E. 6th - 9th	68.2	5.6	8.4	0.6	0.6	1.5	0.6	13.0	1.5	100.0
Airport/Scott	63.4	4.0	16.2	1.4	1.4	-	1.4	10.8	1.4	100.0
Fort Des Moines/Walker	62.2	4.8	15.6	0.6	0.6	1.6	0.6	13.7	0.3	100.0
West Des Moines/ Fairground	66.9	7.9	6.9	1.0	1.6	2.3	0.3	12.8	0.3	100.0
West 9th/Douglas	57.9	11.8	3.5	1.3	7.0	1.3	2.6	14.6	-	100.0
East 14th/Urbandale	72.8	8.6	3.2	1.4	1.1	1.8	1.1	8.6	1.4	100.0
Crocker	80.4	7.0	4.2	-	2.8	-	1.4	4.2	-	100.0
Express Routes	83.7	3.9	3.9	0.7	-	1.3	-	3.9	2.6	100.0
Metro Center	64.7	13.2	10.3	-	-	-	5.9	5.9	-	100.0
All Routes	66.6	6.9	8.0	0.9	1.8	1.8	1.3	11.8	0.9	100.0

Source: De Leuw, Cather & Company; surveyed December 1974.

Table 5

METHOD OF FARE PAYMENT
PERCENTAGE OF QUESTIONNAIRES RETURNED

Route	Adult	Student	Elderly	Trip Ticket	Monthly Pass	Weekly Pass	Student Ticket	Other	Not Reported	Total
University/ Highland - Oak Park	63.1	7.6	14.8	3.0	4.4	1.2	3.0	1.7	1.2	100.0
Clark/E. 6th - 9th	66.9	5.9	10.8	2.2	1.5	2.5	4.0	2.2	4.0	100.0
Airport/Scott	70.1	9.5	2.7	4.1	5.4	4.1	2.7	-	1.4	100.0
Fort Des Moines/Walker	62.3	5.4	8.9	1.9	3.2	4.1	11.7	2.2	0.3	100.0
West Des Moines/ Fairground	68.1	2.0	14.1	2.0	3.9	1.0	4.6	2.0	2.3	100.0
West 9th/Douglas	75.8	3.5	8.8	2.6	3.9	0.9	0.9	1.8	1.8	100.0
East 14th/Urbandale	73.5	3.9	11.4	1.1	4.3	1.1	1.8	1.1	1.8	100.0
Crocker	73.3	5.6	8.5	-	2.8	-	1.4	4.2	4.2	100.0
Express Routes	86.1	2.0	2.0	1.3	2.0	2.6	1.3	0.7	2.0	100.0
Metro Center	76.4	2.9	5.9	-	1.5	1.5	10.3	1.5	-	100.0
All Routes	69.3	4.9	10.5	2.0	3.4	1.9	4.3	1.8	1.9	100.0

Source: De Leuw, Cather & Company; surveyed December 1974.

Description		Percent Patrons Using
Monthly Pass –	$20.00	3.4
Trip Ticket	$ 0.50	2.0
Weekly Pass –	$ 4.50	1.9

Sex of Riders

Age, income level, and employment status distribution by sex are shown in Table 6. Of all respondents, 22 percent were men, 69 percent were women, and nine percent did not indicate their sex.

Reason for Using Public Transit

Responses to the question "Why did you take the bus for this trip" are shown in Table 7. The highest percentages were recorded for "transit is more convenient," "no auto in household," and "no driver's license," respectively. Neither the availability of parking nor the cost of parking were major factors in the decision to use transit. It should be noted that those surveyed were allowed to check more than one reason; therefore, direct inferences cannot be made from this table regarding "captive" (those without other available means of transportation) or "choice" ridership (those who had a car available for that trip).

However, the high percentage of responses to the choices of "no driver's license," "auto used by others," and "no auto in household" reveal that a sizable proportion of the current ridership did not have an alternative means of transportation. Further analysis indicated that 45 percent of those responding either had no driver's license or no auto in their household and 57 percent indicated either no auto in their household or that an auto was being used by others. Passengers who indicated any one of these three choices after allowing for duplicate answers may be considered primary, or what is frequently described (perhaps incorrectly) as "captive" riders. On this basis, 73.3 percent of the ridership could be considered in the "primary" market.

Table 6

AGE DISTRIBUTION, EMPLOYMENT STATUS, AND INCOME BY SEX
PERCENTAGE OF QUESTIONNAIRES RETURNED

AGE DISTRIBUTION

	Under 12	12-18	19-24	25-39	40-65	Over 65	Not Reported	Total
Male	1.0	21.0	9.9	24.6	33.2	8.6	1.7	100.0
Female	0.3	11.6	16.5	0.4	43.2	17.1	10.9	100.0
Not Reported	-	5.9	7.5	11.7	40.6	19.3	15.0	100.0
Percent of Total	0.5	13.2	14.2	6.8	40.7	15.4	9.2	100.0

EMPLOYMENT STATUS

	Employed									
	Full-Time	Part-Time	Retired	Housewife	Student	Unemployed	Part-Time Housewife	Employed Student	Not Reported	Total
Male	63.7	7.3	9.1	-	11.5	1.8	4.6	0.2	1.8	100.0
Female	61.2	12.0	11.2	4.9	5.2	1.0	2.1	0.8	1.6	100.0
Not Reported	44.6	12.9	15.1	5.4	5.4	1.6	1.1	-	13.9	100.0
Percent of Total	60.4	11.0	11.0	3.8	6.6	1.2	2.6	0.6	2.8	100.0

INCOME RANGE

	Up to $3,999	$4,000 to $7,999	$8,000 to $11,999	$12,000 to $19,999	Over $20,000	Not Reported	Total
Male	12.5	16.6	13.9	28.5	12.3	16.2	100.0
Female	19.9	29.2	13.0	13.0	3.4	21.5	100.0
Not Reported	13.9	19.8	12.3	16.0	4.3	33.7	100.0
Percent of Total	17.8	25.5	13.2	16.7	5.5	21.3	100.0

Source: De Leuw, Cather & Company; surveyed December 1974.

Table 7

REASONS GIVEN FOR USING THE BUS
PERCENTAGE OF QUESTIONNAIRES RETURNED INDICATING GIVEN REASONS

Route	No Driver's License	Auto Used By Others	Transit More Convenient	Do Not Like to Drive	Parking Not Available	Transit Less Expensive	No Auto In Household	Parking Cost to High
University/Highland-Oak Park	43.1	27.1	53.2	14.8	9.9	27.3	58.4	15.8
Clark/E. 6th - 9th	25.1	27.2	44.9	13.6	12.1	29.1	30.0	18.6
Airport/Scott	25.7	29.7	45.9	16.2	5.4	35.1	18.9	14.9
Fort Des Moines/ Walker	33.7	27.3	43.5	11.4	7.9	29.8	28.3	13.0
West Des Moines/ Fairground	31.6	25.7	48.4	16.8	8.9	32.2	30.3	17.4
W. 9th/Douglas	32.9	21.9	41.7	14.9	12.7	26.3	24.1	13.6
E. 14th/Urbandale	27.6	25.4	46.1	16.1	11.4	25.4	26.8	22.5
Crocker	31.0	23.9	33.8	11.3	9.9	19.7	16.8	8.5
Express Routes	11.2	28.9	66.4	23.0	14.5	40.8	12.5	28.3
Metro Center	11.8	32.4	57.4	7.4	10.3	27.9	17.6	17.6
All Routes	30.5	26.5	48.0	14.9	10.4	29.2	31.9	17.3

Note: Percents do not add up to 100 because respondents were allowed to choose more than one reason.

Source: De Leuw, Cather & Company; surveyed December 1974.

Waiting Time and Distance From Bus Stop

Tables 8 and 9 show estimated time spent waiting for a bus as well as the number of blocks walked to and from the bus stop, respectively. Almost one-third of those responding said that they waited five minutes for the bus. Approximately two-thirds (the cumulative total) of those surveyed waited five minutes or less, while less than six percent waited more than ten minutes. As most headways would result in an average waiting period of greater than five minutes, these responses indicate that riders carefully plan their bus trips.

More than 84 percent of those responding indicated that they walked three blocks or less to the bus stop and nearly 95 percent said they walked five blocks or less. Ninety percent of the respondents walked five blocks or less from the bus stop at the end of their trips. The indication that people had a shorter walk at their destinations is probably due to the fact that destinations tend to be more centralized and better served by transit.

An accepted planning standard is that the route market is within one-quarter of a mile on each side of the bus line. Based on the survey results, this assumption is reasonable for the Des Moines area since percentages of riders drop off decidedly after three or more blocks. (An average city block is about 600 feet in length, thus the quarter-mile standard would include a little over two city blocks.)

Improvements Needed

Riders were asked to rank seven suggested improvements to the transit system, and/or to list their own suggestions. Table 10 presents their responses. Approximately two-thirds of the respondents returned questionnaires with some usable rankings. Thirty-two percent of those answering the question were men, 56 percent were women, and 12 percent did not indicate their sex. Since there was little difference in overall response between men and women, the total figures are presented.

Table 8

ESTIMATED TIME SPENT WAITING FOR BUS
PERCENTAGE OF QUESTIONNAIRES RETURNED

WAIT TIME (MINUTES)

	0	1	2	3	4	5	6	7	8	9
Male	7.5	5.9	10.7	11.1	5.0	28.7	0.8	2.0	1.4	0.0
Female	9.8	3.2	7.7	9.6	4.9	31.7	1.3	2.7	1.4	0.2
Not Indicated	16.0	3.2	4.6	15.0	4.8	24.1	0.5	2.1	1.1	0.5
Percent of Total	9.8	3.8	8.5	10.5	4.9	30.3	1.2	2.5	1.4	0.3
Cumulative	9.8	13.6	22.1	32.6	37.5	67.8	69.0	71.5	72.9	73.2

	10	11	12	13	14	15	Over 15	Not Indicated	Total
Male	11.7	0.0	0.0	0.0	0.2	6.5	2.6	5.9	100.0
Female	13.3	0.1	0.2	0.2	0.0	4.1	3.1	6.5	100.0
Not Indicated	13.4	0.0	0.5	0.0	0.0	5.9	1.1	2.2	100.0
Percent of Total	12.9	0.0	0.3	0.1	0.1	4.7	2.7	6.0	100.0
Cumulative	86.1				94.0			100.0	

Source: De Leuw, Cather & Company; surveyed December 1974.

Table 9

BLOCKS WALKED TO AND FROM BUS STOP
PERCENTAGE OF THOSE WHO WALKED TO STOP

BLOCKS WALKED TO STOP

	0	1	2	3	4	5	6	7	8	9	10	Over 10	Not Indicated	Total
Male	6.1	35.7	16.3	11.6	6.5	3.8	2.5	1.1	0.4	0.4	1.3	0.8	13.5	100.0
Female	8.9	39.0	17.0	9.3	5.9	2.1	1.3	1.2	0.2	0.2	0.1	0.4	14.4	100.0
Not Indicated	3.9	32.2	19.1	7.9	5.3	3.3	3.9	1.3	0.7	0.0	0.7	0.7	21.0	100.0
Percent of Total	7.9	37.6	17.0	9.7	6.0	2.6	1.7	1.2	0.3	0.2	0.4	0.7	14.6	100.0
Cumulative	7.9	45.5	62.5	72.2	78.2	80.8				85.4			100.0	

BLOCKS WALKED FROM STOP

	0	1	2	3	4	5	6	7	8	9	10	Over 10	Not Indicated	Total
Male	7.3	47.9	15.1	9.5	4.4	2.0	3.4	1.0	0.2	0.5	0.2	0.5	8.0	100.0
Female	8.4	45.4	18.5	8.3	4.0	1.8	0.7	0.3	0.3	0.1	0.2	0.3	11.7	100.0
Not Indicated	9.6	41.6	18.4	8.8	3.2	2.4	1.6	0.0	0.0	0.8	0.0	0.0	13.6	100.0
Percent of Total	8.2	45.6	17.8	8.6	4.0	1.9	1.4	0.4	0.3	0.2	0.2	0.4	11.0	100.0
Cumulative	8.2	53.8	71.6	80.2	84.2	86.1				89.0			100.0	

Source: De Leuw, Cather & Company; surveyed December 1974.

Table 10

RANKING OF SERVICE IMPROVEMENT SUGGESTIONS
PERCENTAGE OF THOSE RESPONDING TO THIS QUESTION

Improvement	Percent Ranking Improvement		Did Not Rank	Total	Rank*
	1st, 2nd or 3rd	4th through 8th			
Reduced Fares	51.6	25.3	23.1	100.0	1
More Night Service	46.6	29.8	23.6	100.0	2
More Day Service	42.4	32.3	25.3	100.0	3
New Routes	32.8	39.5	27.7	100.0	4
More Comfort	21.0	50.8	28.2	100.0	5
More Speed	21.2	48.0	30.8	100.0	6
Simpler Routes	13.0	53.7	33.3	100.0	7
Other	12.9	19.2	67.9	100.0	8

*-Weighted rank based on assigning a value of 8 for each first place response, 7 for each second place response, etc., and ordering by highest accumulated score.

Source: De Leuw, Cather & Company; surveyed December 1974.

The respondents indicated that reduced fares should have the highest priority. Not all respondents ranked all the alternatives; some ranked only those alternatives which were more important to them. Therefore, it is interesting to note the percentage of people who gave an alternative a rank at all. In this case, again, the greatest number of people indicated that reduced fares should have the highest priority.

Ranked closely behind reduced fares was additional transit service—night service, increased day service, and new routes. Other improvements such as more comfort and speed and simpler routes were ranked lower.

More than half of those who ranked the "other" category indicated a desire for Sunday and holiday service. A large proportion (five to ten percent) indicated a desire for more dependable service, better heated and cleaner buses, and improved Saturday service.

Comparison with Previous Data

The DATS study undertook a similar survey in March 1971, and the results of the two surveys were compared in a number of areas. In general, the results were comparable for "captive" ridership, purpose of trip, employment status, riders' age and sex, and blocks walked to and from the bus stop at both ends of the trip. However, there were some differences which are noted below.

In the later survey, the number of work trips was approximately seven percent higher, and the number of school trips about nine percent lower than in the previous survey. This was consistent with the responses given under employment status which also indicated a decrease in the number of students. This may possibly be due to less cooperation on the part of students in returning the questionnaire.

While the previous survey reported that 76.2 percent of the riders did not have a car available for the trip, the present survey indicated only 57 percent without a car for

that trip. However, on the later survey an additional 16 percent indicated that they did not have a driver's license. When these two responses are combined they indicate present "captive" ridership of 73 percent as opposed to 76 percent reported in the earlier survey.

Regarding other differences, in the later survey, seven percent more riders indicated they were older than 40. Also, the distance walked to and from the bus stop decreased slightly in the later survey since a greater number of riders walked only one block or less. However, cumulative totals for all riders using the service within three blocks or less was substantially the same in both surveys.

POLICY, MANAGEMENT AND PERSONNEL FUNCTIONS

The seven member Joint Board of Transit Trustees is responsible for determining transit policy, short-range planning, and operating public transportation in the signatories area. The board is comprised of three representatives from the city of Des Moines and one representative from the communities of Clive, Urbandale, West Des Moines, and Windsor Heights. The Board appoints the executive director of the MTA who is charged with implementing policy and operating all MTA services.

The MTA currently has 143 employees. The staff is divided into three general categories: administrative, maintenance, and transportation.

There are 13 administrative personnel including the executive director: and three department heads, one each for operations, accounting, and marketing. The department heads are directly responsible to the executive director. The administrative section also includes three secretaries, three accounting clerks, an office manager, two information clerks and an inventory control and purchasing supervisor.

31 staff members are directly involved in maintenance and cleaning operations. Each of the thirteen mechanics is charged with a particular duty such as preventative

maintenance, engine overhaul, chassis repair, small unit overhaul, and so forth. Two employees are in charge of body work and upholstery. There are nine servicemen and cleaners, five supervisory personnel, and a storekeeper in charge of parts and inventory control as well as one building janitor.

The Transportation personnel include one superintendent responsible for the day to day planning and scheduling of on-street operations; two route supervisors responsible for monitoring and maintaining scheduled service; two trainmasters responsible for scheduling of drivers; and 94 bus operators (drivers).

It is anticipated that as the newly formed MTA continues to grow and revises its organizational structure, additional personnel will be required. Figure 8 shows the functional organization towards which the MTA is currently working.

FIGURE 8

DES MOINES TRANSIT SURVEY

The Des Moines Metropolitan Transit Authority would like to have your help in planning an improved transit system. Please fill out this form about the trip you are now making and leave it with the surveyor. If you do not finish, please complete the form later and drop it in any mailbox. NO POSTAGE IS REQUIRED. Thank you.

1. What is the purpose of your trip? ☐ Work or Related Business; ☐ Shopping ☐ School; ☐ Social-Recreation; ☐ Medical; ☐ Personal Business; ☐ Other_____ ___

2. Where did you come from before getting on the bus? (Nearest intersection or well-known place)

_____ Street and _____ Street ☐ Des Moines ☐ Suburbs ___

Is that your home? ☐ Yes; ☐ No ___

3. Where will you go after leaving the bus? (Nearest intersection or well-known place)

_____ Street and _____ Street ☐ Des Moines ☐ Suburbs ___

Is that your home? ☐ Yes; ☐ No ___

4. At what time did you board this bus? _____ A.M. P.M. How long did you wait? _____ Minutes

5. What fare did you pay? ☐ Adult fare; ☐ Student fare; ☐ Senior citizen fare; ☐ Trip ticket; ☐ Monthly pass; ☐ Weekly pass; ☐ Student ticket; ☐ Other_____ (please explain) ___

6. Why did you take the bus for this trip? (Check more than one if necessary) ___

☐ Do not have a driver's license ☐ Auto(s) used by other members in family ☐ Transit is more convenient
☐ Do not like to drive ☐ Transit is less expensive
☐ No auto in household ☐ Parking not readily available
☐ Parking costs too high

7. At what intersection did you board the bus?

_____ Street and _____ Street ☐ Des Moines ☐ Suburbs ___

8. How did you get to the bus stop? ☐ Walked How many blocks _____; ___

☐ Transferred from _____ bus route; ☐ Other (please explain)_____

9. At what intersection will you get off this bus?

_____ Street and _____ Street ☐ Des Moines ☐ Suburbs ___

10. From there will you: ☐ Walk How many blocks? _____; ___

☐ Transfer to _____ bus route; ☐ Other (please specify)_____

11. How many times do you ride the bus? (Answer one)

_____ times a week; _____ times a month; _____ times a day

12. What is your job status? ☐ Employed full-time; ☐ Employed part-time; ☐ Retired; ☐ Housewife; ☐ Student; ☐ Unemployed ___

13. Please indicate your sex and age group. ☐ Male; ☐ Female ___

☐ Under 12; ☐ 12-18; ☐ 19-24; ☐ 25-39; ☐ 40-65; ☐ Over 65

14. Please approximate your annual household income. ☐ Up to $3,999; ☐ $4,000 to $7,999; ___

☐ $8,000 to $11,999; ☐ $12,000 to $19,999; ☐ Over $20,000

15. Please indicate how you rank the following possible improvements to the existing transit service in order of importance to you from 1 to 8: 1 = Most important; 8 = Least important ___

___More comfort ___More service at night ___Simpler routing or schedules

___New routes to serve different places ___High-speed service ___Other_____

___More frequent service during day ___Reduced fares _____

16. Do you have any comments or ideas? (Please use space on back of card)

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

RIDERSHIP SURVEY QUESTIONNAIRE

DE LEUW, CATHER & COMPANY
CONSULTING ENGINEERS AND PLANNERS • CHICAGO

Chapter IV

SYSTEM ECONOMICS

This chapter presents information relating to the operating costs and the revenue derived from the existing transit system. All revenue, other than subsidies, is dependent on transit patronage, and information obtained from the boarding and deboarding survey relative to patronage patterns is presented as background for a discussion of the system's economic condition. It should be noted, however, that farebox revenue during the survey indicates that patronage may have been slightly higher than on similar days at the same time of the year.

In addition to daily variations, seasonal variations in daily transit trips also exist throughout the industry, with patronage tending to be lighter through the summer months and highest during the winter. As an indication of this seasonal fluctuation, total passenger revenue in Des Moines for June of 1973 was only 68 percent of the revenue for October of the same year. Because this seasonal factor exists, expanding the survey results directly to yearly values would probably result in an overstatement of patronage. Therefore, it is anticipated that future monitoring programs will provide the data to accurately make the necessary sample adjustments.

Corrections for time periods not included in the survey are reflected in the figures contained in Table 11. Total patronage for each route was determined by adding estimated boardings to the actual counts. These estimates were made by examining survey returns obtained at similar times from other buses on the same route segments. Wherever possible, an average was computed from several surveys.

SYSTEM PATRONAGE

At the time of the survey,* there were 12,546 daily boardings, including 1,017 transfers. The resulting 11,529 revenue-producing boardings represent 1.8 revenue

*December 1974

passenger boardings per mile. Based on an average fare of $0.45 per passenger, the average revenue for the system was $0.80 per mile.

Patronage By Route

To evaluate the performance of each route in relation to the system parameters described above, information on patronage is presented by route in Table 11. On the basis of survey counts, the number of riders using regularly scheduled routes would indicate that the West Des Moines/Fairground route had the highest level of ridership, while the Airport/Scott route had the lowest. Special purpose routes—the Crocker, express routes, Metro Center, 42nd Street Shopper, and Community College—contributed over eight percent of the total patronage. With regard to the express routes, the Urbandale Express, which serves 37 percent of the total number of express patrons, had the highest patronage. Express routes and their share of express patronage are as follows:

Urbandale	37 percent
Windsor Heights	20 percent
West Des Moines	17 percent
Clive	15 percent
Valley	11 percent

The effectiveness of routes is indicated by the number of riders per bus-mile, as shown in Table 11. On this basis, the University/Highland-Oak Park route is the most effective regular route; and the Airport/Scott the least effective. The special purpose routes account for ten percent of the route-miles and contribute 8.5 percent of the patronage.

With the exception of the Clark/East 6th-9th, the regularly scheduled routes in the southern section of Des Moines tend to have lower revenues per mile than routes through other sections of the city.

Table 11

REVENUE COMPARISON BY ROUTE

Route	Daily Boardings	Percent of Total	Transfers	Average[(a)] Fare	Daily Bus Miles	Revenue Boardings/ Bus Miles	Revenue Per Mile in Cents
University/Highland-Oak Park	2,425	19.3	178	$.445	934	2.40	107.1
Clark/East 6th - 9th	1,486	11.8	127	.436	919	1.48	64.5
Airport/Scott	466	3.7	63	.466	357	1.12	52.6
Fort Des Moines/ Walker	1,781	14.2	106	.445	1,030	1.63	72.3
West Des Moines/ Fairground	2,489	19.8	202	.445	1,052	2.17	96.7
West 9th - Douglas/ Indianola - Lacona	1,428	11.4	118	.459	845	1.54	70.6
East 14th/Urbandale	1,405	11.2	169	.456	663	1.86	85.0
Crocker	225	1.8	33	.433	79	2.43	105.2
Express Routes	384	3.1	5	.476	288	1.32	63.0
Metro Center	397	3.2	4	.250	215	1.82	46.0
42nd Street Shopper	40	0.3	4	.450	62	.58	26.0
Community College	20	0.2	-	.500	25	.80	41.0
System Total	12,546	100.0	1,009	.45	6,469	1.78	80.1

(a)-Computed from method of payment shown in Table 5.

Source: De Leuw, Cather & Company; surveyed December 1974.

Transit Utilization-Area Analysis

To measure the relative level of transit utilization in five sectors of the metropolitan area served by the MTA (see Figure 9) an index was developed to relate transit ridership, bus miles, and population. From these parameters, indexes relative to the area averages were developed to show relative levels of bus-miles per capita (service index), relative boarding levels (boarding index), and a utilization index combining the two previous indexes. Using this method of analysis, if each subarea produced the same number of trips per bus-mile per capita, all indexes would equal one. Numbers higher than one indicate a more favorable response to public transit than the system average, while numbers lower than one indicate the converse.

The results of these tabulations are shown in Table 12. The south and east subareas have the highest service and the lowest boarding indexes, and the combination of these characteristics produces the lowest utilization indexes in the study area. The north central subarea shows average utilization, while the northwest and north central subareas show the strongest tendencies toward transit usage.

Maximum Load Points

Maximum load points are those locations where the largest accumulated number of passengers were observed. Table 13 shows the location and maximum accumulated loads occurring on each route. This information can be utilized for an analysis of seating capacity, especially during peak periods; it provides benchmarks against which future passenger count spot checks can be compared; and can also be used to monitor the strength of each route as well as passenger reaction to service changes.

At least two significant observations can be made from the information presented in Table 13. First, maximum busloads observed during the survey indicate that adequate seating capacity is provided and that the Des Moines system operates well within general industry standards which tolerate a limited number of standees during peak periods. The maximum busload was 67 passengers and only eight runs were

Table 12

RELATIVE TRANSIT UTILIZATION BY SUBAREAS

Subarea [a]	(1) Percent of Total Estimated Population Served [b]	(2) Percent Recorded Boardings [c]	(3) Percent Daily Bus Miles	(4) Service Index (3) ÷ (1)	(5) Boarding Index (2) ÷ 20	Utilization Index (5) ÷ (4)
South	14	13	17	1.21	.65	.54
East	17	19	22	1.29	.95	.74
North Central	16	23	18	1.12	1.15	1.03
Northwest	30	23	26	.87	1.15	1.32
West Central	23	22	17	.74	1.10	1.49
	100	100	100	1.00	1.00	1.00

(a)-Approximate area boundaries:

	Side			
	North	South	East	West
South	Raccoon-Des Moines Rivers	-	S. E. 14th Street	Fleur Drive
East	-	Des Moines River	-	I-235
North Central	-	CBD	I-235	7th Street
Northwest	-	University Avenue	7th Street	-
West Central	University Avenue	Raccoon River	CBD	-

(b)-Population estimated using a service area of one-fourth mile from route and 1970 census tract data.

(c)-Excludes CBD boardings.

Source: De Leuw, Cather & Company.

Table 13

MAXIMUM LOAD POINTS

Route (Destination)[a]	Segment[b]	Average Maximum Load[c]	Range	General Location[d]
University	To CBD	19	9-46	6th and University
	From CBD	29	11-39	19th and Woodland
Highland-Oak Park	To CBD	27	19-34	19th and Woodland
	From CBD	25	11-45	5th and Keosauqua
Clark	To CBD	15	11-19	E. 9th and Grand
	From CBD	25	18-30	Park and Keosauqua
East 6th, 9th	To CBD	26	18-34	13th and University
	From CBD	24	11-32	E. 6th and Locust
Airport	To CBD	20	12-35	E. 18th and Walnut
	From CBD	12	10-15	15th and Grand
Scott	To CBD	11	5-22	13th and Locust
	From CBD	11	8-15	E. 11th and Locust
Fort Des Moines	To CBD	28	9-53	E. 12th and University
	From CBD	27	11-47	7th and Mulberry
Walker	To CBD	16	6-36	9th and Kirkwood
	From CBD	28	12-39	E. 12th and Grand
West Des Moines	To CBD	27	14-48	E. 6th and Grand
	From CBD	33	9-67	9th and Walnut
Fairground	To CBD	23	14-30	16th and Locust
	From CBD	35	15-67	E. 16th and Walnut

Table 13 (Concluded)

MAXIMUM LOAD POINTS

Route (Destination)[a]	Segment[b]	Average Maximum Load[c]	Range	General Location[d]
West 9th-Douglas	To CBD	17	5-28	7th and Mulberry
	From CBD	30	17-38	Center and Keosauqua
Indianola-Lacona	To CBD	30	11-43	9th and Forest
	From CBD	14	8-21	7th and Mulberry
East 14th	To CBD	31	19-48	15th and Center
	From CBD	20	16-23	E. 15th and Grand
Urbandale	To CBD	20	13-33	E. 14th and University
	From CBD	34	20-52	8th and Grand
Crocker[e]	To CBD	29	-	19th and Woodland
	From CBD	15	-	17th and Grand
Metro Center	-	24	10-41	9th and Locust

(a) - Overall direction of travel is towards route name.
(b) - Load values for "To CBD" occur in a.m.; load values for "From CBD" occur in p.m.
(c) - Value is average of maximum values for each different bus on route.
(d) - Exact locations of each maximum load may differ--point shown generally picked in direction of increasing load.
(e) - Crocker route exhibits "reverse" loads also--p.m. inbound maximum load 46
--a.m. outbound maximum load 19

General: Express route information insufficient for accurate representation in this table. See text.

Source: De Leuw, Cather & Company; surveyed December 1974.

observed where the passenger load exceeded available seats. The average peak accumulation on any route seldom exceeded 30 passengers and frequently did not utilize more than two-thirds of the seating capacity. This would indicate that, for most routes, the peak service demand could increase by 30 to 50 percent without taxing the seating capacity of the system.

The second significant factor is that all maximum load locations were found to be around the perimeter of the central business district. This is a further indication that the CBD is the dominant trip attractor, which is reflected in the existing route structure. The location of these load points would also indicate that there are no major passenger movements on route segments external to the CBD.

Because the number of runs per day are limited, the express routes have not been included in Table 13. There are, however, a few factors that should be considered. Although most express routes reach their peak load, in either direction, prior to the non-stop portion of the trip, there are a few exceptions to this general rule. The morning run of the Valley Express, for one, reaches a peak at 11th Street and Ashworth Avenue in West Des Moines, presumably because it provides transportation to an elementary school and a high school. The early afternoon Urbandale Express was the only express run observed with a peak load greater than seating capacity.

Significant Boarding Locations

Although passengers can board the system at any point along a route, there were individual boarding areas where much higher than the average route boardings were recorded.

This information should be useful in future planning because it points toward land use types which contribute significantly to public transit usage and conversely, to those that have no impact. Any future plans should not only avoid service reductions to those generators which support transit, but should also seek to expand

or improve service to these areas. This data could also be used to determine the location of bus stops, signs, and bus shelters.

The largest single area generating ridership is the downtown core. The boarding counts indicated that approximately 70 percent of all trips had either an origin or destination within this area. The current viability of Des Moines' CBD and the strong CBD orientation of the bus system act to strengthen this pattern, with the highest loading occurring where the routes cross West Seventh, Sixth, and Eighth Streets, in that order.

Outside the CBD, on the survey days the heaviest loading points generally had boarding counts in the range of 20 to 40 passengers. Major establishments (land use generators) include Merle Hay Plaza, Des Moines Technical High School, Drake University, the State Capitol, Methodist Hospital, Broadlawns Hospital, and the U.S. Veterans Administration Hospital. Other high loading points tend to be near high schools, and a few relate to residential areas. Table 14 identifies the more significant loading points by route. The express routes are not included in this tabulation because, with one exception, there were no heavily patronized loading points recorded outside of the CBD. The exception occurs on the route of the Urbandale Express where 26 patrons were observed boarding the inbound bus at Urbandale Avenue and Merle Hay Road.

With the exception of schools, significant loading points are associated with areas of regional interest such as the CBD, State Capitol area, and Merle Hay Plaza. Outside the central business core, with the possible exception of the larger hospitals which normally generate heavy loadings, isolated areas of concentrated employment do not produce large point loads. Outlying shopping centers and local commercial areas do not appear to produce large loading points within the current system. However, because the current routing system is strongly CBD oriented, it is possible that proper service is not provided. These statements are based on examinations of locations where the significant loading points occurred during the survey. A future examination of additional origin/destination data would enhance the understanding of trip-generator land uses.

Table 14

SIGNIFICANT LOADING POINTS

Route	Location	Counted Boardings	Remarks
University/Highland-Oak Park	University Avenue and 41st Street	34	
	University Avenue and 28th Street	28	Drake University
	University Avenue and 24th, 25th Streets	61	Drake University
	Woodland Avenue and 19th Street	24	Tech High School
	Forrest Avenue and 6th Street	34	
	Holcomb Avenue and 6th Street	48	North High School
Clark/East 6th-9th	Hickman Road and Merle Hay Road	25	
	Franklin Avenue and 49th Street	21	Franklin Jr. High School
	Cleveland Avenue and E. 9th Street	26	
Airport/Scott	None		
Fort Des Moines/ Walker	County Line Road and S.W. 9th Street	49	Route end point
	Loomis Avenue and S.W. 9th Street	35	Lincoln High School Large employer
	Addison Avenue and E. 29th Street	32	
West Des Moines/ Fairground	Walnut Street and 5th Street, West Des Moines	21	
	Ingersoll Avenue and 34th Street	73	High-density residential
	Ingersoll Avenue and 20th Street	46	Tech High School
	Grand Avenue and E. 12th Street	42	State Capital
	Walnut Avenue and E. 26th Street	23	
	Walnut Avenue and E. 30th Street	36	
	Easton Avenue and E. 38th Street	23	

Table 14 (Concluded)

SIGNIFICANT LOADING POINTS

Route	Location	Counted Boardings	Remarks
West 9th - Douglas / Indianola - Lacona	Merle Hay Plaza	83	Merle Hay Plaza
	Douglas Avenue and Beaver Road	45	Hoover High School Meredith Jr. High School to the north
	Douglas Avenue and Lawnwoods Drive	30	V. A. Hospital
	Hickman Avenue and 18th Street	40	Broadlawns Hospital
	Washington Avenue and 19th Street	25	
	Indianola Avenue and S. W. 14th Street	24	Shopping center
East 14th/Urbandale	Merle Hay Plaza	36	Merle Hay Plaza
	Urbandale Avenue and Beaver Avenue	28	Holy Trinity School
	Center Street and 12th Street	19	Methodist Hospital
Crocker	Crocker Avenue and 42nd Street	20	Roosevelt High School
	Crocker Avenue and 31st Street	33	
Metro Center	Ingersoll Avenue and 18th Street	38	
	Locust Street and 7th Street	12	
	Grand Avenue and E. 13th Street	10	
	Walnut Avenue and E. 7th Street	16	
	Walnut Avenue and 7th Street	15	

Source: De Leuw, Cather & Company; surveyed December 1974.

The preceding sections of this report described and analyzed revenue patronage of the MTA transit system. The sections which follow will compare the revenue produced with the cost of providing service, and will present an analysis of fares and deficit financing.

SYSTEM-INCOME/EXPENSE

The Des Moines transit system, like almost all transit systems in the United States, has experienced yearly cost increases coupled with a decrease in revenue. These operating increases have occurred despite reductions in service and fare increases. The following figures briefly summarize the income/expense statement shown in Table 15.

	1970	1971	1972	1973	1974
Total Operating Revenue	$1,750,820	$1,746,630	$1,691,490	$1,567,790	$1,511,020
Percent Change		-0.2	-4.2	-8.3	-4.2
Total Operating Expense[a]	1,673,880	1,671,450	1,757,640	1,875,670	2,110,260
Percent Change		-0.1	+5.2	+6.7	+12.5
Net Income (Deficit)[b]	(57,750)	(54,400)	(169,300)	(346,100)	(399,240)
Percent Change		-6.8	+311.2	+204.4	+160.4

(a) - Less depreciation
(b) - Includes depreciation and non-operating income/expense

Over the previous five-year period, operating revenue decreased by 13.7 percent despite base fare increases of five cents in both 1971 and 1972. During the same period, operating expenses rose by 26 percent. Total fare increases would certainly have been considerably greater had Sunday and late night service not been eliminated in 1971. Although the increase in operating expenses is not limited to any single item, some expenses rose at a greater rate than others.

Table 15

INCOME/EXPENSE STATEMENT
1970-1974

	1970	1971	1972	1973	1974
Operating Revenue					
Passenger Revenue	$1,701,150	$1,697,240	$1,630,800	$1,503,820	$1,429,430
Charter	32,440	35,760	43,370	49,350	66,940
Advertising-Miscellaneous	17,230	13,630	17,320	14,620	14,650
Total	$1,750,820	$1,746,630	$1,691,490	$1,567,790	$1,511,020
Operating Expenses					
Operating and Maintenance	$ 293,430	$ 303,780	$ 337,150	$ 386,360	$ 454,130
Transportation	971,310	977,490	950,080	977,130	1,139,650
Insurance and Safety	75,170	53,640	100,800	108,950	90,970
Administrative	249,650	246,350	279,810	302,450	343,130[a]
Operating Taxes	84,320	90,190	89,800	100,780	82,380
Total (Less depreciation)	$1,673,880	$1,671,450	$1,757,640	$1,875,670	$2,110,260
Net Operating Income (Depreciation not included)	$ 76,940	$ 75,180	$ (66,150)	$ (307,880)	$ (599,240)

(a)-Includes $41,680 marketing funds and $12,720 contingency funds.

Table 15 (Concluded)

INCOME/EXPENSE STATEMENT
1970-1974

	1970	1971	1972	1973	1974
Non-Operating Income					
Sale of Scrap	$ 180	$ 280	$ 200	$ 110	$ -
Interest Income	16,990	12,760	11,760	4,900	49,240
Purchase Discounts	950	930	950	880	-
Other	3,680	3,140	6,180	-	-
Total	$ 21,800	$ 17,110	$ 19,090	$ 5,890	$ 49,240
Gross Income Less Operating Expenses (Depreciation not included)	$ 98,740	$ 92,290	$ (47,060)	$ (301,990)	$ (550,000)
Depreciation	$ 105,850	$ 97,260	$ 72,810	$ 44,110	$ 108,920
Non-Operating Charges					
Interest - Series "A" Mortgage Income Bonds	$ 50,640	$ 49,430	$ 49,430	-	-
Net Income	$ (57,750)	$ (54,400)	$ (169,300)	$ (346,100)	$ (658,920)
Annual Bus Miles	2,223,020	2,171,190	1,939,390	1,806,563	1,875,081

Source: Des Moines Metropolitan Transit Authority.

During this period, transportation costs rose only 17 percent. This is a minimal increase when compared to other systems because of the tremendous inflationary pressures under which transit operates. The rate of increase was minimized by the service cutbacks in 1971. When calculated on a per-mile basis, the increase in transportation cost was 39 percent. Despite the saving effected by the cutback in service, other expense items rose steadily. The smallest increase, 21 percent, was in the area of insurance and safety-related expenses. A 55 percent rise in maintenance costs reflected inflationary pressures as well as costs due to the overextended use and age of the equipment.

In 1974 the total cost per bus-mile of operation (not including depreciation) was $1.125. Of that, $0.275 was attributable to fixed costs. The remaining costs were variable and included $0.242 for maintenance and $0.608 for transportation charges (drivers' wages, etc.). Table 16 compares the percent of increase for the various elements during this five-year period with the increases that occurred in comparable systems.

Table 16

OPERATING COST COMPARISON

Item	Percent of Total Cost	
	MTA	Comparison Systems*
Maintenance	21	18
Transportation	55	57
Insurance	4	6
Administration	16	14
Taxes	4	5

The percentage breakdown of overall expenses is generally comparable to other operating systems of similar size. Maintenance expenses are slightly higher but it is

*Source: Characteristics of Urban Transportation Systems, U.S. Department of Transportation, May 1974. Figures from 1373 Data and are applicable for systems in cities with populations of 250,000 to 750,000.

anticipated that this difference would be minimized when the old equipment is replaced.

Revenue/Cost Comparisons

The cost of operating the transit system during 1974 was $2,110,260, excluding depreciation and non-operating income. Income for the same period amounted to $1,511,020. This results in a revenue/cost ratio for the entire system of 0.72.

The operating costs presented earlier, together with estimated revenue calculated from the on-board survey of ridership, were used to develop several revenue/cost comparisons. Table 17 indicates the revenue/cost ratios for each of the individual routes. None of the routes has a revenue/cost ratio greater than one. The revenues for the less productive routes—Airport/Scott and Metro Center—cover less than half of their operating costs. The University/Highland—Oak Park and Crocker routes very nearly recover costs, and the West Des Moines/Fairground as well as the express routes exhibit economic strength with ratios of about 0.85

The economic viability of segments of each of the regularly scheduled routes was also examined.* Figure 9 illustrates the revenue/cost ratios for various route segments. The ratios are depicted as falling within four specified ranges, with a ratio of less than 1.0 indicating that costs exceed revenue.

---

*Methodology: In computing these ratios, the cost of providing service on a given segment was found by determining the number of daily bus trips on that segment, multiplying by the length of the segment, and the system cost per bus-mile. Revenue was calculated as the number of boardings within the segment, time the average fare for that route, times a factor to account for a reverse trip being made from the CBD. The "CBD factor" assumed that all CBD trips were round trips and credited the outlying route segments where the trip began with the return fare paid in the CBD.

Table 17

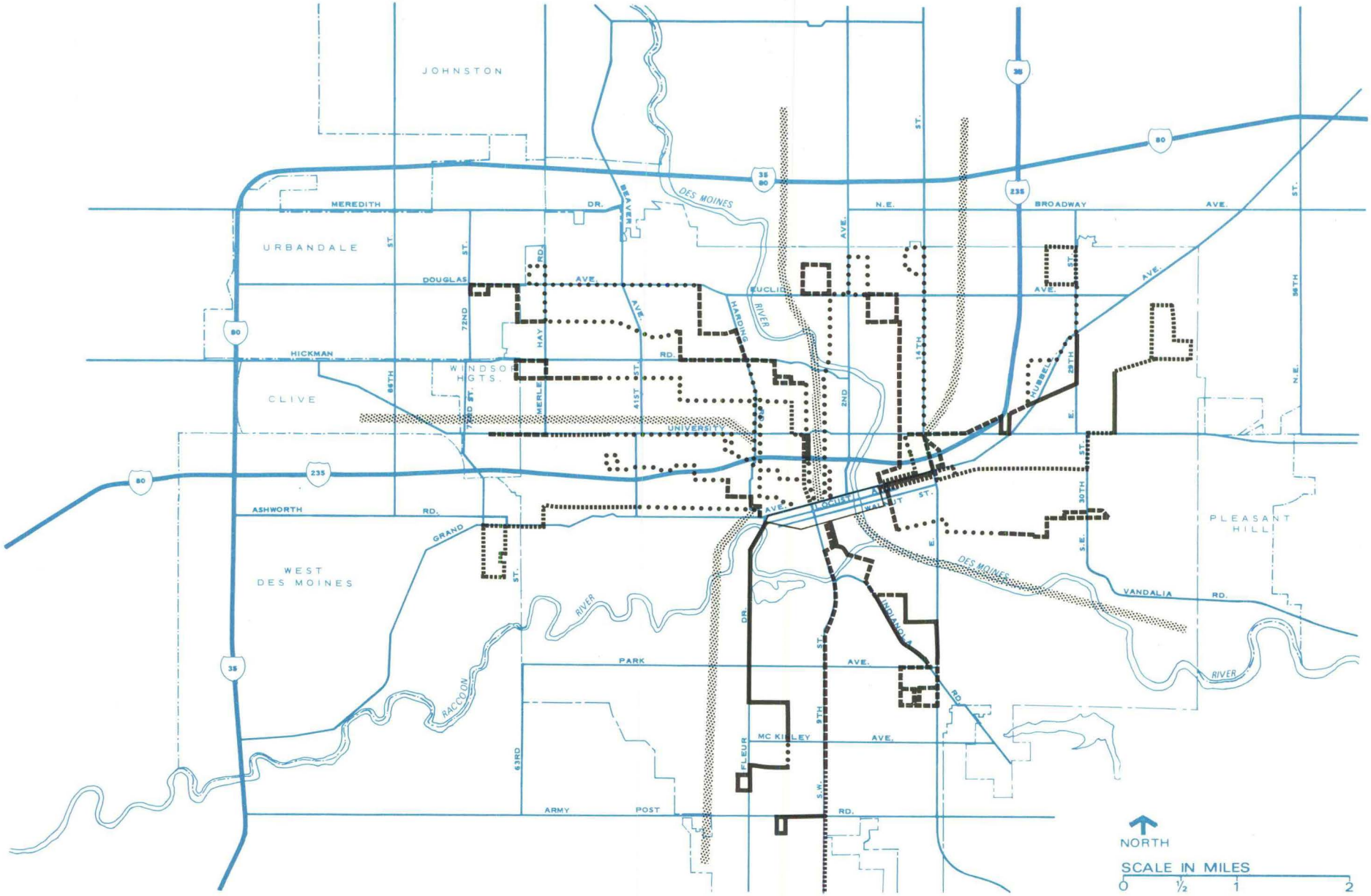
REVENUE COST COMPARISON BY ROUTE

Route	Average/[a] Cost Ratio
University/Highland - Oak Park	0.95
Clark/East 6th - 9th	0.57
Airport/Scott	0.46
Fort Des Moines/Walker	0.64
West Des Moines/Fairground	0.86
West 9th - Douglas/Indianola - Lacona	0.63
East 14th/Urbandale	0.76
Crocker	0.94
Express Routes	0.85[b]
Metro Center	0.40
42nd Street Shopper	0.23
Community College	0.36
Total System	0.72

(a)-Based on average system cost of $1.1250 per mile.
(b)-Express route cost per mile of $0.74 due to higher average speeds.

Source: De Leuw, Cather & Company.

FIGURE 9



LEGEND

INCOME / COST RATIO

- ••••••• OVER 1.00
- ▪▪▪▪▪▪▪ 0.8 - 1.00
- ------- 0.5 - 0.8
- ——— 0 - 0.5
- ▒▒▒▒▒ UTILIZATION INDEX AREA BOUNDARIES

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

INCOME/COST COMPARISON BY ROUTE SEGMENT

(UTILIZATION INDEX AREA BOUNDARIES INCLUDED)

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From an examination of Figure 9, certain patterns emerge which coincide with findings reported elsewhere in this section. All routes serving the southern portions of the city produce low levels of revenue, with income ratios rarely exceeding 0.8. In the western section, all routes operate at very high ratios but, except for those supported by activity at Merle Hay Plaza, the cost ratios decrease as the routes proceed west. In the north and east, all of the loop ends generally pass through more densely populated residential areas and show relatively high income/cost ratios. The Walker route, which passes through a considerable number of "strip" commercial areas along University Avenue and Easton Avenue, has a very low income/cost ratio for those segments.

FARE STRUCTURE

The basic fare on all regular and express MTA routes is 50 cents for adults and 35 cents for senior citizens, students and children 12 years of age or under. This constitutes one of the highest basic transit fares in the nation (see Table 18). Partially for convenience, but also as a fare incentive, the Des Moines transit system has for some time offered $4.50 weekly trip tickets good for an unlimited number of rides. More recently, a $20.00 monthly pass has been offered, also good for unlimited riding.

On the basis of the on-board survey, the average fare paid by those responding to the questionnaire was 45.2 cents. The survey revealed that fares paid by the various categories of riders accounted for the following percentages of total revenue:

$ 0.50 Fare	69.3 percent
0.35 Elderly Fare	10.5 percent
0.35 Student Cash Fare	4.9 percent
0.35 Student Ticket	4.3 percent
20.00 Monthly Pass	3.4 percent
0.50 Trip Ticket	2.0 percent
4.50 Weekly Pass	1.9 percent
Other	1.8 percent

Table 18

COMPARISON OF BASE TRANSIT FARES
November 1974

City	Population Served	Fare	1973 Subsidy Per Capita
Milwaukee, Wisconsin	717,000	55¢	-
DES MOINES, IOWA	250,000	50¢	$ 1.40
Indianapolis, Indiana	746,000	50¢	N/A
Toledo, Ohio	383,000	45¢	4.27
Kansas City, Missouri	675,000	40¢	5.20
Peoria, Illinois	160,000	40¢	2.10
Dubuque, Iowa	62,000	40¢	5.84
Sioux City, Iowa	85,000	40¢	1.80
Portland, Oregon	380,000	35¢	14.00
Denver, Colorado	700,000	35¢	3.26

Table 18 (Concluded)

COMPARISON OF BASE TRANSIT FARES
November 1974

City	Population Served	Fare	1973 Subsidy Per Capita
Akron, Ohio	275,000	35¢	$ 4.50
Trenton, New Jersey	200,000	30¢	6.60
Eugene, Oregon	120,000	30¢	8.00
Los Angeles, California	2,809,000	25¢	15.15
Madison, Wisconsin	225,000	25¢	4.70
Evanston, Illinois	80,000	25¢	4.00
Atlanta, Georgia	1,100,000	15¢	14.08
Salt Lake City, Utah	176,000	15¢	N/A
Everett, Washington	60,000	10¢	7.90

Source: American Transit Association.

OPERATING SUBSIDIES

The Des Moines Metropolitan Transit Authority incurred an operating deficit of approximately $650,000 during 1974. Since May 1973, the Authority's losses have been financed by general revenue funds from the five member MTA communities. Under a formula that has been in effect since May 1973, the contribution is determined by a cost allocation, one-half of which is based on each municipality's assessed value, and the other half on annual transit vehicle-miles traveled in each city. Table 19 illustrates the merged values on which the actual dollar assessment is based. The city of Des Moines, for example, contributed nearly 86 percent of the system deficit in 1974.

The annual vehicle-miles used in Table 19 are projections based on planned service extensions which had not been implemented in 1974. The MTA fare subsidy agreement specifies that the formula must be readjusted each year, using the assessed value and the anticipated annual miles for the coming year.

In this and previous chapters all aspects of the current system have been described. Additional chapters will develop recommendations for improvement strategies and will discuss their operational and financial implications.

Table 19

Merged Values by Percent

Municipality	Assessed Value	Vehicle-Miles	50-50
Clive	1.74	0.18	0.96
Windsor Heights	2.81	1.23	2.02
Urbandale	6.98	2.07	4.52
West Des Moines	8.30	4.73	6.52
Des Moines	80.17	91.79	85.98
Total	100.00	100.00	100.00

Chapter V

SYSTEM EVALUATION

The findings reported earlier will be utilized to evaluate the current operations of the Des Moines metropolitan transit system. The concepts contained in this and preceding chapters influenced the recommended plan which is presented in Chapter VI of the report. The focus in this chapter includes an evaluation of current patrons, system coverage, system configuration, scheduling, fares-subsidies, and facilities.

CURRENT PATRONS

The on-board passenger questionnaire indicated that the majority of MTA's riders are women over 40 years of age who are employed full-time, and whose household income is less than $8,000 per year. Most of them live in Des Moines, work in the central business district, and have no alternative means of transportation. They are concerned about the cost of transit and would like to see expanded service.

The number of riders in the category discussed above indicates that the system is serving the mobility needs of a segment of the population that absolutely depends on public transit. However, to be successful, a transit system should appeal to a representative cross section of the population. Fortunately, the survey indicated that in Des Moines other groups are using the transit service. For example, over 40 percent of the men riding the bus had an income greater than $12,000, and 25 percent were in the 25 to 39 age group. Thus, the system is beginning to attract a broader segment of the population. However, that part of the total ridership is not large at this time (no more than six percent) and represents a market where increased growth should be sought.

It is significant that 48 percent of the riders returning questionnaires indicated that transit was the most convenient mode of travel for that trip even though, in some cases, no other means of travel may have been available. Thirty percent stated that

transit was less expensive than auto use for that trip. These statements show that many riders, once they have used the system, develop positive attitudes toward MTA transit service.

In the same regard, the favorable response from riders on the express routes illustrates a very positive reaction to innovative, consumer-oriented service.

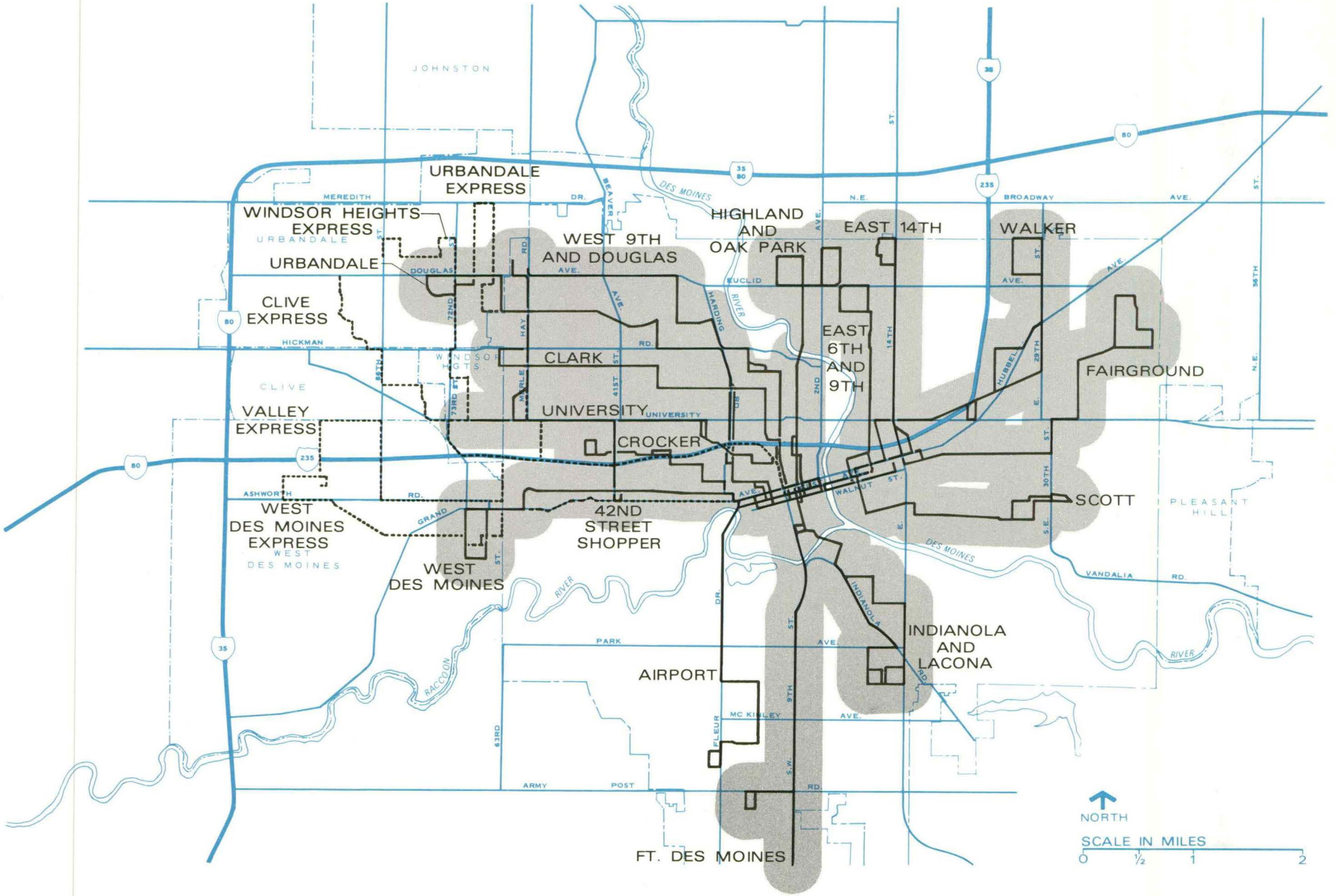
SYSTEM COVERAGE

Figure 10, on the basis of a service area which extends one-quarter mile on either side of a transit route, shows the coverage afforded by the present system. The service areas of the express and Airport routes have been excluded due to the limited number of bus trips made on these routes. Figure 10 illustrates that while transit service is available throughout most of the contiguous urbanized sections in the five-city area, there are some notable exceptions. Unserved "pockets" exist throughout the system, the largest of which are found in the western and southern sectors of the study area.

Many developed sections in the western suburbs are without transit other than the limited service provided by the express buses. This service, however, is intended to serve a particular type of trip and cannot be said to greatly increase the overall mobility of the area. If transit is to become a viable transportation option, its scope, within a cost-effective framework,should be increased to cover a wider spectrum of the service needs of the population. Expanded service to the western suburbs would be consistent with the stated planning objectives of promoting urban development and providing expanded housing opportunities to transit dependents. To date, transit service in the western suburbs has not fully satisfied these objectives.

In the southern service area, development has also taken place away from the current route structure, leaving large segments of the population without convenient service. The residential sections in this area include older, low-density housing, expensive single-family homes and a few new apartment complexes. This

FIGURE 10



NOTE:
COVERAGE SHOWN AS ONE QUARTER MILE EITHER SIDE OF ROUTE

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

EXISTING TRANSIT COVERAGE

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heterogeneous quality coupled with an unpaved street system, makes it difficult, if not impractical, to offer overall transit coverage with conventional fixed-route service. Clearly, some alternative to conventional service should be considered for such neighborhoods.

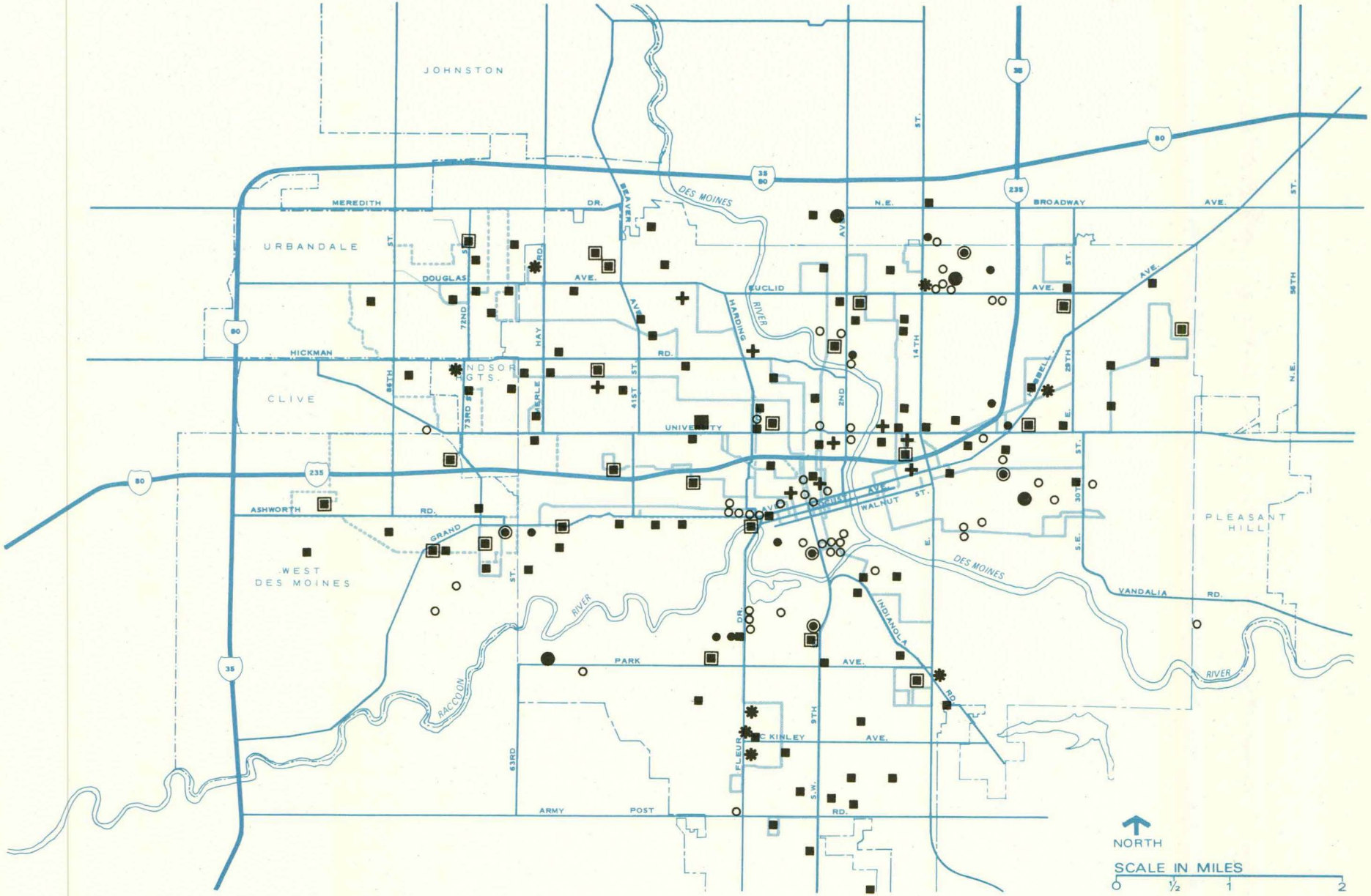
In the remainder of the MTA service area, the problems are less obvious. Occasional coverage gaps occur due to extended route spacing rather than expanding development. Among the more significant of these areas are the residential neighborhoods to the north and northwest of the fairground, the industrial area west of I-235, and the growing residential tracts north of Douglas Avenue. These areas have service deficiencies which, particularly in the eastern section, may be reduced by restructuring the present routes.

Special Service Generators

Figure 11 shows the location of special traffic generators such as shopping centers, schools, hospitals, large centers of employment, and some apartment complexes and their proximity to the current route structure. With the exception of the areas previously discussed, all of these activity generators are located on or near a bus route. However, because the current routing is highly oriented toward the CBD, service to generators outside of the downtown core is inconsistent, and depending upon the desired direction of travel, ranges from excellent to poor. If it is convenient to travel toward or through the CBD en route to the desired destination, the service is good. If not, the use of public transit can involve unduly long trips and a transfer via the downtown area.

Access to the airport is provided by the Airport route but this service is provided at the expense of service to nearby residential areas. The survey showed that very little patronage was generated at the airport—only ten trip ends were recorded there during an entire day—and is questionable whether this service should be continued when nearby, unserved areas may generate a greater level of ridership.

FIGURE 11



LEGEND

- ● 1,000 OR MORE EMPLOYEES
- ◉ 500-1,000 EMPLOYEES
- • 250-500 EMPLOYEES
- ○ 100-250 EMPLOYEES
- ■ ELEMENTARY SCHOOL
- ▣ HIGH SCHOOL
- ■ DRAKE UNIVERSITY
- ✱ SHOPPING CENTER
- ✚ HOSPITAL

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

ACTIVITY GENERATORS

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Poor, Elderly, and Minority Group Service

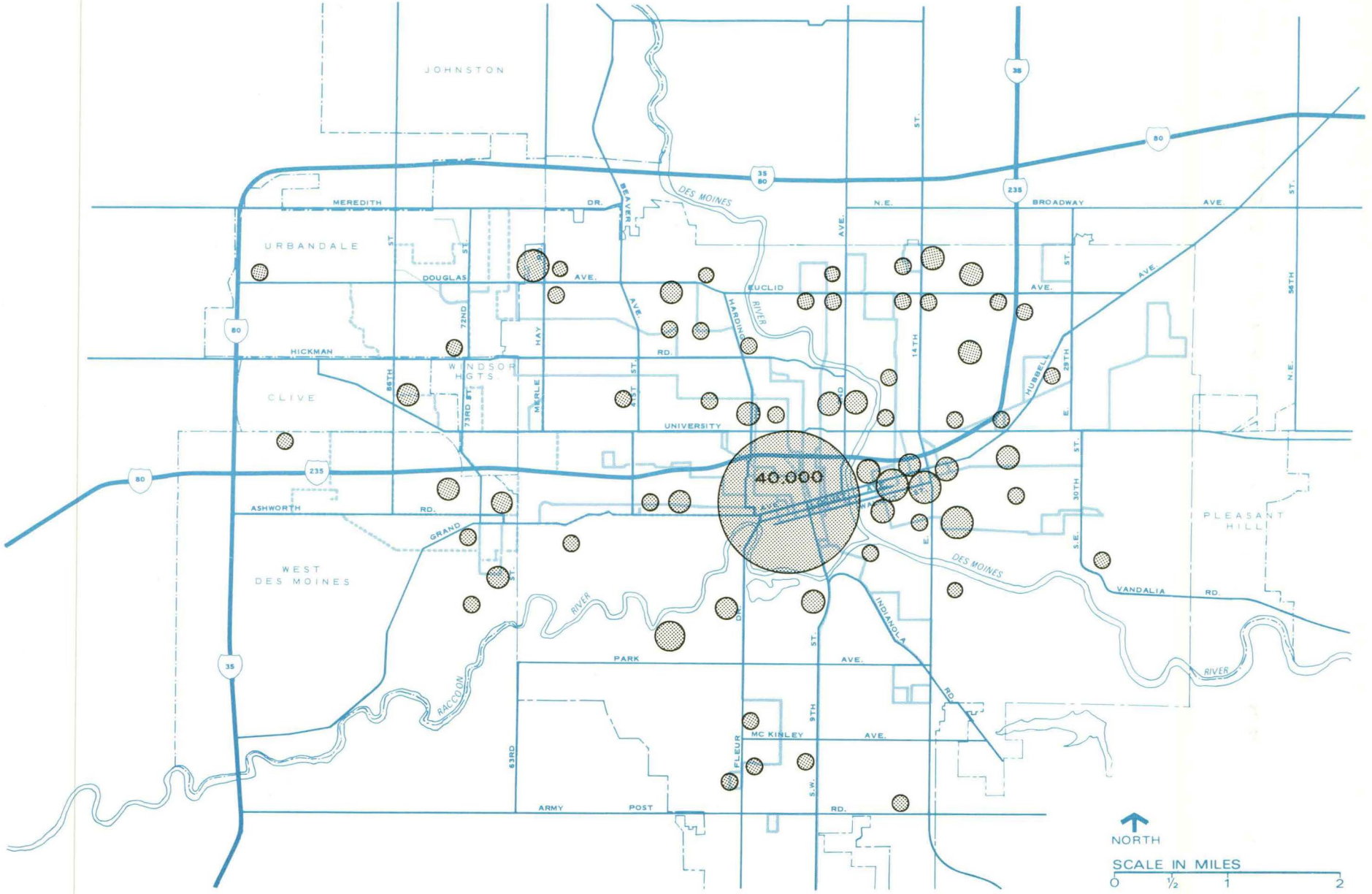
Housing for the poor, the elderly, and minority groups tends to be located near or immediately north of the CBD. As most of the service is oriented to the CBD, these segments of the population have fairly good access to transit. This is especially true of minority groups who are concentrated in areas tightly surrounding the CBD, through which most of the routes pass. However, some concentrations of low-income families are found in the eastern sections of the city where as discussed earlier, there are coverage gaps. While there is sufficient access, for the most part, between concentrations of low income families and the CBD, access to employment outside of the CBD is considerably more limited.

Based on quarter-mile coverage standards, much of the elderly population is served by existing transit service. However, several large retirement homes located on Grand and Hickman Avenues in Des Moines as well as others in West Des Moines do not have close access to transit. It is often impossible for the aged to walk long distances, especially in inclement weather and consequently, effective service for the elderly should be near their origins and destinations. While it is often difficult to properly serve this segment of the population with conventional fixed-route service, any future modifications should consider some form of service to the larger retirement homes.

Employment Distribution and Transit Service

Figure 12 presents the approximate employment distribution by area and number of jobs, and the relationship to the existing route structure. The major single job center is obviously downtown Des Moines, which is also the major orientation of the MTA transit system. With the exception of the zonal concentration of jobs at or near the northeast and southeast city limits, transit service and employment seem to be well coordinated. Further study is warranted, however, to determine how well individual routes serve major centers of employment. This type of study should include an analysis of service areas and a study to develop coordination between bus schedules and job starting and ending times.

FIGURE 12



SCALE

250-749

750-1500

1500-2500

NUMBER OF EMPLOYEES

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

EMPLOYMENT DISTRIBUTION - 1973

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SYSTEM CONFIGURATION

As previously noted, the existing routes are structured to provide uniform service only to the CBD. The result is that crosstown movement by transit is almost always very inconvenient. To make transit an attractive means of travel in the MTA service area, some effort must be made to provide a system capable of allowing the rider to conveniently travel in any direction.

The present route structure is, for the most part, straight-forward, employing a minimum number of split ends and alternate routing patterns. The Indianola-Lacona extension is, however, an exception, and the present practice of running alternate buses in alternate directions on these routes is confusing. Unless one is very familiar with the schedule, it is difficult to even know on which side of the street a bus can be boarded. Routing of this type discourages ridership as it is difficult to understand, especially for those not familiar with the transit system or new to the area. Recommendations for simplifying the routing in this area will be presented in the following chapter.

Several routes are structured to provide special types of service. One of these is the reduced-fare, 12-minute-headway Metro Center route which was designed to provide internal downtown circulation to serve the Capitol area to the east and the extended retail and commercial areas to the west. Unfortunately, as it is presently structured, there is little demand for this service.

Revenue per bus-mile on this route is covering only 40 percent of the cost of operation. Throughout the day, many trips are made where less than ten passengers are served. In addition to the length of time it takes to complete this run, it appears that high density service is being provided to areas which do not generate transit trips. While in theory the loop concept is attractive, in practice the cost, in this instance, does not justify the service.

SCHEDULING

A frequently stated reason for not using public transit facilities is a lack of knowledge as to route locations and schedules. The present schedule structure contributes greatly to this problem and there appear to be four primary reasons for this complexity:

- Scheduling of buses during the peak period is not uniform between either routes or buses on the same route. Peak period headways between buses on many routes vary by as much as 16 minutes. A case in point is the Urbandale/East 14th Street route.

- During the off-peak period, individual route headways are constant between buses on the same route, but there is considerable variance between routes.

- Many of the headways are not planned on evenly divided portions of an hour and as a result, arrival times vary throughout the system from hour to hour. From the consumer's viewpoint, this makes it very difficult to become familiar with the schedule.

- Scheduling also affects transfer waiting time. With the varying headways, the time it takes to accomplish a transfer is not predictable and a wait time of more than twenty minutes is common.

For the frequent rider, these variances are a source of confusion and for those new to transit, this confusion is considerably compounded. A uniform system of scheduling, at evenly divisible time periods—10, 15, 30, or 60 minutes—can be easily understood and is readily marketable, With all buses on a uniform schedule, it would be possible to coordinate transfers and minimize wait times.

FARES AND SUBSIDIES

As outlined earlier, the present $0.50 base fare will discourage any significant increase in riders, especially in the short-haul market. One index to the effect of any fare policy is its relationship to transit ridership per capita. Table 20 compares 1973 MTA ridership per capita with similar systems from selected cities, and also illustrates the close relationship between base fares and ridership intensity. In general, the lower the base fare, the greater the per capita ridership. Des Moines not only has one of the highest base fares in the nation, but at 10.4 rides per capita, it also has one of the lowest transit utilization rates for cities with populations in the range of 100,000 to 250,000.

The degree to which a high fare inhibits transit patronage can also be inferred from the impressive increases in the number of riders that have accompanied fare cuts in Cincinnati, Atlanta, Los Angeles, and San Diego. See Table 21. The MTA's special $4.50 and $20.00 unlimited-ride passes, do not provide the needed incentive for this kind of growth. The regular commuters, who make up the bulk of MTA riders during peak periods, normally use the system only twice a day on about 22 working days per month. The $20.00 monthly pass, therefore, still translates into a $0.45 fare for these patrons.

Fare levels, of course, are a function of the extent to which a transit system has sufficient non-fare tax revenue to accomplish a reduced fare program. A high fare policy is basically a method of holding down deficits, but it also inhibits ridership. As a result of the $0.50 are, for example, in 1973 a subsidy of $1.38 per capita was required to support the bus service. As shown in Table 22, this was a low level of subsidy when compared to subsidies in a number of other cities. Despite a sharp increase in operating expenses during 1974, subsidies to cover the MTA's deficit of approximately $650,000 amount to only $2.60 per capita, which is still low relative to the contributions made by other cities.

Table 20

SELECTED ANNUAL TRANSIT RIDERSHIP
PER CAPITA
1974

City	Population Served By Transit	Annual Rides Per Capita	Base Fare
Evanston, Illinois	80,000	37.00	$0.25
Madison, Wisconsin	225,000	35.80	0.25
Trenton, New Jersey	160,000	35.30	0.30
Tacoma, Washington	250,000	29.20	0.25
Erie, Pennsylvania	175,000	27.80	0.30
Duluth, Minnesota	150,000	26.70	0.35
Schenectady, New York	100,000	21.70	0.40
Sioux City, Iowa	85,000	18.10	0.40
Peoria, Illinois	160,000	12.70	0.40
DES MOINES, IOWA	250,000	10.40	0.50
Wichita, Kansas	277,000	7.30	0.30

Source: American Transit Association and De Leuw, Cather & Company

Table 21

EFFECTS OF TRANSIT FARE REDUCTIONS

City	Population	Old Fare	Reduced Fare	Percent Fare Reduction	Percent Change in Ridership	Date of Change
1. Akron, Ohio	275,425	40¢	35¢	12.5	+17.3 (9/72-9/73)	9/72
2. Atlanta, Georgia	497,421	40	15	62.5	+18.6 (2/72-2/73)	3/72
3. Cincinnati, Ohio	452,524	55	25	54.5	+48.0 (3/73-3/74)	4/73
4. Everett, Washington	53,622	25	10	60.0	+62.5 (9/73-9/74)	1/74
5. Jacksonville, Florida	528,865	30	25	16.7	+21.8 (7/73-7/74)	1/74
6. Kansas City, Missouri	507,330	50	40	20.0	N/A	1/74
7. Louisville, Kentucky**	361,958	40	25	37.5	+10.5 (6/73-6/74)	7/73
8. Newport-Covington, Kentucky (Transit Authority of Northern Kentucky)	25,998 52,535 78,533 total	40	25	37.5	+43.9 (9/73-9/74)	4/73
9. St. Louis, Missouri	622,236	45¢ local 50¢ express	25¢ local 30¢ express	44.4 40.0	+15.0 (11/73-11/74)	11/73
10. San Diego, California	697,027	40	25	37.5	+74.7 (8/72-8/73)	9/72

*-In some cases, the fare reduction was combined with service increases, some of which were forced by heavy ridership growth.

**-Louisville raised the rush hour fare from 40¢ to 50¢ and lowered non-rush hour fares from 40¢ to 25¢.

Source: American Public Transit Association and De Leuw, Cather & Company.

Table 22

SELECTED OPERATING SUBSIDIES PER CAPITA
1973

City	Population Served By Transit	Subsidy Per Capita	Subsidy Source
Eugene, Oregon	120,000	$8.00	Employee Payroll Tax
Everett, Washington	60,000	7.90	Motor Vehicle Tax Household and Employer Tax
Trenton, New Jersey	200,000	6.60	City and County General Funds
Tacoma, Washington	250,000	6.50	N/A
Madison, Wisconsin	225,000	4.70	State Subsidy Program and Local Property Tax
Akron, Ohio	275,000	4.50	Property Tax
Fort Wayne, Indiana	175,000	4.30	Property Tax and Auto, Building, and Bank Excise Tax
Evanston, Illinois	80,000	4.00	Gasoline Sales Tax
Springfield, Missouri	125,000	3.60	Funds from Electric and Gas Utilities
Omaha, Nebraska	346,000	2.40	Property Tax, Service Contracts
Peoria, Illinois	160,000	2.10	Property Tax
Sioux City, Iowa	85,000	1.80	General Funds
DES MOINES, IOWA	250,000	1.40	General Funds
Wichita, Kansas	277,000	1.20	Ad Valorem Tax, Revenue Sharing Tax

Source: American Public Transit Association and De Leuw, Cather & Company.

This is not to imply, however, that a deficit of over $650,000 is an easy burden, especially without any state or Federal financial operating assistance. Since May 1973, the MTA's losses have been covered by general revenue funds from the five member communities, with contribution from each community determined by the cost allocation formula previously described. The transit system, therefore, has become another of the many urban services which Des Moines and other cities are attempting to provide out of limited general funds. In such circumstances, it is understandable that a community will attempt to hold down the deficit level and a higher base fare is one method of accomplishing this goal.

Faced with the same problem, many cities have turned to a variety of specialized funding sources to support their transit systems and provide a reasonably low fare. Funds are usually drawn from a combination of two or three sources uch s motor fuel taxes, local income and sales taxes, special property taxes, auto registration fees, parking surcharges, and hotel/motel room taxes (See Table 22). As a result of such special funding, transit is not required to compete with other community needs for limited general revenue dollars.

FACILITIES

There are three general areas pertinent to a discussion of transit related facilities. These include garage and office structures, rolling stock, and supporting route fixtures.

The MTA maintenance and office facilities are located in an obsolete structure. The office space is inadequate to accommodate an expanding staff, and no space is available for meeting rooms and driver screening and training functions. The maintenance area is long and narrow, making the movement in and out of maintenance locations difficult for buses. Long open pits, the open battery area, and the lack of painting facilities are safety hazards. Lighting and ventilation throughout the area is marginal and adequate storage is not provided for the coach fleet.

The MTA has been aware of these inadequacies for some time, and is currently developing plans to build new office, storage, and maintenance facilities. A site has been chosen in the vicinity of Morgan and S.W. Ninth Streets; an architectural feasibility study has been made; and a capital grant application has been prepared to support this development. The new facility will include provisions for offices and meeting rooms, drive-through maintenance bays, component rebuilding, and a body shop and paint stall as well as a drive-through daily service bay. A separate building will provide for enclosed storage of 100 coaches.

Excluding the 25 new coaches put into service during January 1975, the present bus fleet is beyond industry standards of useful life in terms of both age and accumulated miles. Useful life is generally considered to be seven to 12 years, with milage of 500,000 miles. Prior to 1975, the average age of MTA's bus fleet was 18 years, and all coaches had over 500,000 accumulated miles. Lack of a refined preventative maintenance program and adequate body and painting facilities contributed to the fleet deterioration.

The Joint Board of Trustees has approved the purchase of 30 new 51-passenger transit coaches to augment the 25 buses recently put into service. This will provide the MTA with a base fleet of 55 new buses.

At the present time, supporting bus stop signs and shelters are either non-existent or very badly weathered. Current MTA plans to alleviate the present lack of facilities include the purchase and placement of 1,600 bus stop signs, 25 heated passenger shelters, and 20 paved passenger-loading areas. With these items in place, the visibility of the transit system will be more apparent throughout the MTA service area.

MAINTENANCE/OPERATIONS

With decreasing revenues and increasing costs, maintenance programs tend to be reduced to a minimum effort and prior to public take-over, maintenance of the Des

Moines transit property had been sharply curtailed. The MTA is aware that the current operations do not provide a conscientious, preventative maintenance program. The inventory of parts, although improved, lacks overall organization and control. Proper reporting and information systems, to be used as a basis for sound maintenance decisions, must also be developed. These deficiencies are recognized and an improvement program is under way.

On-street bus operations are currently monitored by only one MTA employee at any given time. Communication between the office and the employee is via a one-way radio system, from the office to the field. On a normal daily basis, this arrangement is inadequate to monitor the on-street performance of the system, and precludes a smooth reaction to bus failures or obstructions along the routes. The planned installation of two-way radio equipment in all coaches will facilitate uniform service throughout the system. However, this will not reduce the need to expand field monitoring by MTA personnel.

Chapter VI

TRANSIT IMPROVEMENT ALTERNATIVES

This chapter presents alternative service improvement concepts for the Des Moines metropolitan area. Considerations which lead to the formulation of alternative improvement strategies are discussed below.

TRANSIT IMPROVEMENT CONSIDERATIONS

Any future transit development plan must evolve within the framework of the adopted transit goals set forth in Chapter I. Without minimizing the importance of any single objective, the emergence of several patterns can be seen. The transit system is not meant to be static, but should be continually improved and expanded to serve new development as well as to foster desired urban growth. Emphasis should be on providing continued and improved service to those who are dependent upon the system, while at the same time promoting the use of transit by a greater segment of the population. The increased utilization of transit would serve to ease traffic congestion.

The system evaluation indicated several conditions which warrant improvement. The most significant of these were the lack of service in the south and in the western communities; the inability to make crosstown trips independent of the CBD; and the lack of uniform scheduling. In addition, transit coverage gaps were found in the eastern, southern and western service areas.

The alternatives developed for the four western communities emphasized transit service which would link these communities with the existing MTA service area. The intra-area approach—i.e. serving travel needs internal to each suburban area—was not considered feasible at this time because of the absence of a significant number of major traffic generators (with a few exceptions) and the lack of a sufficient data base from which to make transit projections. The non-rider attitude survey, which is

programmed for the next phase of the transit development program, will permit the more detailed intra-area transit analysis. In addition, this information will be used in a "park-n-ride" analysis which has been requested by many suburban representatives in their meetings with the MTA, CIRALG, and the Consultant.

The southern sector is faced with the dual problem of having many unserved areas as well as a lack of ridership with the present conventional fixed-route service. A revised plan for this sector must consider both of these factors.

In developing alternatives to facilitate crosstown movements, several constraints were recognized. A route which provides only crosstown service in cities like Des Moines must be carefully planned to be successful. If crosstown movements are to be served without requiring extensive subsidies, the route must also be attractive to established travel movements. For example, in the case of east-west crosstown service, a number of existing routes could be restructured to serve crosstown movements as well as trips to the CBD. The present study lacks the detail needed to effectively pursue this option. However, because the CBD is located south of much of the metropolitan area, a route could be initiated which would serve both the CBD and north-south crosstown movements.

The following discussion of alternatives includes estimated annual operating costs as well as the number of additional buses required for each alternative. These costs were determined by estimating the number of additional buses required for the various alternatives and assigning a cost for each additional bus. It was assumed that each vehicle would have 1,524 hours of peak hour service per year (six hours per weekday for 254 days). Buses operating during non-peak periods were assumed to provide service 2,760 hours per year (eight hours each weekday for 254 days; and 14 hours each Saturday of the Year). The cost per bus-hour ($10.96) was determined by dividing the annual cost of the system in 1974, less administrative costs and taxes, by the total number of bus-hours per year (estimated as 154,000 in 1974). Although the implementation of service improvements during or after 1975 will result in increased unit prices, the 1974 figure was used to maintain an accurate benchmark which could be projected with the appropriate inflation rate for future service years.

SERVICE IMPROVEMENT ALTERNATIVES

Uniform Scheduling

As previously mentioned, there is currently a wide variation in headways throughout the system for both peak and non-peak periods. Parameters involved in standardizing the schedules were considered for 30-minute, non-peak hour headways and for both ten- and 15-minute peak hour headways for the entire system.

A 30-minute, non-peak period headway appears feasible for a number of reasons. First, it approximates the existing irregular service intervals and provides an appropriate level of service for non-peak periods under existing financial constraints. Second, it eliminates complete dependency on schedules since the bus would arrive at the same time every hour. Currently, the MTA has 21 buses operating during non-peak periods. Implementation of 30-minute headways during non-peak periods throughout the system would require three additional buses.

Both ten- and 15-minute peak hour headways were analyzed. Each affords an appropriate level of service which, approximates the existing but irregular service. Although implementation of a ten-minute headway would be more desirable from the rider's point of view, final selection must be based upon available financing, level of service desired, peak loading conditions, and amount of ridership. A 15-minute peak hour headway would utilize 57 buses compared to the 51 buses currently used in the morning and the 53 buses used in the afternoon; thus, five additional buses would be required. On the other hand, a ten-minute peak hour headway would require 83 buses, or 31 additional buses. Unless the ridership could support ten-minute peak hour headways, the capital and operating costs may be prohibitive.

The uniform scheduling alternative is based on a 14-hour day (5:00 a.m. to 7:00 p.m.), which includes two 3-hour peak periods (6:00 a.m. to 9:00 a.m. and 3:00 p.m. to 6:00 p.m.).

Currently, some of the buses do not operate during the entire peak or off-peak periods. If all schedules were standardized, additional service would be required from the existing fleet.

Three cost factors are included for each alternative:

- Cost of providing an additional 33 hours of service each weekday and eleven hours on Saturdays with the existing fleet. This would result in an annual operating cost of $98,100 which would be added to either the ten- or 15-minute peak period alternative.

- Annual cost of operating the additional buses which would amount to $174,300 for the 15-minute peak hour service and $608,500 for the ten-minute peak hour service.

- Capital cost of the new equipment.

The total operating cost for 15-minute peak hour service and 30-minute off-peak service would be $272,400. With ten-minute peak hour service, the annual operating cost would increase to $706,600.

Capital costs for this improvement concept include $331,000 for the purchase of 5 new buses assuming 15-minute peak service or $2,052,200 for the purchase of 31 new buses assuming 10-minute peak service.

Pulse Scheduled Operation

Pulse scheduled operation is a scheduling system under which all buses in a given set of routes start at the same time and place, follow their routes, and return to the starting point at the same time. At a common terminal point, the buses wait for approximately five minutes and then begin another route cycle.

As with conventional bus operations, a pulse scheduled system provides service on fixed routes according to a fixed schedule. However, the schedule—not the route—is the primary consideration in the operating hierarchy. The schedule is identical for all routes and is designed to bring all buses together at once to permit transfers with minimum passenger delay. While pulse scheduling may be advantageous for the Des Moines area, it requires a detailed analysis not included in this study.

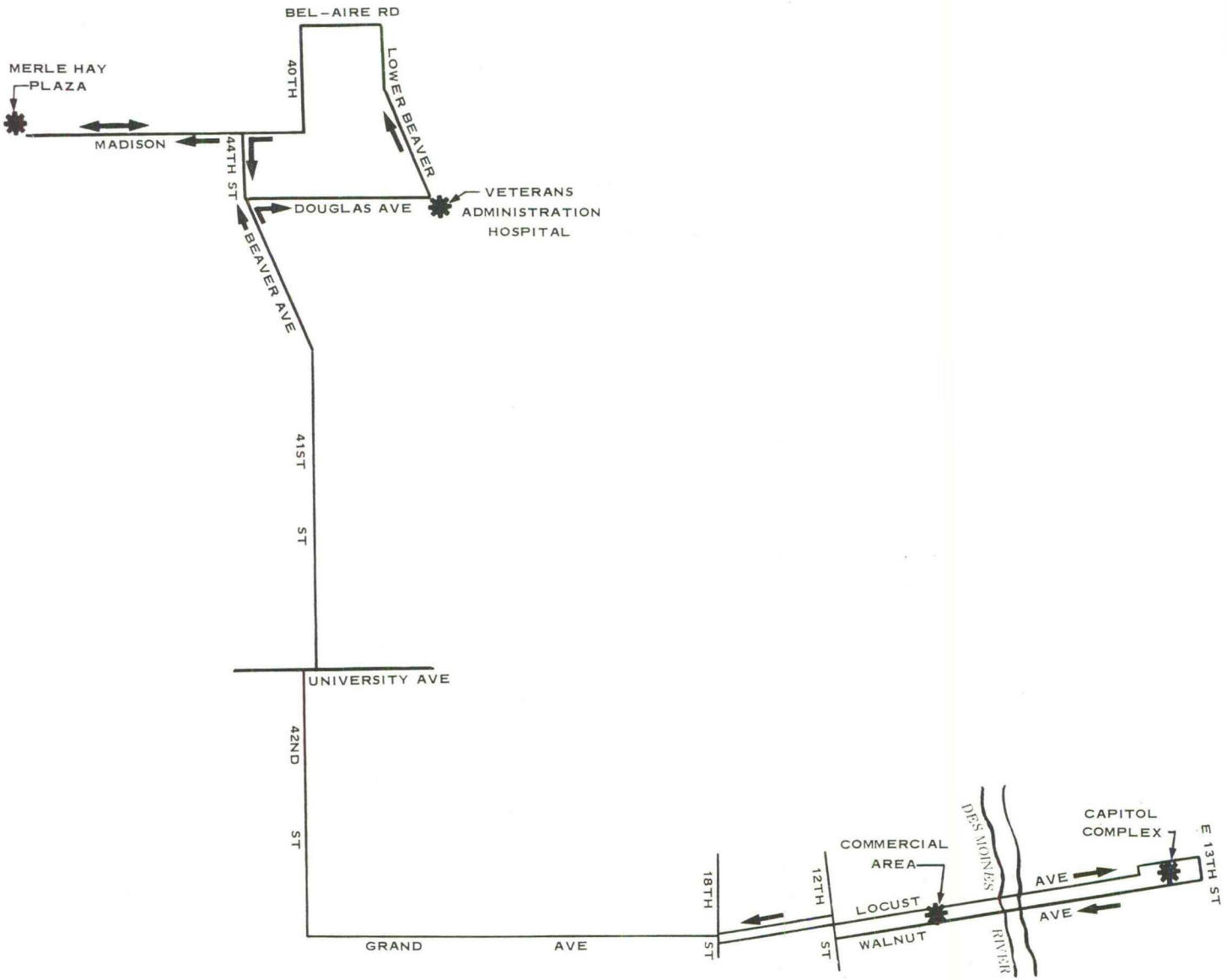
Near West Crosstown Route

Implementation of this route would provide needed crosstown service between the CBD and the far northwestern sections of Des Moines (see Figure 13). From the CBD, the route would proceed west on Grand Avenue and north to Douglas Avenue via 42nd Street, 41st Street, and Beaver Road. At Douglas, the route would split into two legs. The first would proceed north to Madison Avenue, and then west to Merle Hay Plaza. The second leg would loop through the neighborhood to the northeast of Douglas and Beaver Avenues via Douglas, Lower Beaver, Bel Aire, 40th, Madison, and 44th Streets. At the downtown terminus, the route would extend east as far as the State Capitol to eliminate the need for transferring and to strengthen anticipated development between the Capitol and the commercial core.

This route has several advantages. First, it would permit north-south movements in the northwest area; all routes which presently pass through this area follow an east-west pattern. This route would intersect all existing east-west routes, thereby providing multidirectional movements. Service would be provided to the numerous high-density apartment complexes along Grand Avenue and extended to the higher-density residential area north of Douglas. Finally, increased coverage would be afforded to the areas along the 41st/42nd/Beaver corridor.

This route meets the need for north-south crosstown service in the west part of Des Moines, while at the same time it offers improved connections between two established transit generators—downtown Des Moines and Merle Hay Plaza. With this dual function, patronage levels should increase enough to continue the service and,

FIGURE 13



DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

NEAR WEST CROSSTOWN ROUTE ALTERNATIVE

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at the same time, new transit usage patterns could be created. This route would also serve as a marketing test for an area which currently supports transit. While most of this north-south corridor is already served by existing transit coverage, based on the quarter-mile criteria, this route would provide service closer to many potential new riders. Reaction to this service should, therefore, give the MTA a measure with which to evaluate other service increases.

With the implementation of the Near West Crosstown route, the 42nd Street Shopper service could be eliminated. This route is currently underutilized; its principal patrons are elderly persons residing along Grand Avenue who travel to Merle Hay Plaza. Replacement of this route with the crosstown route would substantially improve the present quality of service.

A round trip to Merle Hay Plaza would be 17.0 miles; to the northeast residential loop would be 20.2 miles. A round-trip is expected to take 90 minutes. Fifteen-minute headways are recommended during peak periods with 30-minute headways during non-peak periods. During peak hours, every other bus would travel alternate legs at the northern end, providing each leg with 30-minute service. During non-peak hours, service would be provided to Merle Hay Plaza at 30-minute intervals, but no non-peak service would be offered on the residential loop. The annual operating cost for this service would be approximately $191,000 based on 1974 costs. This expense would be partially offset by discontinuing the 42nd Street Shopper route. An estimated 13,900 would be saved per year, thereby reducing the total annual operating cost, not including revenues, to $177,100. The purchase of six new buses to provide this service would require a capital expenditure of $397,200. Assuming that patronage levels would be similar to those for routes presently operating near the area, an estimated 308,000 additional boardings would be generated each year.

North Side Crosstown Route

To complement the north-south movements that would be generated by the Near West Crosstown route, another crosstown line should be considered to permit east-west movement along the entire Douglas Avenue-Euclid Avenue corridor. This link would provide more direct access for residents in the northernmost part of the city to such activity centers as Merle Hay Plaza, Veterans Hospital, Riverview Amusement Park, Eastgate Shopping Center, and the many businesses near McDonald Street, 22nd Street, N.E., and Delaware Avenue. However, to determine the feasibility of implementing this service, a more detailed analysis would be required.

Southern Area Service Options

The need for improved service in the southern area has been discussed in previous chapters. Transit is used less here than in other areas because service is not as comprehensive nor as regular as it is elsewhere, and also because of the internal complexities of the area such as the lack of paved streets and the low-density housing. Large areas of residential development are not within a reasonable walking distance to bus routes, and some of the scheduling is very confusing, especially on the Indianola-Lacona route.

Conventional routing could be simplified and extended to several of the unserved areas by moving one leg of the Indianola-Lacona route to South Union Street. Transit could be provided along the entire length of Union Street thus reaching a very large area which is substantially without service. Unfortunately, since much of Union Street is not paved, it cannot be used by standard transit vehicles. Therefore, this alternative should be reconsidered after the street is paved.

Another possible way to simplify the Indianola-Lacona route would be to run alternate buses down each route segment, around the existing loop at the end of the branch, and back on the same route. This would eliminate confusion about where a bus was going and still provide adequate service.

The lack of paved streets in this area prohibits any attempt to provide uniform conventional service at the present time. Other factors such as the diverse population and varying population densities suggest that some type of non-conventional service may be appropriate in this area. A demand-responsive transit vehicle which feeds to a fixed trunk line could overcome these obstacles and improve the quality of service provided to the entire area.

Demand-Responsive Service

Under this concept, often referred to as dial-a-ride, the patron is offered door-to-door service on a flexible, demand-responsive schedule. In many ways, the system is similar to taxi service, except that customers share rides and costs with others who are going in the same general direction. Unlike a conventional fixed route system, no schedules are printed and no routes are delineated. Instead, vehicles are dispatched throughout a defined service area in response to requests for service.

The system is composed of three basic elements: the control center, a fleet of vehicles, and a radio communications system which links the control center with the vehicles. When requesting service a customer usually calls the control center, and gives the origin and destination of his trip and the time he would like to travel. A dispatcher, who is in direct contact with the bus driver, then assigns the customer to the bus which would best serve the request and transmits the request for service to the driver over the radio. The driver inserts the pickup address on his itinerary. In keeping with the shared ride concept, other passengers may be picked up or dropped off before this customer is picked up.

Because dial-a-ride provides point-to-point service (although there are service variations), it is an especially attractive means of transportation for senior citizens and handicapped persons who may not be able to walk to and from the bus stop. At night, this kind of service may be more cost-effective than operating several empty buses along conventional routes, and it enhances the rider's feeling of security. Also dial-a-ride is simple enough so that even the infrequent rider can become familiar with the system.

The main advantages of dial-a-ride are its flexibility and its ability to attract riders who would not otherwise use transit. Routes are planned to satisfy demand, trip-by-trip, and can adjust to fluctuations over the day. As new areas are developed within the community, they can be served without altering fixed routes or schedules or otherwise affecting the existing level of service. At most, only the fleet size would have to be altered.

Dial-a-ride can also provide service in situations where fixed route transit is not feasible, such as late-night operation when travel demand tends to be sporadic and infrequent. Attractive service can be provided in low-density areas for which fixed route transit service would necessarily be infrequent with widely separated routes and high costs. In addition, the smaller vehicles typically used for this type of service are able to travel in areas not accessible to standard transit coaches.

There are several variations of demand-responsive service. Many-to-many service is structured to pick up a person at any origin and to take him to any destination. Many-to-few and many-to-one types of service distribute passengers to or from a limited number of points such as at major activity centers or at transfer points where the passenger must change vehicles to continue his trip. Demand may be generated at all times by phone calls to a dispatcher prior to the trip or may be organized on the basis of subscriptions that are arranged in advance.

Demand-responsive service has been implemented in many areas. Table 23 presents operating characteristics of those systems similar in magnitude to the potential requirements for the southern area of Des Moines. For comparison purposes, the southern MTA service area contains approximately 15 square miles and 39,000 people.

Dial-A-Ride Application

One alternative concept for the southern area would retain only the Fort Des Moines route as a line haul conventional route. Demand-responsive vehicles would form a

Table 23

OPERATING CHARACTERISTICS OF SELECTED DEMAND-RESPONSIVE SYSTEMS

Community	Population Served	Area Served (Sq. Mi.)	Total Vehicles Peak/Off-Peak	Vehicles Per Square Mile Peak/Off-Peak	Weekday Ridership	Passengers Per Vehicle-Hour	Fare	Cost Per Passenger-Mile	Revenue Per Passenger-Mile
Ann Arbor, Michigan	10,000	1.4	7/4	5/3	600	7.2	25¢	$1.14	$0.39
Batavia, New York	18,000	5	5/5	1/1	455	7.6	45¢	N/A	N/A
Bay Ridges, Ontario	25,000	12	14/14	1.1/1.1	950	6	30¢	N/A	N/A
El Cajone, California	60,000	17	14/14	.8/.8	600	3	50¢	N/A	N/A
Ft. Leonardwood, Missouri	40,000	12	(80 Total)	6/6	1,000	6.5	40¢	N/A	N/A
Haddonfield, New Jersey	44,000	11	18/12	1.6/1	1,200	6.3	30¢	N/A	N/A
La Habra, California	47,000	7	5/2	.7/.3	450	6.6	50¢	2.02	0.33
La Mesa, California	45,000	7	5/5	.7/.7	275	4.5	50¢	N/A	N/A
La Mirada, California	32,000	6	6/6	1.0/1.0	360	5	25¢	1.39	0.23
Regina, Saskatchewan	35-60,000	5-8	16/12	3.2/1.5	3,000	9.5	35¢	0.71	0.29

Sources: De Leuw, Cather & Company

U.S. Department of Transportation, Demand-Responsive Transportation, State-of-the-Art Overview, 1974.

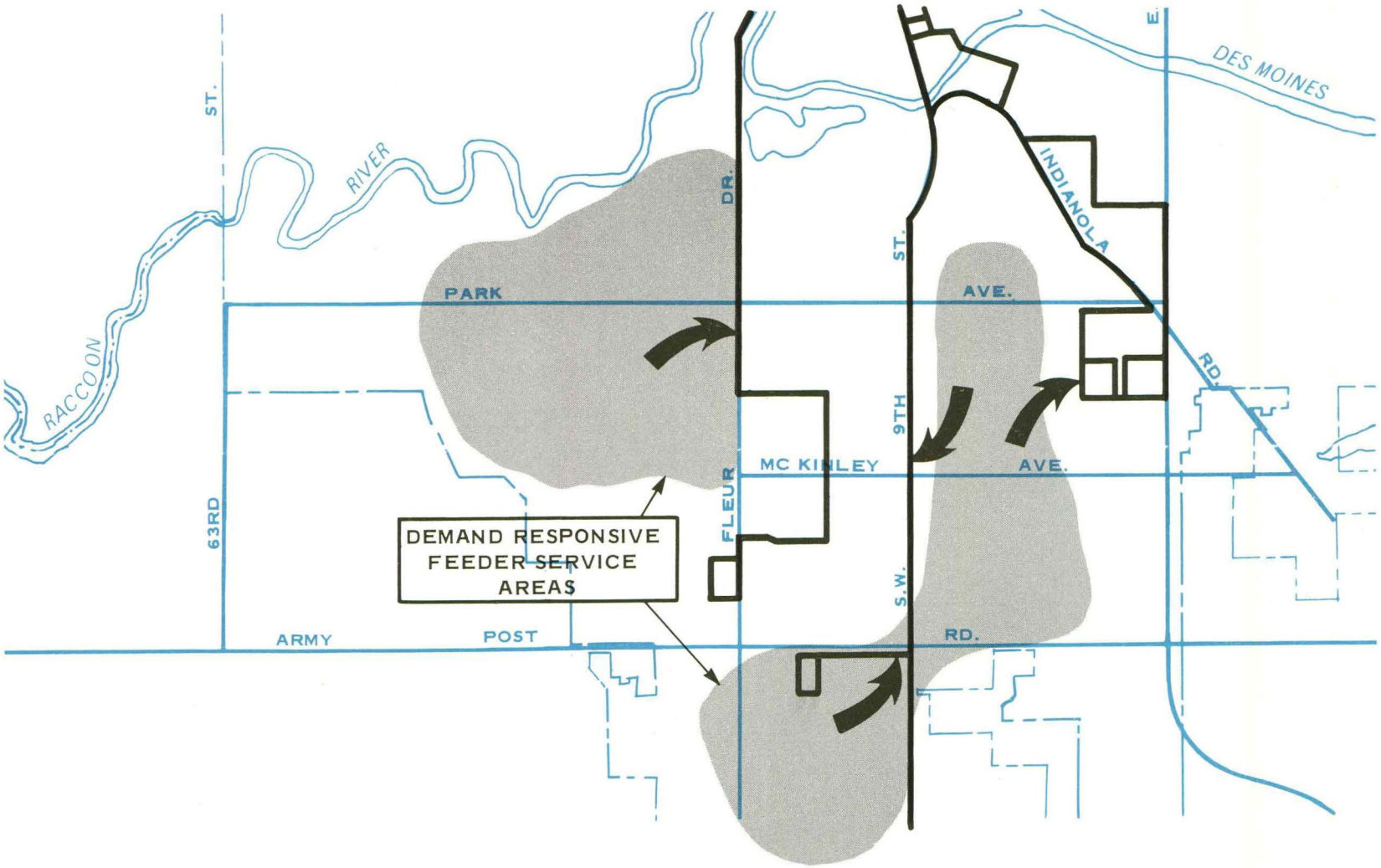
collector-distributor system throughout the area, picking up and dropping off passengers at designated points along this trunk line. Based on the operating statistics given in Table 23, it was estimated that about 15 small vehicles (at a standard of one vehicle per square mile) would be required to serve the area. It would cost approximately $696,600 to provide this service. The cost includes $149,000 which would be saved by discontinuing the Airport and Indianola-Lacona routes. The cost of purchasing the required 15 vehicles and two spares is estimated to be $224,400.

A second alternative would retain the present fixed route system and utilize demand-responsive vehicles to extend service to those areas not presently covered by the fixed route system (See Figure 14). These would include developed areas west of Fleur Drive, a corridor along Union Street, and large areas of unpaved streets to the north and south of the Army Post Road intersection with Union Street. Approximately 13,700 additional people would be served under this concept.

During peak periods, the demand-responsive service would function as a feeder system to the fixed routes, picking up people on a subscription basis. During off-peak periods, service would be provided to activity centers within the area as well as the fixed routes. Preliminary estimates indicate that five additional vehicles would be required, which would increase the annual operating cost by approximately $281,900. The estimated cost of purchasing the required five vehicles and one spare would be $79,200. Based on an initial patronage rate of five trips per capita annually, it is expected that 75,000 additional rides could be generated per year. This amounts to approximately 60 trips per vehicle per day, which is comparable to that of other dial-a-ride systems.

It should be noted that the vehicle requirements and associated costs are order-of-magnitude estimates based on comparisons with similar operations.

FIGURE 14



DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

LIMITED DEMAND RESPONSIVE FEEDER SERVICE AREAS

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Western Area Options

Four basic concepts appear feasible for providing transit service to the communities of Clive, Windsor Heights, West Des Moines, and Urbandale:

- Express Line Service – operating all day service over the current express routes.

- Existing Route Extension – extending local routes to the west, primarily over the east-west arterial streets.

- Dial-a-Ride – utilizing a dial-a-ride system to interconnect with the termini of present local routes.

- Dial-a-Ride/Fixed Route – combining dial-a-ride and fixed route service.

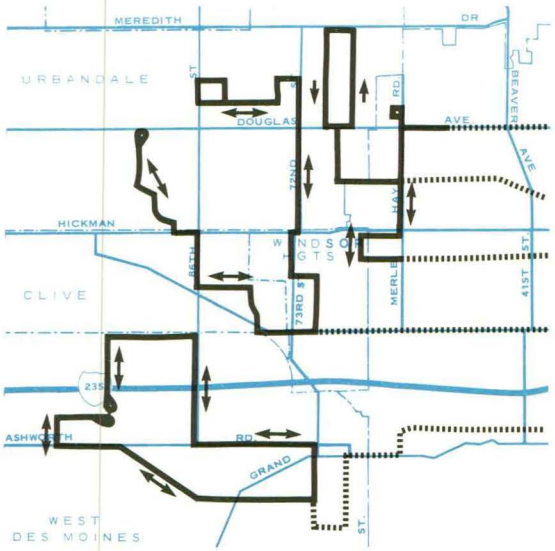
The details of these plans are outlined below and illustrated in Figure 15.

Express Line Service

Under this concept, the route configuration of the present express lines would be maintained, but service would be provided on an all-day basis. Local and express buses would operate during peak hours; only local buses would operate during non-peak periods. Express buses would continue to use I-235, but locals would link up with and operate over already existing line haul routes. To accomplish this, the following changes would be implemented:

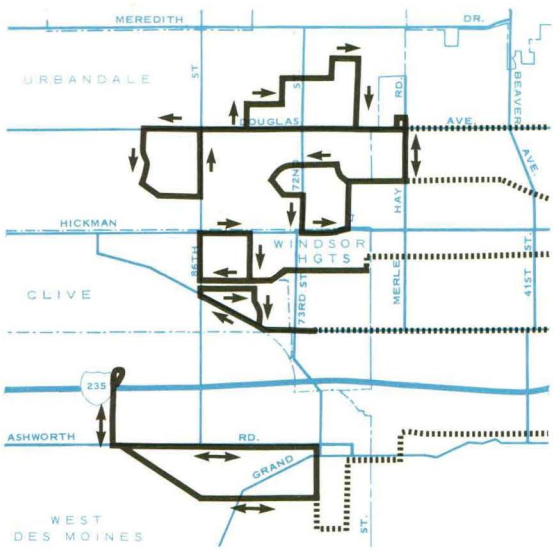
- Buses on the University Avenue route would be extended alternately over the Clive Express and Windsor Heights Express routes;

- Buses on the West Des Moines line would operate alternately over the West Des Moines Express and the Valley Express routes; and



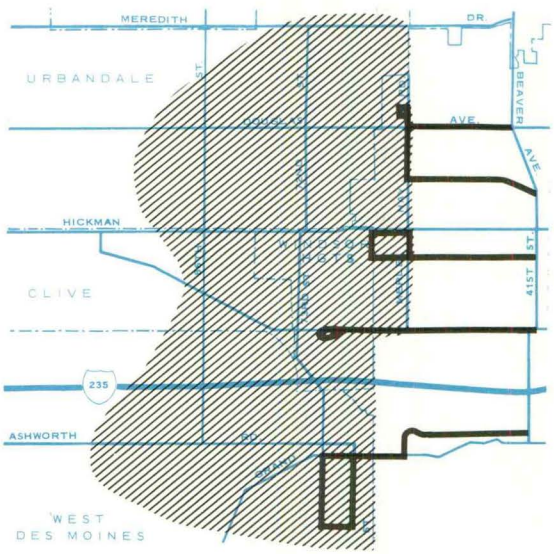
CONCEPT I

PRESENT EXPRESS LINES USED FOR LOCAL AND EXPRESS SERVICE



CONCEPT II

WESTWARD EXTENSION OF CURRENT FIXED ROUTES



CONCEPT III

ALL DIAL-A-BUS

LEGEND

EXISTING ROUTE

PROPOSED ROUTE

DIAL-A-BUS SERVICE AREA

DES MOINES AREA TRANSIT DEVELOPMENT PROGRAM UPDATE

WESTERN AREA TRANSIT IMPROVEMENT CONCEPTS

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- Service on the Clark/East 6th-9th line would be extended to cover the portion of the Urbandale Express route north of Hickman Road.

Extending the University/Highland-Oak Park route over the Windsor Heights and Clive Express lines would add approximately 40 minutes to the average round trip running time of 100 minutes. Five buses would be required to maintain the recommended non-peak-hour 30-minute headways along the current route east of 69th and University; and ten buses would be required to maintain 15-minute peak hour headways. With buses operating alternately over the Clive and Windsor Heights branches, service on each branch would be provided at 30-minute headways during peak hours and at 60-minute headways during non-peak periods. Under the recommended scheduling plan, two additional buses would be required during peak hours and one additional bus would be required during non-peak periods. The existing express runs would continue and would essentially supplement the new service.

Extending the West Des Moines-Fairground line over the Valley Express and the West Des Moines Express routes would increase the round trip running time from 125 minutes to approximately 160 minutes. To maintain the recommended 15- and 30-minute headways east of 63rd Street, one additional bus would be required during non-peak hours, and two additional buses would be required during peak periods. Express runs would be in addition to this schedule. Each route extension would be served at 30-minute headways during peak periods and at 60-minute headways during non-peak periods.

The extension of the Clark/East 6th-9th line north of Hickman Road along the Urbandale Express route would add about 35 minutes to the maximum round trip time of 105 minutes. To maintain 15-minute peak headways along the entire route, including the extension, two additional buses would be required. One additional bus would be required to maintain 30-minute non-peak headways.

Implementation of transit service in these areas along the express route line would increase the MTA's operating expenses by nearly $191,000. This cost would be in addition to operating the existing routes on the recommended peak and non-peak headways. The purchase of six new buses to operate this service would cost $397,200.

It is difficult to make accurate patronage estimates and this difficulty is compounded without a sufficient data base. However, for order-of-magnitude purposes, it can be assumed that this service would generate about one-half the number of rides per capita as the present routes in Des Moines. The four communities, therefore, should eventually generate about 215,600 rides annually in addition to current express ridership. This service could be implemented almost immediately.

Express line service would afford good access to downtown Des Moines and points along each route, and also provide limited mobility between suburbs. It would not, however, provide direct access to Merle Hay Plaza.

Existing Route Extension

Under this plan, all local MTA routes operating in the western part of Des Moines (except Crocker) would be extended along east-west streets directly into the four communities. To avoid confusion with dual routing patterns, the present express route structure would be changed to conform to the new local route configurations as described below.

- The West Des Moines-Fairgrounds route would be extended alternately along Ashworth Road to 35th Street and along Vine Street to 35th Street. Both extensions would operate north over 35th Street to the new shopping center near I-235. Express runs would use the above routes and operate via Grand Avenue, making no stops east of 63rd Street.

- University/Highland-Oak Park buses would continue west along University Avenue-Pittsburgh Des Moines Steel Road to 86th Street in Clive, and loop 86th, Harbach and 78th Streets. Express buses would stop for passengers as far east as 42nd Street, then divert via 42nd Street to I-235 for the trip downtown.

- The Clark/East 6th-9th route would be extended via 63rd Street, Washington Avenue, College Avenue, and Harbach to 86th Street in Clive and then make a terminal loop via 86th Street, Hickman Road, and 80th Street. Express buses would pick up passengers all the way to Beaver Avenue, then operate express via Beaver, 42nd Street, and I-235.

- Buses on the Urbandale-East 14th Street line would operate alternately along Merle Hay Road to Merle Hay Plaza or along Urbandale Avenue and make a loop via Roseland Avenue to Ashwood, Bryn Mawr, 72nd Street, Hickman, and Westover. Express buses would pick up and discharge passengers as far east as Beaver Road, and then operate express via Beaver, 42nd Street, and I-235.

- The West 9th-Douglas service would continue to operate through Merle Hay Plaza, but would be extended west on Douglas Avenue. At 80th Street the route would split into two sections. One branch would continue on Douglas to Hillsdale, Patricia, New York, and Clive Road. The other branch would operate north on 80th Street and make a loop via Airline, 72nd, Aurora, 70th, Townsend, and 66th Street. Express runs would combine both service loops in a single trip, and passenger stops would be made as far as Beaver Avenue. From there, service would be express via Beaver, 42nd Street, and I-235.

Under this alternative, seven additional buses would be required during peak periods and five additional buses would be required during non-peak periods. This would create 30-minute peak hour headways along Vine Street and Ashworth Road and

60-minute non-peak-hour headways. Service along the University Avenue, Clark Street, and Douglas Avenue extensions into Clive and Urbandale would operate on the recommended peak hour and non-peak-hour headways, except for the two terminal loops in Urbandale where headways would be twice as long.

The Urbandale Avenue extensions would operate at 30-minute headways during peak periods to the Roseland Drive area of Urbandale, and to Merle Hay Plaza. Buses would serve both areas every 60 minutes during non-peak hours.

Extending the existing routes into the western suburbs would increase the MTA's annual operating expenses by about $268,200 and the purchase of seven new coaches to operate this service would add $463,400 in capital expenses. The route configuration would afford good access to downtown Des Moines and points along the way, and would provide indirect access to Merle Hay Plaza via a transfer to the Near West Crosstown route. In many parts of the suburbs, service would be more frequent than with the express route configuration. It is anticipated that about 245,336 boardings would be generated in addition to express ridership. This plan could also be implemented almost immediately.

Dial-a-Ride

Under this plan existing local and express routes would remain the same and dial-a-ride service would be provided throughout the western communities. During peak periods, the dial-a-ride service would operate primarily as a feeder system to the termini of the fixed routes, but during non-peak hours it would operate on a many-to-many basis, with coordinated stops at the fixed route termini.

The urbanized portion of the four communities encompasses an area of about ten square miles and a population of approximately 40,000 (4,000 persons per populated square mile). On this basis, approximately 15 vehicles would be needed during peak hours and ten during non-peak periods, or the equivalent of one vehicle per square mile during non-peak periods and 1.5 per square mile during peak hours. Service would be provided from 5:00 a.m. to 7:00 p.m.

Implementation of dial-a-ride service in the western area would cost approximately $663,700 per year and would also require the purchase of 15 small vehicles and 2 spares costing an estimated $224,400. An estimated 301,700 new rides would be generated annually. The increase vehicle requirements and operating costs over the fixed route schemes is attributed to the inefficient vehicle productivity rate generic to demand-responsive transit. However, dial-a-ride service would afford maximum coverage of the area and permit patrons to travel to any point within the suburbs. By transfering to fixed route buses in Des Moines, riders would have access to downtown Des Moines as well as to any point along those routes. Dial-a-bus service could not be immediately implemented since new vehicles and communications equipment would have to be purchased and dispatchers would have to be trained.

Fixed Route Extensions and Dial-A-Bus

With this option fixed routes would be extended into the suburbs only during peak periods. The route alignments would follow one of the two plans described above. During off-peak periods, the fixed routes would stop at their current termini and dial-a-bus service would be provided in the suburbs. The system would operate on a many-to-many basis, and would also be coordinated with the schedules of the fixed route buses.

This plan would require six or seven additional buses on the fixed routes during peak hours (depending on which route alignment is used), and approximately ten dial-a-ride vehicles during off-peak hours. Service would be provided from approximately 5:00 a.m. to 7:00 p.m.

This option would increase the MTA's annual operating expenses between $396,400 and $463,200. The capital expense of purchasing seven additional transit coaches and twelve small vehicles for demand-responsive service are estimated as $621,800. About 280,000 new rides would be generated annually in addition to current express ridership. The dual mode service would furnish access to downtown Des Moines and intermediate points during peak hours and would afford good internal

circulation within the suburbs during non-peak periods. With coordinated scheduling, it would be relatively easy to transfer from dial-a-bus to fixed routes. Service could be implemented following the purchase of dial-a-ride vehicles and communications equipment, and the training of dispatchers.

East Side Service Improvements

Service improvements may also be warranted on the east side of Des Moines. Existing routes do not cover the entire area as there is no convenient service to a number of residential, industrial and commercial areas. Some route segments pass through unproductive stretches of commercial "strip" development while other segments serve only one side of the route because of existing developments.

Such conditions emphasize the need for a restructuring of the existing Fairground and Walker routes as well as the possible implementation of additional service. Route restructuring should achieve the following improvements:

- Elimination of the one-sided service area created by routing the Fairground line past extensive lengths of the fairgrounds.
- Elimination of the currently unprofitable service along the heavily commercial University-Easton Avenue corridor of the Walker route.
- Expansion of transit coverage to the residential areas south and east of the fairgrounds and loop.
- Provision of transit service to the industrial/commercial areas east of I-235.
- Elimination of the existing coverage gap in the residential area northwest of the fairgrounds.

- Extension of service to expanding residential development north and east of the current Walker loop.

The transit service problems on the east side require just as much consideration as those in other sections of the metropolitan area. However, they cannot be resolved with the same type of system changes proposed elsewhere. To solve the specific problems and at the same time maintain effective service to other east side areas, the current route structure must be considerably revised. This type of detailed corridor analysis is beyond the scope of this study. It is expected such a detailed analysis would be given high priority in future transit study programs.

Metro Center Alternatives

In terms of revenue, the Metro Center route is one of the least successful routes within the system. Several concepts were considered to make this route more productive.

- Extending the service to include Grand Avenue, while terminating the less productive westerly segments;

- Providing service to nearby motels and the Veterans Memorial Auditorium; and

- Providing service within a reduced fare zone utilizing all buses passing through the area.

Under the first concept, increased coverage would be focused primarily on the core area of the business district, while the west end of the loop at West Tenth Street would be shortened. The existing service overlap would be eliminated by widening the loop to include Grand Avenue.

This concept has the potential for providing service closer to the concentrated development along Grand Avenue and for reducing the time required to complete the loop; however, it would necessitate bus movements opposite (contra-flow) to existing traffic on either Walnut or Grand Avenues. For the Metro Center route alone, this plan would probably not be feasible. In addition, no cost savings would be effected; however, riders may have a more favorable reaction (or increase in riders) to this direct service.

The second alternative would involve re-routing buses north of the business district to serve several major nearby motels and the Veterans Memorial Auditorium. This would also necessitate shortening the west end of the loop. A new ridership base could potentially be attracted. However, this alternative would result in a very circuitous trip for persons traveling between the commercial and office area to the west and the State Capitol on the east. In addition, people staying at motels tend to be short-term visitors who are not familiar with the city or the transit system. This unfamiliarity would tend to lessen the potential for any significant transit patronage. The few riders who do utilize this line would be discouraged by the new routing, further deteriorating its cost-effectiveness.

The third plan would provide downtown service, at a reduced fare or at no fare, utilizing all buses which currently pass through the area. Under this concept, existing Metro Center service would be discontinued and people would board any bus passing through downtown Des Moines. All patrons boarding the bus within and past a designated downtown zone would pay a fare when leaving the bus. If a patron left the bus before passing out of the zone, either a reduced fare or no fare, would be collected. Once the bus passed beyond the zone, the full fare would be collected when the person alighted. Patrons riding from one end of the route past the downtown zone would have already paid their fares when they boarded. To avoid paying a second fare when getting off, they would be issued a payment slip on the inbound portion of the trip up to the point where the bus entered the downtown zone. Only those persons riding entirely through the downtown zone would need to be issued a payment slip.

This type of service is in operation in a number of areas (Dayton, Pittsburgh, Seattle) and has several advantages. Since it utilizes buses which are already in operation, service can be provided without any additional expense. By eliminating the three buses currently on the Metro Center route, the MTA would save an estimated $66,800 annually.

To change the area covered by this service would only require redesignating the low fare zone; the existing route structure would not have to be changed. Finally, not having to collect fares when patrons get on in the downtown area would facilitate boardings during peak periods. Disadvantages of this alternative include a slightly more complicated fare payment system and a non-uniform schedule of service in the downtown area. However, the latter would be minimal due to the frequency of buses passing through the CBD.

Downtown Terminal Concept

The concept of a downtown transit terminal (or terminals) was also considered. Terminals are normally used to eliminate congestion on streets by providing off-street storage for waiting buses and to provide shelter for riders in bad weather. They are also used to facilitate transfers at points where alternative travel modes are available such as between bus and rail transit or between intercity and intracity buses. Additionally, a terminal might be required at a point where many different routes converge to more easily accommodate the larger number of boardings and alightings, such as with a pulse scheduled system.

None of the above conditions currently exists in Des Moines. Under the existing route structure, the additional congestion caused by the presence of the buses on the street is not significant enough to warrant the expense of a terminal.

The primary intermodal transfer involves the bus and the pedestrian, with the greatest activity occuring in the area of West Sixth, Seventh and Eighth Streets. This concentration of activity is not high enough to warrant a terminal, either. If a

terminal was warranted, it probably could not be located in this area due to a lack of available sites. In that case, a large number of people would be forced to leave the bus prior to reaching the terminal, make a transfer not now required, or walk farther to their destinations. All of these inconveniences would discourage riders and result in higher system deficits.

The above discussion was limited to the concept of central terminals. Passenger convenience is served, however, if routing through the downtown area is designed to include natural loading points where there is a substantial gathering of transit patrons. Des Moines is currently planning the construction of an elevated pedestrian walkway. Proper coordination between the walkway and the transit system should be pursued to insure a convenient interface between the two travel modes. This coordination could include the design of passenger waiting areas at walkway exit and entry points as well as downtown bus route modifications to better serve these points. Continuing work by the city's Planning and Traffic/Transportation Departments should be coordinated with MTA route improvements in the downtown area.

Chapter VII

RECOMMENDED TRANSIT DEVELOPMENT PROGRAM

In Chapter VI service improvement alternatives are described together with estimated equipment requirements, operating costs and patronage potential to each alternative. This chapter presents the recommended transit development program, including the selected service improvements, and total additional equipment requirements, costs and revenues expected with implementation of the plan.

Five-year pro forma budgets are also presented showing the financial implications of a "no improvements" alternative and the cost of adopting the recommended plan. Also discussed are financing, marketing and the need for continuing system monitoring and plan updating.

RECOMMENDED PLAN

The alternatives selected for incorporation in the recommended plan were those judged to offer the most effective means of raising the level of transit service throughout the Des Moines area. Criteria used to evaluate alternatives included cost, ease of implementation, effects on present routes, level of increased mobility afforded to presently unserved areas, and potential patronage.

The recommended service plan, includes:

- Uniform scheduling
- Near West Crosstown service
- Improved service to the south Des Moines area
- Improved service for Clive, Urbandale, West Des Moines, and Windsor Heights

- CBD "zone" service
- Reduced fares

Uniform Scheduling

At present, headways vary from route to route and between buses on the same route. This lack of uniformity results in poor transfer connections and confuses both the infrequent and the frequent transit patron. To alleviate these problems, it is proposed that uniform headways of 15 minutes during peak periods and 30 minutes during non-peak periods be instituted throughout most of the system.

Uniform scheduling would not apply, however, to the Airport/Scott, Crocker, and express routes. Existing and projected patronage of the Airport/Scott route would not warrant this level of service, while the Crocker and express routes provide a special type of service and should not be included in the scheduling change.

Uniform scheduling, with the exceptions noted above, would require five additional buses for peak period service and three additional buses for non-peak period service. Schedule changes would also add 33 hours of service each day to the existing total hours of scheduled service. The estimated annual operating cost of implementing this improvement is $272,400.

Near West Crosstown Route

The present route configuration generally serves only those trips to and from the central business district. While the CBD will continue to be the primary trip generator in the system, the system should be structured for more comprehensive metropolitan service. To better serve the northwest area of Des Moines, a north-south route intersecting the present routes is recommended.

The proposed Near West Crosstown route would furnish service along the 42nd/41st/Beaver Avenue corridor and at the same time afford increased service to Merle Hay Plaza and the central business district.

The route would operate at 15- and 30-minute headways, requiring six buses during peak periods and three buses during the base service periods. Following implementation of service on the new route, it is recommended that service be discontinued on the lightly used 42nd Street Shopper route. The estimated annual operating expense of the service (taking into account the savings realized by discontinuing the 42nd Street Shopper bus) would be $177,100.

Improved Coverage in the Southern Area

There are several major areas in the southern portion of Des Moines which lack adequate transit service. As discussed in Chapter VI, conventional service would be impractical in these areas for at least two reasons:

- The newly developed residential area west of Fleur Drive would be difficult to serve due to the low-density housing patterns.

- In other areas, the lack of paved streets would make service with conventional transit coaches impossible.

To overcome these limitations, it is recommended that a limited number of small demand-responsive vehicles be used to supplement existing service. Under the proposed program, five van-type buses would operate during the peak periods on a collector/distributor subscription basis. During the off-peak periods, the buses—in addition to the feeder service—would provide limited many-to-many, dial-a-ride service within the entire southern area. Their primary function, however, would be interconnection with existing fixed route service.

This method of coverage is recommended since such service could operate within the constraints existing in south Des Moines while avoiding the excessive expense of a premium service throughout the area. The estimated annual operating cost of limited demand-responsive feeder service is $281,880.

Increased Service to the Western Suburbs

At present, the western suburbs of Clive, Urbandale, West Des Moines, and Windsor Heights are afforded only limited express bus service during the morning and afternoon peak periods. These communities have a combined population of 40,000. Expanded service could be consistent with the desires of the residents, the MTA Board and existing planning objectives.

It is recommended that service in the western suburbs be expanded by extending existing conventional routes. This alternative is proposed since it would substantially increase the level of service at minimum cost. Systematic additional expansion would also be possible should future development continue westward.

Implementation of route extensions would require an additional six buses during peak periods and four buses for off-peak service. The additional annual operating expense is estimated to be $268,200.

Central Business District Zone Designation

The present Metro Center route was initiated to provide circulation within the CBD and between the CBD and the State Capitol complex to the east and the commercial areas to the west. Because of the length of time required to make this loop and the

service area overlap with parallel street service, the present route is among the least cost-effective of any in the system.

Almost all existing routes pass through the downtown. It is therefore recommended the Metro Center rate be discontinued and that a free fare zone be considered for the downtown whereby any rider could board any bus and ride free of charge. A free fare should attract new riders to public transit and upgrade the image of the entire system. Institution of free fare would not produce additional operating expense. Moreover – excluding the initial expense of modifying fare collection procedure and promoting free fare zone service – an estimated annual savings of $66,800 would be realized by discontinuing the present service on the Metro Center route.

Fare Reduction

As previously indicated, the MTA presently has one of the highest base fares in the country. Examination of the comparative base fare, per capita ridership, and the responses to the passenger survey indicates that the high fare may be responsible for the low transit utilization rate.

To increase use of current transit service in the Des Moines area as well as the mobility of those who must rely upon public transit, it is recommended that the MTA lower the base fare. A fare decrease, regardless of amount, has proved a stimulus to transit patronage across the country. The community interest generated has changed transit's image from that of a declining city entity to that of an emerging asset.

Table 24 outlines the likely effect of various fare reductions on ridership, operating deficits, and regional subsidy per capita.

Table 24

PROJECTED RESULTS OF FARE DECREASES
(1974 Line-Haul Ridership - 2,600,000)

Base Fare	Projected* Ridership Growth	Projected 1975 Deficit (in millions)	Projected Subsidy Per Capita
$0.50	none	$0.80	$3.20
$0.40	8-12%	$1.00	$4.00
$0.35	12-30%	$1.00-1.10	$4.00-4.40
$0.30	15-40%	$1.10-1.20	$4.40-4.80
$0.25	20-50%	$1.16-1.31	$4.60-5.20

*-Based on research of induced ridership due to fare decreases on other properties.

Source: De Leuw, Cather & Company

Selecting the balance between fares and deficits appropriate to the community involves consideration of funding priorities, the role of transit within the community, and the extent to which transit is considered a necessary community service. For these reasons, no specific decrease is recommended, since a change in

fares is properly a matter of local policy. However, a reduction to 35 cents would appear to produce the most cost-effective results. A further reduction might begin to strain the capacity of the system and considerably expand the operating deficit.

CAPITAL IMPROVEMENT PROGRAM

In addition to the capital expenditures included in the Recommended Plan, the MTA has developed a capital improvement program which will provide the necessary facilities to offer improved service. In Table 25, the items included in this program are listed along with their anticipated cost. Some of the items—new buses, bus stop signs, and shelters—relate directly to improving the image and visibility of public transit. In addition to the new bus fleet, other improvements which will enable the MTA to offer consistently dependable transit service will include a new garage and maintenance facility, two-way radio equipment, and registering fare boxes.

Construction of New Garage, Maintenance and Office Facility

The existing facility, located on High Street, houses both the garage and administrative offices of the MTA. Originally built for trolley cars, the structure is over eighty years old and portions of the building are unusable in their present condition.

Other major shortcomings of the existing facility include:

- Lack of adequate space for offices, driver training, and control of possible new services such as demand-responsive transit.
- A long, narrow maintenance area which includes a number of open pits and no drive-through provisions.
- Poor lighting and ventilation.

Table 25

ANTICIPATED CAPITAL EXPENSES

Item	Total Cost	Local Share
Garage, maintenance and office facility	$3,990,100	$ 798,000
Payment for 25 coaches received	1,379,700	275,900
Thirty new buses	1,800,000	360,000
Registering fare boxes	128,000	25,600
Radio equipment	201,000	40,200
Bus stop signs	56,000	11,200
Bus stop shelters/loading areas	96,500	19,300
Service vehicles	15,000	3,000
Maintenance parts/shop equipment, etc.	164,400	32,900
Total	$7,830,700	$1,566,100

Note: Figures do not include proceeds of $669,600 from sale of property, etc.

$408,100 has already been received from member communities.

Source: Capital grant application amendment dated September 9, 1974 and capital grant application dated January 10, 1975.

- No temperature-controlled area for bus storage, which adds to fuel consumption during the winter months.

A modern facility which would alleviate all of these problems is presently in the planning stage. Adequate office and conference space, drive-through maintenance bays, and an enclosed storage area for 100 buses have been incorporated in the plans. In addition, space will be allocated for painting and bodywork—activities not feasible in the present facility. Appendix A contains detailed breakdown of the space that will be provided in the proposed facility.

Purchase of 55 New Buses

Prior to the acquisition of new coaches in 1974, the average age of the bus fleet was 18 years (see Table 3). Individual ages ranged from 12 to 23 years, with almost half of the fleet (43 buses) in service for 20 years. The accumulated mileage ranged from a low of 422,000 miles to over 560,000 miles. By normal industry standards, the entire fleet warrants replacement. In addition, the higher than average maintenance costs (discussed in Chapter VI) in Des Moines are a direct result of the age and condition of the existing fleet.

As part of the initial capital grant which enabled the MTA to buy the bus system from the private operator, 25 new 40-foot coaches were purchased and placed in service in January 1975. A second capital grant application has petitioned for funds to purchase 30 additional 40-foot buses. Within a 90-coach fleet, this would provide the system with 55 new buses. The fleet of new buses would be adequate to meet the existing vehicle requirements for base service periods. During peak service hours, however, it would still be necessary to use the older equipment. Replacement of the remaining 35 older vehicles would be contingent upon future vehicle mix studies.

Aside from the decreased maintenance requirements, transit in Des Moines would benefit from the positive image generated by an all-new base fleet. The attitude portion of the passenger questionnaire indicated that cleaner, more dependable buses were of concern to over one-third of those responding.

Registering Fare Boxes

At the present time, the MTA is unable to monitor revenue on a route-by-route basis, and the installation of registering fare boxes will provide this capability. In addition to total revenue data, information will also be obtained, from the type of fares paid, which can be related to various passenger classifications. This day-to-day information is especially important to the MTA at a time when it is seeking to improve transit usage through both service improvements and an expanded promotional program. Without detailed and accurate feedback information, the measurement of any improvement or promotion cannot be adequately assessed. Registering fare boxes will also provide the information needed to support the evaluation and monitoring capabilities upon which the success of future planning depends.

Two-Way Radio Equipment

If all MTA vehicles are equipped with two-way radios, the Authority can provide more dependable service throughout the area. Reactions to bus breakdowns, street repair work, unusually high loads, disorderly conduct on buses, and other special circumstances will be handled more smoothly and efficiently if communication capabilities are available. As less time would be spent by MTA personnel in dealing with such situations, more efficient service would result.

In addition to the immediate benefits, the installation and use of this equipment will provide the opportunity to develop flexible types of specialized transit service requiring radio communications.

Bus Stop Signs

At the present time, throughout most of the Des Moines transit system, there are no bus stop signs. As the few signs that exist are small and badly weathered, they lack visibility and connote a deteriorating transit system.

In order to enhance transit marketability and clearly identify bus stops, the capital improvement program includes the purchase and installation of 1,600 new signs. With approximately 200 one-way route-miles within the system, these 1,600 signs would allow one-quarter mile placement along both sides of all routes.

Installation of Bus Stop Shelters

The climate in Des Moines includes several months of harsh winter weather and the program includes the installation of heated passenger shelters throughout the system. Such shelters will provide increased comfort to transit riders and, in addition, will present an improved image of the bus system to people passing by. The shelters can also serve as distribution points for route and schedule information.

Table 26 lists suggested locations for 20 shelters and includes the land use activities which will be served. These locations were determined on the basis of several factors including points of maximum loadings derived from the passenger surveys, MTA staff, judgment, and suggestions solicited from representatives of each of the five member communities.

Other capital items which have been requested are intended to provide the necessary supplementary equipment to maintain dependable service. These items include two service/supervisor cars, one three-quarter-ton truck, portable shop equipment, installation of emission control devices on older buses, and spare engine/transmission cradle assemblies.

SUMMARY OF RECOMMENDED PLAN

Table 27 summarizes the estimated cost, equipment requirements, and additional annual revenue which can be anticipated if the recommended improvements are implemented. All costs are stated in 1974 dollars.

Table 26

SUGGESTED BUS PASSENGER SHELTER LOCATIONS

	Location	Facilities Served
1.	Ingersoll and 35th	Shopping area
2.	University and 24th or 25th	Drake University and shopping
3.	County Line Road and S. W. 9th	Future park and ride
4.	Holcomb and 6th Avenue	High school and recreational center
5.	Ingersoll and 20th	High school and school board
6.	Douglas and Beaver	High school and shopping
7.	Grand and E. 12th	State Capitol and office complex
8.	Hickman and 18th	Broadlawns Hospital
9.	Walnut and East 30th	Shopping area, State fairgrounds and Highway Patron Center
10.	Loomis and S. W. 9th	High school and shopping
11.	University and 41st	Shopping center
12.	Forest and 6th	High-density residential area

Table 26 (Concluded)

SUGGESTED BUS PASSENGER SHELTER LOCATIONS

Location	Facilities Served
13. Madison and E. 29th	Elementary school and shopping
14. Douglas and Lawnwood	Veteran's Hospital
15. Urbandale and Beaver	Shopping center and school
16. Cleveland and E. 9th	High-density residential area and Lutheran Hospital
17. Hickman and Merle Hay	Shopping center
18. Washington and 19th	
19. Elm and 4th, West Des Moines	Layover and future park and ride
20. Harback at City Hall, Clive	Future park and ride
21. Hickman and 72nd, Windsor Heights	Future park and ride
22. Douglas and 72nd, Urbandale	Shopping and city center

Source: Metropolitan Transit Authority.

Table 27

INCOME-EXPENSE ESTIMATION FOR PROPOSED IMPROVEMENTS

Improvement	Additional Buses Required		Additional Annual Expense[a]	Additional Annual Revenue	Additional Deficit[a]	Capital Costs[a]	
	Peak	Non-Peak				Total	Local Share[b]
Uniform Scheduling	5	3	$272,400	$ 78,900	$193,500	$ 331,000[c]	$ 66,200
Near West Crosstown	6	2	177,100	137,600	39,500	397,200[d]	79,400
Southern Area Feeder Service	5	5	281,900	33,800	248,100	79,200[e]	15,800
Westward Extensions	7	5	268,200	110,400	157,800	463,400[f]	92,700
Service to CBD	-	(3)[g]	(66,800)	-	(66,800)	-	-
Total	23	12	$932,800	$360,700	$572,100	$1,270,800	$254,100

(a) - 1974 dollars.
(b) - Local share based on 80 percent Federal funding through Capital Grant Program.
(c) - 5 buses @ $65,000 each and 5 radios @ $1,200 each.
(d) - 6 buses @ $65,000 each and 6 radios @ $1,200 each.
(e) - 6 dial-a-ride vehicles @ $12,000 each and 6 radios @ $1,200 each.
(f) - 7 buses @ $65,000 each and 7 radios @ $1,200 each.
(g) - Parentheses indicate savings.

Source: De Leuw, Cather & Company

The capital costs assume that 23 new vehicles will be purchased to provide the expanded service. Of these, 18 would be standard transit coaches of the type presently in use. The estimated cost is $65,000 per bus. The remaining six purchases would be small van-type vehicles capable of holding 10 to 15 passengers each, and would be used for the demand-responsive feeder service. Because the MTA currently does not operate any comparable vehicles, the capital cost reflects the purchase of six vehicles – five in operation, and one in reserve. The estimated cost, at $12,000 per vehicle, is $72,000. All buses would be equipped with radio equipment costing an additional $1,200 per unit.

The capital expense for the entire improvement program would be $1,270,800. Assuming 80 percent funding through Federal capital grant programs, the local share would be $254,100.

Estimates for the increased operating expenses were arrived at by using the number of additional bus-hours times the 1974 operating cost of $10.96 per bus-hour. On this basis, the additional operating cost would amount to $932,800 per year. Assuming the present fare structure, additional revenue is estimated at $360,700. Thus, the additional net deficit would approximate $572,100.

It is recognized that this represents a considerable increase in the operating deficit. However, several points should be kept in mind as the improvement plan is considered. The service area of public transit in Des Moines has not changed for many years and, for the most part, does not reflect new growth. Designed to respond to this growth, the proposed plan correlates the service area with the populated area. With the declining trend in population growth, it is unlikely that substantial increases beyond those included in the recommended plan will be required in the near future. Consequently, this should not be considered as the beginning of a continuing spiral of increased operating costs and deficits. Changes should be made in the system to respond to changes in the community, but it is unlikely that major increases in operating costs will be involved.

Although the MTA has assured the continuation of transit service and made some major improvements in a very short period of time, it has not been able to reverse the decline in ridership. The Authority is now at a critical juncture if a change is to be made from simply maintaining a fairly expensive service with declining, or at best stabilized, patronage to one which substantially attracts new riders and portrays a responsive community service image.

Many areas throughout the United States have been at this same crossroad and, through a combination of service increases and fare decreases, have been able to effect substantial gains in ridership.

Improvement Priorities

A number of factors must be considered relative to priorities for implementing each of the service improvements included in the recommended plan. Some of these are:

- Magnitude of transportation benefits to community.
- Comprehensive development benefits (land use/transit/environmental, etc.).
- Available local, State and Federal funds.
- Benefit to image of transit.
- Necessary lead time.

Because each of the recommendations was developed to serve a specific and separate need, each must be considered somewhat independently of the others. Thus, while all recommendations start with an equal priority and should be implemented as soon as possible, start-up times vary and not all improvements can be accomplished simultaneously. Elimination of the Metro Center route and creation

of a downtown reduced fare zone could be accomplished within one year because no new equipment is needed and the necessary detailed planning is minimal. On the other hand, initiation of demand-responsiveness feeder service in the southern sector will require at least two years of system design and equipment acquisition.

The near west crosstown route, uniform scheduling, and extension of service to the western suburbs involve implementation of conventional transit service and would require a year of preparation. Initially, for at least two reasons, uniform scheduling should be pursued. First, the benefits will accrue only over a period of time as people learn of the added convenience. Second, the westward route extensions and near west crosstown improvements were both planned on the basis of uniform schedules. The next priority within this group should be the extension of routes into the western suburbs in order to provide service which does not exist at the present time. The implementation of the near west crosstown route should be the final improvement as it is primarily an enhancement of service in the western area rather than an extension to unserved areas.

While the recommended order of implementation is based primarily on necessary lead time, it also provides for initial improvements that will benefit the entire system, followed by increased service to individual areas. The suggested order in which improvements should be implemented is as follows:

- CBD reduced fare service
- Uniform scheduling
- Westward extensions
- Near west crosstown
- Southern area feeder service

Five-Year Pro Forma Budget

Regardless of whether or not the recommended plan is adopted, the MTA financial situation will continue to change. To illustrate this, a pro forma, "no improvements" budget is presented for the years 1975 to 1979.

In formulating Table 28, several assumptions were made relative to operating costs and revenue. It was assumed that the basic fare structure would be changed only if an application were made for a Federal operating subsidy. To be eligible for this assistance, it would be necessary to reduce elderly fares to $0.25 during the off-peak periods, which would decrease revenue by one to two percent. Excluding this change, revenue would remain proportional to ridership.

In the past year, although transit systems across the country have experienced an increase in patronage, ridership in Des Moines declined by four percent. It is also significant that patronage increases in many cities can be attributed to improvements such as reduced fares and service extensions. This fact would appear to point to a continuing patronage and revenue decline if no improvements are made.

The MTA has taken some positive steps to counteract the decline in transit usage. For example, the bus fleet is being upgraded and new bus stop signs and shelters will be provided. Furthermore, a marketing campaign has begun to improve public awareness and encourage the use of the available transit services. However, without service improvements, or the occurrence of unpredictable changes in general life styles (e.g., a $0.30 to $0.40 increase in the price of gasoline), it is difficult to foresee any significant ridership growth. For these reasons, passenger revenue, under this alternative, was conservatively assumed to remain constant over the future five-year period.

Unlike passenger revenues, revenue from charter service has increased steadily during the previous years. This is, in part, due to the fact that charter rates more closely reflect operating costs, and rise accordingly. However, revenues have accelerated at a

faster rate than operating costs. Charter revenue estimates were therefore based on increases of 10 percent per year, which relates to an annual inflation rate of eight percent (explained below) and a service growth of two percent per year.

Operating expenses were increased at the rate of eight percent per year. This was based on the assumption that the inflation rate would decrease from over 11 percent in 1974 to six percent in 1979. Although the six percent is lower than the present rate and may appear to be optimistic, it is considered to be reasonable because it is two to three percent above the annual rate of inflation prior to the large increases experienced in the past few years.

The results of these assumptions are shown in the pro forma budget presented in Table 28. Due to increases in charter fees, revenue is estimated to increase slightly over the five-year period. On the other hand, it is estimated that operating expenses will increase by nearly 50 percent, resulting in a 1979 deficit of over $1.5 million. This sizable increase in the deficit assumes no service increases, and a continually increasing deficit without any service improvements would appear difficult to justify from a community cost/benefit point of view.

In addition to the operating deficits shown, the MTA is presently committed to funding the capital improvements program described earlier. The required yearly funding effort for this program is shown as the last item in the projected budget.

Table 29 presents a similar pro forma budget which assumes that the recommended service improvements will be implemented. The effects of possible changes in the base fare are not included in this budget for reasons previously described. All of the basic assumptions used in formulating the "no improvements" budget apply except that additional increases in both costs and revenues will result from service increases. The cost of recommendations that need more than a one-year lead time are programmed in the appropriate implementation period. Expenses were escalated from 1974 values prior to insertion in the table.

Table 28

FIVE-YEAR PRO FORMA BUDGET
ASSUMING NO IMPROVEMENTS MADE

	1974	1975	1976	1977	1978	1979
Operating Revenue						
Passenger	$1,429,400	$1,429,400	$1,429,400	$1,429,400	$1,429,400	$1,429,400
Charter	66,900	73,600	80,900	89,000	97,900	107,700
Advertising	14,600	14,600	14,600	14,600	14,600	14,600
Total	$1,510,900	$1,517,600	$1,524,900	$1,533,000	$1,541,900	$1,551,700
Operating Expenses						
Transportation	$1,139,600	$1,230,800	$1,329,200	$1,435,600	$1,550,400	$1,674,400
Operating and Maintenance	454,100	490,400	529,600	572,000	617,800	667,200
Administrative	343,300	370,700	400,300	432,300	466,900	504,300
Other	173,300	187,200	202,300	218,400	235,900	254,800
Total (Less Depreciation)	$2,110,300	$2,279,100	$2,461,400	$2,658,300	$2,871,000	$3,100,700
Operating Deficit	$ 599,400[a]	$ 761,500	$ 936,500	$1,125,300	$1,329,100	$1,549,000
Capital Improvement Expenses						
Total		$4,451,500	$3,379,300[b]	-	-	-
Local Share[c]		$ 890,300	$ 675,900	-	-	-

(a)- This figure does not include depreciation or non-operating income included in Table 15.
(b)-Figures do not reflect proceeds of $669,600 from sale of property, equipment, etc.
(c)-$408,100 has already been contributed by member communities.

Source: De Leuw, Cather & Company and existing Capital Grant Applications.

Table 29

FIVE-YEAR PRO FORMA BUDGET
ASSUMING IMPLEMENTATION OF RECOMMENDED PLAN

	1974	1975	1976	1977	1978	1979
Operating Revenue						
Passenger	$1,429,400	$1,429,400	$1,756,300	$1,790,100	$1,790,100	$1,790,100
Charter	66,900	73,600	80,900	89,000	97,900	107,700
Advertising	14,600	14,600	14,600	14,600	14,600	14,600
Total	$1,510,900	$1,517,600	$1,851,800	$1,893,700	$1,902,600	$1,912,400
Operating Expenses						
Transportation	$1,139,600	$1,191,100	$1,746,800	$2,081,800	$2,248,300	$2,428,200
Operating and Maintenance	454,100	475,300	689,100	818,800	884,300	955,000
Administrative	343,300	359,200	521,800	620,300	669,900	723,500
Other	173,300	181,400	262,900	312,300	337,300	388,000
Total (less Depreciation)	$2,110,300	$2,207,000	$3,220,600	$3,833,200	$4,139,800	$4,494,700
Operating Deficit	$ 599,400[a]	$ 689,400	$1,368,800	$1,939,500	$2,237,200	$2,582,300
Capital Expenses						
Previously Planned Improvement Expenses						
Total		$4,451,500	$3,379,300[b]	-	-	-
Local Share[c]		$ 890,300	$ 675,900	-	-	-
Additional Capital Expenses Assuming Plan Implementation						
Total		-	$1,191,600	$ 79,200	-	-
Local Share[c]		-	$ 238,400	$ 15,800	-	-
Total		$4,451,500	$4,570,900	$ 79,200	-	-
Total Local Share[c]		$ 890,000	$ 914,300	$ 15,800	-	-

(a) - This figure does not include depreciation or non-operating income included in Table 15.
(b) - Figures do not reflect proceeds of $669,600 from sale of property, equipment, etc.
(c) - $408,100 has already been contributed by member communities.

Source: De Leuw, Cather & Company and existing Capital Grant Applications.

The figures show an increase in revenue of approximately $400,000 by 1979. However, operating expenses are expected to more than double for the same period. The net effect is a deficit which increases to about $2.6 million over the forecast period.

In addition to the increased deficit, capital expenditures required to provide additional new vehicles (outlined in Table 27) would amount to $254,100, assuming 80 percent Federal participation. Included in this figure is a local share of $238,300 for the purchase of 18 standard transit coaches in 1976 and $15,800 for purchase of six van-type vehicles in 1977.

Financing

While an analysis of financing was not programmed for this phase of the study, a brief review of financing constraints and opportunities that are pertinent to the proposed program should be included as an adjunct to other considerations. An increased level of public financing is the obvious resource available to revitalize the MTA mass transit system. Prior to this study, the critical problem has been that all operating funds and a portion of the capital funding had to be provided entirely from local financial sources as the State and Federal governments offered no operating assistance.

As discussed in Chapter 4, the MTA, which has no taxing authority, has been financed from general revenue sources from the five member municipalities. The individual contributions are based on a formula related to assessed valuation and bus vehicle-miles traveled in each municipality. In 1974, for example, the reported operating deficit of nearly $659,000 was pro rated on the following basis:

Table 30

1974 LOCAL OPERATING FUNDING

Municipality	Amount	Percent
Clive	$ 6,330	0.96
Des Moines	566,540	85.98
Urbandale	29,780	4.52
West Des Moines	42,960	6.52
Windsor Heights	13,310	2.02
Total	$658,920	100.00

Source: MTA

While the Federal Government could provide 80 percent of the MTA's capital funding needs under programs that have been in effect for a number of years, it was not until November 1974 that operating assistance was authorized. The National Mass Transportation Assistance Act provides $11.8 billion over the next six years for capital and operating assistance. The bill provides nearly $4.0 billion for operating assistance on a 50-50 percentage basis and $7.8 billion for capital construction and improvements, with the Federal Government paying 80 percent and the local government(s) 20 percent.

Operating assistance and capital improvement funds have been allocated to urbanized areas throughout the United States on a formula based on the population and population density. The projected apportionment for the Des Moines urbanized area is shown in the following table.

Table 31

FEDERAL MASS TRANSIT ASSISTANCE FUNDS
PROJECTED APPORTIONMENT
DES MOINES URBANIZED AREA
(Section 5)

Fiscal Year	Amount
1975	$ 500,110
1976	833,518
1977	1,083,573
1978	1,291,953
1979	1,416,980
1980	1,500,332
Total	$6,626,466

Source: Federal Register, January 3, 1975.

The Federal operating assistance program will be of tremendous assistance to many communities throughout the United States. It is, however, not an end-all program for it does require continued funding by state and/or local government(s) and there are a number of requirements that have to be met in order to obtain this assistance.

Federal aid will be a major input to the MTA's financing program. Table 32 illustrates the Federal and local share of operating fund contributions under the "no improvement" and recommended plan alternatives for the five-year period covered by this study. The table does not include the cost of a reduced fare program which would be added to the cost of the recommended program.

Table 32

ALTERNATIVE PROGRAMS
OPERATING FUNDING

Fiscal Year	"No Improvement" Local Share	"No Improvement" Federal Share	Recommended Plan Local Share	Recommended Plan Federal Share
1975	$ 450,700[a]	$ 310,800	$ 450,700[a]	$ 238,700[b]
1976	525,100[a]	411,400	684,400	684,400
1977	562,650	562,650	969,750	969,750
1978	664,550	664,550	1,118,600	1,118,600
1979	774,500	774,500	1,129,150	1,291,150
Total	$2,977,500	$2,723,900	$4,352,600	$4,302,600
5-Year Average	$ 595,500	$ 544,800	$ 870,500	$ 860,500

[a]-"Maintenance of effort" requirement.

[b]-The Federal share is reduced during the first year in the Recommended Plan due to the savings realized from discontinuing the Metro Center service. The savings is allocated to the Federal share due to the "maintenance of effort" requirement.

Source: De Leuw, Cather & Co.

The additional funding required each year to implement the recommended plan including all programmed capital improvements is shown in Table 33. Table 34 shows the anticipated federal funding assistance for both capital and operating needs necessary to support the existing systems and recommended improvements.

Aside from Section 3 funds previously applied for, it was assumed that all additional capital improvement funding would make use of available Section 5 funds to the fullest extent possible.

Table 33

RECOMMENDED PLAN
SUMMARY OF EXPENSES BY YEAR

Year	Additional Operating Expenses		Capital Expenses	
1975	CBD fare zone service	$(72,100)	Begin design and construction of new garage	$ 610,800
	Fare reduction	See note d	Payment for 25 coaches received	1,379,700
			Thirty new buses	1,800,000
			Registering fareboxes	128,000
			Radio equipment	201,000
			Bus stop signs	56,000
			Bus stop shelters/loading areas	96,500
			Service vehicles	15,000
			Maintenance parts/ shop equipment, etc.	164,400
Total (1975)		$(72,100)		$4,451,400

Table 33 (Concluded)

Year	Additional Operating Expenses		Capital Expenses	
1976	Uniform scheduling	$317,700	Completion of garage construction	$3,379,300
	Westward extensions	312,800		
	Near West crosstown	206,600	Purchase of 18 new coaches for new services	1,191,600
Total (1976)		$837,100		$4,570,900
1977	Southern area feeder service	$355,100	Purchase of six small vehicles for feeder service (including radios)	$ 79,200
Total (1977)		$355,100		$ 79,200
1978	--None--		--None--	
1979	--None--		--None--	

Notes:

a. ( ) indicates savings

b. All operating costs escalated by eight percent per year from 1974.

c. Capital expenses do not include proceeds of $699,600 from sale of property, etc.

d. Exact fare reduction to be determined locally. See Table 24 for the estimated financial implications of a given fare reduction.

Table 34

ANTICIPATED FEDERAL FUNDING ASSISTANCE

NO IMPROVEMENT PLAN

Year	Operating Assistance Eligibility[a]	Available Section 5 Funds	Section 5 Funds Available for Capital Improvements	Capital Assistance Required	Supplemental Section 3 Capital Funds Required	Section 3 Funds Now Applied For	Total Section 3 Funds
1975	$ 310,800	$ 500,110	$ 189,310	-	-	$3,561,200	$3,561,200
1976	411,400	833,518	422,118	-	-	2,703,400	2,703,400
1977	562,650	1,083,573	520,923	-	-	-	-
1978	664,550	1,291,953	627,403	-	-	-	-
1979	774,500	1,416,980	642,480	-	-	-	-
Total	$2,723,900	$5,126,134	$2,402,234			$6,264,600	$6,264,600

RECOMMENDED PLAN

1975	$ 238,700	$ 500,110	$ 261,410	-	-	$3,561,200	$3,561,200
1976	684,400	833,518	149,118	$ 953,300	$542,772[b]	2,703,400	3,246,172
1977	969,750	1,083,573	113,823	63,400	-	-	-
1978	1,118,600	1,291,953	173,353	-	-	-	-
1979	1,291,150	1,416,980	125,830	-	-	-	-
Total	$4,302,600	$5,126,134	$ 823,534	$1,016,700	$542,772	$6,264,600	$6,807,372

(a)-Based on "maintenance of effort" requirement and 50 percent Federal funding limit. See Table 3.
(b)-Assumes use of $261,410 surplus Section 5 funds from fiscal year 1975.

Under current State enabling legislation, the MTA must go "hat in hand" to each municipality for their pro rata share of the funding needs. While the member municipalities have agreed to fund the MTA, that funding commitment is not binding as the municipalities can decide to separate from the Authority. Thus, the Authority is never certain that even a basic level of funding will be forthcoming. While the commitment that the municipalities have made to date is commendable and has essentially guaranteed the continuation of transit service, it has been a burden. To be put on sound, businesslike financial basis, the MTA, which provides an essential service to the entire region, should have an annual source of funding that is specifically designated for MTA use. A regular source of revenue would provide financial stability for public transportation and as the expenditure of these funds would be approved by the MTA board, accountability would remain with the municipal representatives.

It is recommended that sufficient local funds be made available on an annual basis for the MTA to implement the basic recommended plan, plus an additional amount for reduced fare and capital grant programs. That amount should approximate $1 million annually and should be derived from a revenue source that will grow at an annual rate of about eight percent. As this may require a referendum and/or a change in State enabling legislation, efforts to obtain this funding should be immediately initiated. The research that would be involved in exploring various sources has been programmed for the second phase of the Transit Development Program.

In addition to a permanent source of local funding, efforts should be made to involve the State in the MTA's capital and operating funding programs. The trend toward more balanced state transportation funding is occurring throughout the country and Illinois, Michigan, Minnesota, Ohio, New York, and Wisconsin have all developed very excellent programs. The level and source of State funding is obviously a major policy decision in which many factors external to the Des Moines area will have to be considered. However, substantial funding of capital programs by the State, perhaps at a 50 percent level for operating programs and 100 percent for

limited demonstration programs, is consistent with the level of effort of a number of the states cited above.

Even with State and Federal assistance, a substantial amount of local funding will still be necessary and efforts to secure a permanent local source should not be dependent upon possible State funding. With sufficient funding, a well-conceived plan and program, and a trustee board committed to improved service, it will be possible to develop an efficient and coordinated transit for the region.

Marketing and Public Relations

The service recommendations presented in this study are intended primarily for the benefit of the transit-dependent residents of the Des Moines area. However, as a result of the expanded service area and higher service standards, non-transit-dependent patrons can also be attracted. The scope of the improvement program involves many new routes as well as modifications of existing services and a continuing public relations campaign will be needed to inform existing and potential riders of the benefits available to them. The objectives of such a marketing program would be to improve the image of public transit; to gain support for various services; and to increase patronage.

A variety of advertising methods are available for the promotion of the MTA's services. Among the more important ones are:

1. *Effective Use of the News Media.* Good relations should be maintained with press, radio and television personnel. Editors, reporters, and radio and TV commentators must be kept well informed of all developments concerning the local public mass transportation system.

2. *Customer Information.* Each transit vehicle and a few selected bus stops should be equipped with an adequate supply of bus schedules and system route maps. The schedules that are currently used have attractive format,

but they should be modified to give outbound as well as inbound time points. The MTA should also produce a systemwide route map to complement the individual route maps that accompany each timetable. This map should be color-coded for easy route identification and should carry all pertinent information concerning the transit system.

All of the MTA's major bus stops should be clearly marked and identified by curb striping and signing identified by a unique logo which includes the MTA information number. Each of these bus stop signs should also show the hours and frequency of service for all routes which stop there. Keeping in mind the local practice of allowing flag stops at any intersection along a route, bus stop signs should be erected every two blocks in densely populated neighborhoods, and every quarter mile in suburban, low-density areas.

3. *Community Participation.* It is suggested that the MTA contact all major community groups to convey the transit system's interest in public service. To promote new ridership, transit representatives should be available to attend meetings and address various business, school, fraternal and social service organizations to explain the advantages of public transportation.

4. *Driver Training.* While driver courtesy is not a major problem of the existing transit service in Des Moines, it should be emphasized that the driver is generally the only representative of the operating company who comes in contact with the public. For the maintenance of a good public image, therefore, it is essential that drivers be properly instructed in methods of handling unforeseen situations that may arise, and in dealing with the special requirements of transit patrons – especially the elderly. Drivers should also attempt to closely adhere to posted schedules. Unreliable service will ultimately result in the loss of patronage.

5. *Special Promotional Activities.* A variety of special promotional methods should be utilized by the MTA to increase ridership. Among the ideas that might be considered are:

   - Special family fares
   - Employer-paid annual transit passes for employees
   - Special passes for the elderly, blind, crippled, and otherwise handicapped people
   - A cardless day once a week for various classifications of workers
   - Bus decorations, including imaginative color schemes and, in some cases, music.

During 1974 the MTA spent about $42,000 on marketing and also hired a new marketing manager. This level of effort exceeds the old transit industry standard stipulating that one percent of total revenues should be spent on advertising activities. This standard is no longer adequate, however, and should continue to be disgarded in favor of a policy which ties the size of the marketing budget to goals relative to ridership growth or patronage of new services. It is also recommended that the Des Moines MTA take full advantage of any free advertising time in the media in view of the "public service" nature of the recommended improvements.

Continuing Program

The TDP update should be viewed as one step toward providing transit service to meet the needs of residents in the Des Moines area. The information contained in this report serves as both a plan for near-term expansion and improvement and a benchmark against which to judge the effects of future changes. To assure the development of a transit system which will evolve to meet the changing needs of the area, system monitoring and plan updating must be done on a continuing basis.

The MTA should initiate a comprehensive and continuous monitoring system for individual routes, and measurements should be established relative to overall system performance. Basic input for various service and trend analyses should be obtained from the route data. The information should include route ridership figures by day, hour, and passenger type; transfer information; daily bus hours and miles on each route; maintenance records for each bus; cost of various cleaning, maintenance and repair activities; personnel records and expenses; charter mileage and hours; school bus passenger, mileage, hours, maintenance and repair records; and any other data pertaining to bus operations. To supplement the above data, field studies should also be undertaken to collect information on schedule adherence, travel times, and maximum load checks. The installation of the new recording fare boxes will greatly facilitate these system monitoring tasks.

Plan updating involves the application of pertinent data gathered through the system monitoring process. Because the economic, social and land use conditions which effect transit patronage are continually changing, a program of periodic review is necessary. Effects of previous service changes should be analyzed with respect to continued or expanded application.

In addition to route and system monitoring, additional transit development planning should be pursued. For example, this report has not detailed the transportation needs of either the elderly or the handicapped. It is recognized that more study effort is needed in this area. As the necessary man power becomes available CIRLAG should undertake this study, which might include an identification of the locations of establishments catering to the needs of the elderly and handicapped, an analyses of their particular transportation needs, and alternative methods of serving those needs. Other areas on which future studies should focus include:

- Data analysis by route segment
- The development of service standards and performance measures.
- Route modification and adjustments, especially for the east side service area.
- Non-rider transit attitudinal survey.
- Management, operations and legislative analyses.
- Detailed financing alternatives.
- Development of specific monitoring format.

The process of future planning must be shared jointly by both the Metropolitan Transit Authority and the Central Iowa Regional Association of Local Governments. This will assure a public transit plan which both complements and is integrated with the overall transportation plan. This is particularly important as new transportation alternatives such as car pooling, dial-a-ride, jitney, coordinated taxi and other techniques evolve to supplement existing conventional transit service.

APPENDIX

APPENDIX A

DESIGN PROGRAM

METRO TRANSIT CENTER
DES MOINES METROPOLITAN TRANSIT AUTHORITY
DES MOINES, IOWA

PREPARED BY:
LYNCH·PAYNE·CHAMPION·BERNABE, INC.
DES MOINES, IOWA

The information in this program was collected with the assistance of the staff of the Des Moines Metropolitan Transit Authority. All design assumptions are based on this program.

1. ADMINISTRATIVE OFFICES
   A. EXECUTIVE DIRECTOR'S OFFICE (15'x20') — 300 sq. ft.
      1. Large Desk (72"x36") and Chair
      2. Credenza
      3. 4 Side Chairs
      4. Small Conference Table and 4 Chairs
      5. 2 - 2 Drawer Files
      6. Direct Access to General Office
      7. Direct or Easy Access to Board Room
      8. Direct to Executive Secretary
      9. Easy Access to Legal Counsel
      10. Easy Access to Operations Manager
      11. Easy Access to Personnel Manager
      12. Easy Access to Public Relations Manager
      13. Easy Access to Comptroller

   B. EXECUTIVE SECRETARY (15'x20') — 300 sq. ft.
      1. Large Desk (72"x32") and Chair
      2. Credenza
      3. 3 Side Chairs
      4. 2 - 2 Drawer Files
      5. Direct Access to General Office
      6. Direct Access to Director's Office

B. 7. Direct Access to Board Room
8. Easy Access to Operations Manager
9. Easy Access to Personnel Manager
10. Easy Access to Public Relations Manager

C. LEGAL COUNSEL (15'x12'-6") 188 sq. ft.
1. Large Desk With Return (66x32) and Chair
2. 2 Side Chairs
3. 2 - 2 Drawer Files
4. Direct Access to General Office
5. Easy Access to Director

D. COMPTROLLER (15'x12'-6") 188 sq. ft.
1. Large Desk With Return (66x32) and Chair
2. 2 Side Chairs
3. 2 - 2 Drawer Files
4. Direct Access to Accounting Department
5. Direct Access to General Office
6. Easy Access to Director

E. OPERATIONS MANAGER (15'x20') 300 sq. ft.
1. Large Desk with Return (66"x32") and Chair
2. 2 Side Chairs
3. 2 - 2 Drawer Files
4. Direct Access to General Office
5. Easy Access to Transportation
6. Easy Access to Maintenance Supervisor
7. Easy Access to Executive Secretary
8. Easy Access to Purchasing and Inventory Control
9. Easy Access to Service Supervisor

F. PERSONNEL MANAGER (15'x15') 225 sq. ft.
1. Large Desk (72"x32") With Return and Chair
2. 2 Side Chairs
3. 2 - 2 Drawer Files
4. Direct Access to General Office
5. Easy Access to Executive Secretary
6. Easy Access to Testing and Interview

G. MARKETING AND PUBLIC RELATIONS MANAGER (15'x15') — 225 sq. ft.

1. Large Desk (72"x32") With Return and Chair
2. 2 Side Chairs
3. 2 - 2 Drawer Files
4. 1 - 72"x36" Drafting Table
5. Easy Access to Director and Executive Secretary
6. Easy Access to General Office

H. MARKETING STAFF (30'x15') — 450 sq. ft.

1. 3 Large Desks (72"x32") with Return and Chair
2. 3 Side Chairs
3. 2 Large Drafting Tables (84"x36")
4. Lay-off tables
5. Sink and Counter
6. Storage Cabinet
7. Direct Access to Marketing Manager
8. Easy Access to General Office

I. BOARD ROOM (15'x30') — 450 sq. ft.

1. Conference Table and 12 Chairs
2. Credenza
3. Storage
4. Projection Capabilities
5. Tack Boards
6. Direct Access to Executive Secretary
7. Easy Access to Director's Office
8. Accessible to Front Entrance
9. Accessible to General Office
10. Closet
11. Electronic News Media Outlets
12. Supplemental Air Conditioning to Handle Photo Lighting

J. GENERAL OFFICE — 1,056 sq. ft.

1. 10 Desks (60"x30") With Return
2. 10 Chairs
3. 12 - 4 Drawer Files
4. Storage Space and Work Room
5. Easy Access to Private Offices

6. Easily Accessible to Control Center, Dispatching Room
7. Accessible to Toilets (Office Personnel)
8. Direct Access to Record Storage

K. RECORD STORAGE — 600 sq. ft.
1. Small Safe for Office Cash
2. 6 - 4 Drawer Fire Proof Files
3. Room 1 Hour Rating

L. PERSONNEL OFFICE — 600 sq. ft.
1. Desk (60"x30") With Return and Chair
2. 4 - 4 Drawer Files
3. 2 - Desks (48"x24") and Chairs
4. 2 Side Chairs
5. Accessible to Front Entrance
6. Accessible to Personnel Manager and General Office

M. CASH ROOM
Cash Room has not been included because method of handling fare box receipts has not been determined.

N. TOILETS (OFFICE PERSONNEL AND VISITORS) — 525 sq. ft.
1. MEN
   a. 2 Water Closets
   b. 2 Urinals
   c. 2 Lavs w/Mirrors, 1 Towel Cab't
   d. Easy Access to General Office
2. Women
   a. 2 Water Closets
   b. Sanitary Napkin Disposers
   c. 2 Lavs w/Mirrors, 1 Towel Cab't
   d. Couch
   e. Easy Access to General Office
3. Janitor's Closet — 150 sq. ft.
   a. Service Sink
   b. Wall Hanging Space
   c. Shelf Space
   d. Floor Area for Equipment
   e. Centrally located in Office Area

O. MECHANICAL EQUIPMENT	375 sq. ft.
P. ATRIUM AND CIRCULATION	1,400 sq. ft.
1. Waiting Area	
a. 6 Chairs	
b. 2 Tables	
TOTAL ADMINISTRATIVE AREA	6,372 sq. ft.

2. OPERATIONS

A. CONTROL ROOM — 900 sq. ft.
   1. DISPATCHER
      a. Desk (60"x30") and Chair
      b. Wall Chart Space
      c. Control Panels for Overhead Doors
   2. Communications
      a. 3 Desks (60"x30") and Chairs
      b. Computer Terminal
      c. Radio Communications
      d. T.V. Surveillance Equipment
      e. Telephone information Center
   3. Operators window and Deal Plate

B. OPERATORS ROOM — 600 sq. ft.
   1. Tables and Chairs to Seat 50
   2. Space for Vending Machines (Candy, Soft Drinks, Cigarettes)
   3. Bulletin Board
   4. Grooming Mirror
   5. Direct Access to Exterior, Near Parking and Ready Buses.
   6. Accessible to Locker Rooms and Toilets
   7. Accessible to Operations Office

C. TRANSPORTATION MANAGER — 225 sq. ft.
   1. Desk (60"x30") and Chair
   2. 2 - 4 Drawer Files
   3. Accessible to General Office, Operators Facilities, Including toilets

D. MAINTENANCE SUPERVISOR — 130 sq. ft.
1. Desk (60"x30") and Chair
2. 2 - 4 Drawer Files
3. Accessible to Maintenance Area, General Office, Toilets

E. SHOP FOREMAN — 150 sq. ft.
1. Desk (60"x30") and Chair
2. 2 - 4 Drawer Files
3. Accessible to Maintenance Area, General Office, Toilets

F. PARTS MANAGER — 150 sq. ft.
1. Desk (60"x30") and Chair
2. 2 - 4 Drawer Files
3. Catalog Shelves

G. TRAINING CLASSROOM — 1,050 sq. ft.
1. 50 Folding Classroom Chairs
2. Projection Capabilities
3. Chalk and Tackboard Space
4. Simulator
5. Accessible to Operators Lounge, Front Entrance, Toilets, Director of Training
6. Storage

H. OPERATORS LOCKER ROOM — 1,500 sq. ft.
1. MEN'S LOCKER ROOM
   a. 200 Lockers and Benches
   b. 2 Full Length Mirrors
   c. 3 Water Closets
   d. 4 Urinals
   e. 4 Lavs
   f. 2 Showers
2. WOMEN'S LOCKER ROOM
   a. 16 Lockers and Bench
   b. 1 Full Length Mirror
   c. 2 Water Closets
   d. 2 Lavs
   e. 1 Cot
3. Adjacent to Operators' Room

I. SERVICE AREA — 5,200 sq. ft.

1. Fuel Station
2. Revenue Processing Terminal
3. Cyclone Cleaner
4. Automatic Wash Stall
5. Drying Area
6. Degreasing Station
7. Adjacent to Storage Garage
8. Convenient to Maintenance Area
9. 40,000 Gallon Fuel Below Grade
10. Tower Operated Entrance Doors

J. MAINTENANCE — 15,180 sq. ft.

1. 15 Repair and lubrication Stalls
   a. 10 Locations With Traveling Posts
   b. 5 Locations with Flat Floors
   c. Lube Outlets at each Hoist
   d. Easy Access to Machine Shop
   e. Easy Access to Parts Window
   f. Direct Bus Access From Exterior
   g. Each Location Approximately 16' x 54'
   h. Traveling Monorail Crane
2. Wheel Alignment Stall — 928 sq. ft.
   a. Alignment Pit
   b. Tool Racks
   c. Direct Bus Access From Exterior
3. 2 Body Stalls — 2,088 sq. ft.
   a. Accessible From Exterior
   b. Drive-Thru Stall
   c. Compressed Air
4. Paint Stall — 928 sq. ft.
   a. Water Wash Power Exhaust
   b. Drive-Thru
   c. Fold Down Scaffold on Walls
   d. Air Outlets
5. Paint Shop — 320 sq. ft.
6. Upholstry Shop — 320 sq. ft.
7. Paint Storage — 160 sq. ft.

7.	Paint storage (continued)	
	a. Accessible to Paint Stall	
	b. Steel Shelving	
	c. Mixing Table	
8.	Parts Department	2,058 sq. ft.
	a. Racks, Shelves and Bius	
	b. Window and Counter Area to Maintenance Area	
	c. Desk for Parts Clerk	
9.	Machine Shop	1,995 sq. ft.
	a. Repair Benches	
	b. Open Floor Space for Movable Equipment	
	c. Access to Parts Department	
	d. Clean Room	
10.	Engine Rebuild	525 sq. ft.
	a. Engine Stands	
	b. Bench Space	
	c. Access to Machine Shop	
11.	Test	
	a. Acoustical Absorption	210 sq. ft.
	b. Test Equipment	
	c. Access to Engine Rebuild	
12.	Tires	1,128 sq. ft.
	a. Storage for 400 Tires on Pipe Racks	
	b. Space for Regrooving Machine	
	c. Retainers for inflating Tires	
	d. Adjacent to Maintenance Area	
13.	Batteries	
	a. 2 Battery Chargers	200 sq. ft.
	b. Storage for 20 Batteries	
	c. Acid Storage	
	d. Fire Resistant Room	
14.	Mechanics Locker Room	1,380 sq. ft.
	a. 50 Lockers (25 per shift) and benches	
	b. 2 Bradley Wash Fountains	
	c. 4 Wall Mirrors	
	d. 2 Water Closets	
	e. 2 Urinals	
	f. 4 Unit Gang Shower	
	g. Lunch Space for 25	

h. Easy Access From Maintenance Area

15. Security
    a. Fences - 8' Cyclone with 3 Strand Barbed Wire Top Around Storage and Maintenance
    b. 3 Gates
    c. Exterior Lighting
    d. T.V. Surveillance to Control Center
16. Parking Areas
    a. Employee Parking
        1) Operators (225)
        2) Maintenance and Administration (52)
        3) Returned Buses (50)
           Buses to Be Driven Thru Service By Operators
        4) Aprons and Drives to be Concrete for Buses, all other parking can be Asphaltic Concrete.
17. Circulation — 740 sq. ft.

TOTAL OPERATIONS AREA — 38,085 sq. ft.

3. BUS STORAGE FACILITY (408' x 135') 55,080 sq.ft.

A. Provide enclosed storage for 100 buses.

B. Temperature in winter to be maintained at approximately 45°F.

C. Buses to be stored in tandem 3 per stall.

D. Stalls to be drive through.

APPENDIX B

METHODOLOGY IN COMPUTING COST, RIDERSHIP AND REVENUE FORECASTS FOR RECOMMENDED SERVICE IMPROVEMENTS

The two sections of this appendix document the assumptions and figures used in estimating costs and ridership for the service change alternatives discussed in the report.

COSTS

The costs associated with any new service were estimated on the basis of the cost per additional bus-hour. This bus-hour cost was computed as the total 1974 operating cost of $2,110,260 divided by the estimated annual bus-hours of 153,968 (including pull-out/pull-in time), yielding an operating expense of $13.71 per bus-hour, including both fixed and variable costs.

Fixed costs would not be materially increased if additional conventional fixed route service were implemented. Consequently, when estimating the cost of conventional service, the above figure was reduced by 20 percent. This reduction corresponds to that portion of operating costs presently spent for administration (16 percent) and taxes (four percent). Thus, the cost per bus-hour for new conventional service was computed as $13.71 x .80 = $10.96.

Demand-responsive service requires dispatchers and other administrative personnel not the rest of the system. The cost per bus-hour used for estimating the operating expense of demand-responsive service, therefore, includes administrative costs but not taxes. It was calculated as $13.71 x .96 = $13.16.

To relate costs per bus-hour to annual operating expense, standard service periods were defined. Weekday service was assumed to be provided on 254 days per year.

The daily service period was defined as 14 hours, consisting of two three-hour peak periods and an eight-hour base period. Saturday service would be provided 52 days per year for a 14-hour service period, and would afford the same level of service as the weekday base period. Thus, the annual cost of adding one bus during each of the three periods may be computed as:

Period	No. of Buses		Days/ Year		Hours/ Day		Cost/ Hour		Annual Cost per Bus*
Weekday Peak	1	x	254	x	6	x	$10.96	=	$16,703
Weekday Base	1	x	254	x	8	x	$10.96	=	$22,271
Saturday	1	x	52	x	14	x	$10.96	=	$ 7,979

*Conventional service assumed in this sample.

For any new service, vehicle requirements were estimated for each of the service periods. Annual costs were then computed as the number of buses required times the appropriate annual cost.

The requirement for additional vehicles varied according to the improvement being considered, and factors which determined the number of buses needed for each of the service improvements are described below.

Near West Crosstown

At the northern end of the route there are two legs; one serving Merle Way Plaza and the other, a residential area north of Douglas. Merle Way Plaza, with a total round trip route length of 20.2 miles, is the longer of the two legs. Assuming an average speed of 13.5 miles per hour, the round trip running time is equal to

$$\frac{20.2}{13.5} = 1.50 \text{ hours.}$$

For 15-minute service during peak periods and 30-minute service during base periods, the vehicles required are calculated below:

$$\frac{\text{90-minute running time}}{\text{15-minute headway}} = \text{6 vehicles required during peak period.}$$

$$\frac{\text{90-minute running time}}{\text{30-minute headway}} = \text{3 vehicles required during base period.}$$

Uniform Scheduling

For all existing routes, the schedule of each bus was examined to determine the round trip running time during both peak and off-peak periods and the scheduled layover time. An examination of these data led to a determination of a standardized round trip running time during each service period. The number of vehicles required for 10- and 15-minute peak headways and 30-minute off-peak headways was then calculated as the standard running time divided by the desired headway. This number, when compared to the number of buses presently in use, yielded the additional vehicle requirements.

If standard three-hour peak service periods are assumed, some peak period buses which presently run for less than three hours, would have to make additional runs. Examination of current schedules indicated that a total of 33 additional hours of service per day would be required from peak period buses already in service. Standardized 14-hour service on Saturdays would require an additional 11 hours of service from existing buses.

The vehicle requirements as determined for each route are shown in Table B-1.

Table B-1

UNIFORM SCHEDULING VEHICLE REQUIREMENTS

Route	Running Time (Minutes)		Standardized Running Time (Minutes)		Vehicle Requirements (Headway)			Additional Vehicles		
	Peak	Base	Peak	Base	10-Minute Peak	15-Minute Peak	Base	10-Minute Peak	15-Minute Peak	Base
West Des Moines/ Fairground	117-143	120-126	120	120	13	9	4	3	(1)	0
Clark/East 6th-9th	101-113	96	100-110	90	10	7	3	3	0	0
University/Highland-Oak Park	98-118	100	100	90	11	8	3	1	(2)	(1)
Fort Des Moines/ Walker	115-122	111	120	120	12	8	4	4	0	1
West 9th-Douglas/ Indianola-Lacona	121-126	105	120	120	13	9	4	7	3	1
Airport/Scott	110-113	51	100	60	6	4	1	2	0	0
Urbandale/East 14th	115-137	115-120	120	120	15	10	5	9	4	2
Crocker	34	--	40	--	3	2	0	2	1	0
					83	57	24	31	5	3

Note: ( ) Indicates a reduction in vehicle requirements.

Source: De Leuw, Cather & Company

Southern Area Demand-Responsive Service Concepts

In the southern area, the vehicle requirements for the dial-a-ride service concepts were based on a comparison with similar demand-responsive systems. The operating characteristics of ten such systems are shown in Table 23, found in Chapter 6 of the report.

Of these ten systems, only three utilize significantly more than one vehicle per square mile. In two cases – Ann Arbor, Michigan and Regina, Saskatchewan – the population density is greater than in the other study areas and more than twice that of the proposed service area. In three instances, less than one vehicle per square mile was reported for both peak and off-peak service periods. These factors led to the adoption of a criteria of one vehicle per square mile for service concepts in the southern area of Des Moines.

As the entire southern area includes approximately 15 square miles, a full-coverage, demand-responsive system to feed the retained Fort Des Moines Route, would require 15 vehicles.

It is necessary to check if these vehicles would provide the necessary capacity, assuming the Airport and Indianola-Lacona Routes were discontinued. Boarding counts made, showed 91 boardings on the Airport Route and 290 on the Indianola-Lacona Route. Assuming all trips were round trips, the system would have to handle (290 + 91) (2) = 762 trips per day. From Table 23 a reasonable average rate of productivity of six trips per vehicle-hour may be assumed. This results in a daily system capacity of:

6 (trips per hour) x 15 (vehicles) x 14 (hours per day) =
1260 trips (which is more than the 762 required).

Thus, 15 vehicles would afford the necessary capacity to serve existing transit patronage and allow for a 65 percent growth.

The service area of the limited feeder bus concept is comprised of approximately five square miles and thus, five vehicles would be required. For this concept, it was not necessary to make a capacity check because the existing transit demand would continue to be served by existing routes.

Western Area Service Options

The four service concepts developed for the western suburban area included the extension of existing Des Moines routes over present express route paths; extension of Des Moines routes over new routing loops; demand-responsive service throughout the area; and demand-responsive service to function as feeder buses to line-haul extensions of Des Moines routes. In determining the vehicle requirements for each of these alternatives, it was assumed that the entire system would be operating under uniform headways of 15 minutes during the peak periods and 30 minutes during the off-peak periods.

The requirements for express line service are shown below.

Extension of University Route over:

Clive Express Leg – 6 miles round trip @ 13 m.p.h. =
(6/13) (60) = 28 minutes running time.
Windsor Heights Leg – 8 miles round trip @ 13 m.p.h. =
(8/13) (60) = 37 minutes running time.

To allow for the longer time and possible delays, a total extension time of 40 minutes was used.

$$\frac{\text{40-minute running time}}{\text{15 (30-min. on each leg)}} = \text{2.66 buses peak period}$$

$$\frac{\text{40-minute running time}}{\text{30 (60-min. on each leg)}} = \text{1.33 buses off-peak period}$$

Because of running time conditions on the University Route, two additional buses would be needed during peak periods, with one bus sufficing during the off-peak period.

Extension of West Des Moines Route over:

West Des Moines Express Leg – 8 miles round trip @ 13 m.p.h. =
(8/13) (60) = 37 minutes running time.
Valley Express Leg – 8 miles round trip @ 13 m.p..h. =
(8/13) (60) = 37 minutes running time.

Allowing for some delay, a nominal 40-minute period was used. As before, this would require two additional buses during the peak periods and one additional off-peak bus.

Extension of the Clark Route over the Urbandale Express Route – 6 miles @ 13 m.p.h. = (6/13) (60) = 28 minutes round trip time.

A nominal period of 30 minutes was assumed, and vehicle requirements were calculated as:

$$\frac{\text{30-minute round trip}}{\text{15-minute headway}} = \text{2 buses peak period}$$

$$\frac{\text{30-minute round trip}}{\text{30-minute headway}} = \text{1 bus off-peak period.}$$

The total vehicle requirements for this alternative are, therefore, six vehicles during peak periods and three during off-peak periods.

The requirements for extension of local routes are detailed below.

Extension of each of the two branches of West Des Moines Route: 7 miles @ 13 m.p.h. = (7/13) (60) = 32 minutes round trip time.

A nominal period of 30 minutes was assumed.

$$\frac{\text{30-minute round trip}}{\text{15 (30-min. on each leg)}} = \text{2 buses peak period.}$$

$$\frac{\text{30-minute round trip}}{\text{30 (60-min. on each leg)}} = \text{1 bus off-peak period.}$$

Extension of one leg of University Route: 4.5 miles @ 13 m.p.h. = (4.5/13) (60) = 21 minutes round trip time.

$$\frac{\text{21 minutes round trip}}{\text{15-minute headway}} = \text{1.4 buses during peak period.}$$

$$\frac{\text{21 minutes round trip}}{\text{30-minute headway}} = \text{.7 buses during off-peak period.}$$

From the above calculations, a vehicle requirement of one bus during each period was determined.

Extension of one leg of Clark Route: 4 miles @ 13 m.p.h. = (4/13) (60) = 19 minutes round trip time.

$$\frac{\text{19-minute round trip}}{\text{15 minutes headway}} = \text{1.27 buses peak period}$$

$$\frac{\text{19-minute round trip}}{\text{30 minutes headway}} = \text{.6 bus off-peak period}$$

The above calculations indicate the need for one additional vehicle during both periods.

Extension of two legs of Urbandale Route:
one 2 miles, one 3.8 miles

As one leg has a round trip length of two miles and the other is 3.8 miles, round trip requirements will be based on the longer trip.

3.8 miles @ 13 m.p.h. = (3.8/13) (60) = 17 minutes round trip time.

$$\frac{\text{17-minute round trip}}{\text{15 (30-min. each}} = 1.1 \text{ buses peak period.}$$

$$\frac{\text{17-minute round trip}}{\text{30(60-min. each leg)}} = .6 \text{ bus off-peak period.}$$

The above calculations indicate a requirement of one additional bus during each period.

Extension of two legs of the Douglas Route: As the round trip lengths are five miles and six miles respectively, the requirements will be based on the longer trip.
6 miles @ 13 m.p.h. = (6/13) (60) =28 minutes round trip time.

A nominal period of 30 minutes was used.

$$\frac{\text{30-minutes round trip}}{\text{15 (30-min. each leg)}} = \text{2 buses peak period}$$

$$\frac{\text{30 minutes round trip}}{\text{30 (60-min. each leg)}} = \text{1 bus off-peak period.}$$

Implementation of all concepts in this alternative would require an addition of seven vehicles during peak periods and five vehicles during off-peak periods.

Dial-A-Ride Service

Vehicle requirements were again estimated on a vehicle-per-square-mile basis. The populated area covers approximately ten square miles, with a population density of 4,000-people per square mile. To serve this area, 10 vehicles would normally be required. However, the presence of Merle Hay Plaza, the West Des Moines business district and various large office buildings would generate the potential for trips internal to the area and consequently, the peak period requirements were increased to 1.5 vehicles per square mile. Thus, this alternative would require 10 vehicles during the base period and 15 during the peak periods.

Demand-Responsive Service and Fixed Route Extensions

This alternative provides for fixed route service during the peak periods and demand-responsive service during the off-peak period. Vehicle requirements for this concept may be derived from previous alternatives as it is essentially a combination of the two. Dependent on whether express routes or extensions of current local routes are chosen, peak period, fixed route service would require six or seven additional vehicles. Off-peak, demand-responsive service would again require 10 vehicles.

After the vehicle requirements for each improvement alternative were defined, the associated cost was computed by applying the unit costs described earlier. Table B-2 shows this computation and the resultant increase in operating costs.

PATRONAGE/REVENUE

The following paragraphs describe the methods used to estimate increased patronage which would result from the various service improvement alternatives presented in the report. The methods vary according to the type of service considered and the

Table B-2

ADDITIONAL ANNUAL OPERATING EXPENSE
FOR IMPROVEMENT ALTERNATIVES

Alternative (Unit Cost)	Vehicle Requirements: Conventional Peak ($16,703)	Conventional Off-Peak ($22,271)	Conventional Saturday ($7,979)	Demand Responsive Peak ($20,044)	Demand Responsive Off-Peak ($26,725)	Demand Responsive Saturday ($9,575)	Total Cost
Near West Crosstown*	6	3	3				$ 190,968[a]
Uniform Scheduling*	5	3	3	Also, 33 hours/day, 254 days; 11 hours/day, 52 days @ $10.961/hour			272,401
Southern Area-- All D-A-R				15	15	15	854,160
D-A-R Feeder*				5	5	5	281,720
Western Area-- Express Line	6	3	3				190,968
Local Extension*	7	5	5				268,171
All D-A-R				15	10	10	663,660
Combination							
Express/D-A-R	2				10	10	396,406
Local Extension/D-A-R	6				10	10	463,218
*-Recommended Plan	18	11	11	5	5	5	$1,013,260

(a)-Does not reflect savings of $13,900 realized from discontinuing 42nd Street shopper service.

availability of data and wherever possible, estimates were made using patronage level indicators developed from Des Moines ridership counts. Revenues were then calculated directly from patronage forecasts using the average fare of 45 cents.

Near West Crosstown

As most of this proposed route would run through areas where transit service now exists, it was possible to utilize existing transit patronage data, on a segment-by-segment level, as a basis for forecasting ridership.

Two general approaches were taken, depending on whether the new route would run parallel or perpendicular to existing routes. If the existing and proposed routes were parallel and the areas they transversed were similar in nature, it was assumed that revenue boardings per route-mile would be the same. However, if the two routes were within one-half mile of each other, adjustments were made to reflect the fact that some patrons would be switching from the existing route to the proposed route and would not be new to the system. This estimate, therefore, does not yield total route patronage, but rather additional generated patronage. Where the existing and proposed route coverage overlapped, it was assumed that 100 percent of the people would use the route within one-eighth mile from their point of origin. As the distance to either route increased to one-quarter mile, each route was assumed to attract 50 percent of the potential transit patrons. It was also assumed that there were no coverage overlaps if the existing and proposed routes were one-half mile or more apart.

When the proposed route intersected existing routes, the new route was assumed to generate trips at the same rate as the intersected routes. Data obtained from one-mile sections of the existing routes located on either side of the proposed intersections were used to determine the estimated patronage. The new route was divided into segments which were determined by its intersections with existing routes. Assuming the proposed route would run north and south; for each segment, the upper half would have the same base trip generation rate as the existing route

intersected at the top of the segment and the rate for the lower half would correspond to that of the existing route intersected at the bottom of the segment. At each intersection, there would be coverage overlaps between routes. As before, the total trips per mile were factored downward by the attraction factor, using the one-eighth-and one-quarter-mile limits.

The procedure described above assures that as the new route passes through different areas, the forecasted trips reflect the known transit usership rates. An example of these calculations is shown below.

Segment:	41st Street between University and Franklin Avenue
Segment length:	3/4 mile
University trip generation rate:	200 trips per mile per day.
Franklin trip generation rate:	172 trips per mile per day.
Attraction factor:	0.66 for both routes.

Trips generated from upper half of route segment =
(Attraction factor) (University trip rate) (Length of route segment) = (.66) (200) (.25) = 33 trips per day

Trips generated from lower half of route segment =
(.66) (172) (.25) = 28 trips per day

Although the total segment length is three-quarters mile, we have only accounted for one-half mile in the equation due to the fact that 100 percent of the potential transit trips within one-eighth mile of the two existing routes are already attracted

to those routes. Therefore, only the center one-half mile of the three-quarter-mile segment has the potential to generate transit trips. The total trips generated by that segment would be 61 (33 + 28). Using this method for the entire proposed route, 546 loadings per day are forecasted. As the forecasted trips are one-way trips, if it is assumed that all trips would be two-way (no CBD loadings are included in the above number), there would be 1092 loadings. Annual revenue would then equal:

(daily loadings) (average fare) (days per year) =
(1092) (.45) (254) = $124,815

Saturday patronage is estimated as one-half weekday patronage. This would increase revenue by

(1092) (.5) (52) (.45) = $12,776

In total, the estimated revenue for the Near West Crosstown Route would be $137,600.

Uniform Scheduling

Because this improvement is an enhancement of present service rather than an addition to serve new areas, it is difficult to predict an increased patronage level. Increases in ridership should occur gradually as the public learns and is attracted by the simplified scheduling. The service does, however, represent an increase in bus hours of on-street service. Patronage estimates were made on the basis of the additional bus hours and the current MTA average of 16.5 boardings per bus hour. This rate was adjusted downward to allow for the fact that most transit prone people are already utilizing public transit and would simply benefit by the revised scheduling. For additional peak period hours, the patronage rate was reduced 50 percent to 8.25 boardings per bus hour. During off-peak period, the rate was reduced by 70 percent to 4.95 boardings per bus hour.

The following calculations illustrate this:

Peak Period Hours:

(5) buses (6) hours/day (254) days/year = 7620 hours/year
(33) hours/day additional service (254) days/year = 8320 hours/year
7620 + 8320 = 15,940 additional peak hours/year

Off-Peak Period Hours:

(3) buses (8) hours/day (254) days/year = 6096 hours/year
(3) buses (14) hours/Sat. (52) Sat./year = 2184 hours/year
(11) additional buses/Sat. (52) Sat./year = 572
6096 + 2184 + 572 = 8852 additional off-peak hours/year

(15940) (.50) (16.5) = 131,505
(8852) (.30) (16.5) = 43,817
175,322 boardings/year

(175,322) boardings (.45) average fare = $78,894 annual additional revenue

Southern Area Feeder Service

In the southern area, the additional patronage would be derived from five demand-responsive vehicles which would serve new areas outside the existing fixed route system. Response rates in similar systems show that an average of six trips per vehicle hour would be a reasonable estimate. For this extension of service, the yield would therefore be:

(5) buses (6) trips (14) hours/day (254) days/year = 106,680 annual boardings

If half the boardings per capita now attained in Des Moines are assumed, the ridership is calculated as:

(10.8) boardings/capita (.5) (13,700) population of newly served areas = 73,980 annual boardings

Both figures, while not equal, are within the same general range. Because Des Moines experiences a generally lower per capita ridership than other areas (see Table 20) and the southern area shows a lower response to transit than other local areas (Table 12), the lower figure was used. For calculation of annual revenue the patronage estimate was rounded to 75,000 annual boardings. This resulted in an annual revenue estimate of (75,000) (.45) = $33,750.

Western Area Concepts

Patronage estimates for the western suburban area were based on the number of annual bus miles each alternative would add and the number of boardings per bus mile currently attained by the MTA. Applying the systemwide average of 1.8 boardings per mile in the western area would, however, result in a high estimate and a rate of one-half of the system average was used. This assumption was based on the following facts:

- Population density is lower in the western suburbs;
- Therate represents a ridership built up over many years; and
- The current express service would continue to serve some of the potential transit demand.

Where demand-responsive service will be included, a generation rate of six boardings per vehicle hour was used, which is comparable to the utilization of similar systems. Additional bus miles were estimated for each service extension in the following way:

$$(\text{length of round trip})\ (\text{service period})\ \left(\frac{60}{\text{headway}}\right)$$

On most legs headways are specified as being 30 minutes during peak period and 60 minutes during off-peak and Saturday periods. Thus, for these standard headways, the daily miles equal:

$$(\text{length})\ (8)\ \left(\frac{60}{60}\right) = (\text{length})\ (8) \text{ for off-peak periods}$$

$$+ (\text{length})\ (6)\ \left(\frac{60}{30}\right) = (\text{length})\ (12) \text{ for peak periods} = \text{length}\ (20)$$

$$\text{Saturdays add } (\text{length})\ (14)\ \left(\frac{60}{60}\right) = (\text{length})\ (14) \text{ miles per day.}$$

On some single leg extensions, the frequency is doubled and thus daily bus miles = length (40).

The resulting annual bus miles, patronage, and revenue calculations are as follows:

For the express route service alternative:

Additional annual bus miles =
(all round trip miles at 30/60 headways) (20) (254) +
(all round trip miles at 15/30 headways) (40) (254) +
(all round trip miles (14) (52) =
(30) (20) (254) + (6) (40) (254) + (36) (14) (52) =
239,568,annual bus miles

Patronage is then estimated to be
(239,568) (.9) = 215,611 boardings/year
Revenue = (boardings) (average fare) = (215,611) ($.45) = $97,025

For the local route extensive service alternative:

Additional annual vehicle miles =
(31) (20) (254) + (8.5) (40) (254) + (39.5) (14) (52) =
272,596 additional annual vehicle miles.
Estimated annual boardings = (272,596) (.9) = 245,336
Estimated annual revenue = (245,336) ($.45) = $110,401.

For the all demand-responsive alternative:

Patronage for demand-responsive service was estimated on the basis of vehicle hours times an average productivity as explained above.

(15) vehicle peak period (6) hours/period (254) +
(10) vehicle off-peak period (8) hours/period (254) +
(10) vehicles Saturday (14) hours (52) =
50460 vehicle hours.
Estimated annual boardings =
(50460) (6) = 302,760 boardings
Estimated annual revenue =
(302,760) ($.45) = $136,242

For the combination local extension and demand-responsive service alternative:

Local extension service during peak periods would add:

(31) round trip miles (60 minutes / (30) minutes headway) (6) hours (254 days +

(8.5) round trip miles (60) minutes / (15) minutes headway (6) hours (254 days =

146,304 vehicle miles.

Boardings from local service = (146,304) (.9) = 131,673 boardings.
Off-peak demand-responsive service would add
(10) vehicles (7) hours (254) days +
(10) vehicles (14) hours (52) Saturdays = 25060 vehicle hours
Boardings from demand-responsive service estimated as
(25060) (6) = 150,360 annual boardings.

Total annual boardings = 131,673 + 150,360
= 282,033
Revenue is estimated as (282,033) ($.45) = $126,915.

APPENDIX C

RESOLUTIONS OF ADOPTION

By the

DES MOINES URBAN AREA
TRANSPORTATION POLICY COMMITTEE

RESOLUTION

Des Moines Urban Area Transportation Policy Committee

Subject: Des Moines Area Transit Development Program

WHEREAS, the Central Iowa Regional Association of Local Governments has been designated by prior agreement to act as the administrative and coordinating agency for continuing transportation planning as designated by the Governor, and

WHEREAS, the Des Moines Urban Area Transportation Policy Committee has been authorized to act for and on behalf of the Association, and

WHEREAS, a cooperative agreement has been executed with the Des Moines Metropolitan Transit Authority for transit planning, and

WHEREAS, the Des Moines Urban Area Transportation Policy Committee has authorized the development of a Short Range Transit Development Program under the direction of the CIRALG staff and the Technical Subcommittee, and

WHEREAS, the Des Moines Urban Area Transportation Technical Subcommittee, which includes representation from the Des Moines Metropolitan Transit Authority (MTA) and working closely with the MTA staff, has been involved in the development of the Transit Development Program, and

WHEREAS, the Federal Urban Mass Transportation Administration has reviewed and approved the report entitled, "Des Moines Area Transit Development Program Update", upon the condition that the report be approved by the Policy boards of the Central Iowa Regional Association of Local Governments and the Des Moines Metropolitan Transit Authority, and

WHEREAS, the Des Moines Urban Area Transportation Technical Subcommittee has recommended approval of the Transit Development Program document during its regular meeting of July 18, 1975

NOW, THEREFORE, BE IT RESOLVED BY THE DES MOINES URBAN AREA TRANSPORTATION POLICY COMMITTEE:

That the report entitled, "Des Moines Area Transit Development Program Update" be approved and forwarded to the Des Moines Metropolitan Transit Authority (MTA) for adoption.

PASSED AND APPROVED THIS 11th DAY OF August, 1975.

DES MOINES URBAN AREA TRANSPORTATION POLICY COMMITTEE

OF THE

CENTRAL IOWA REGIONAL ASSOCIATION OF LOCAL GOVERNMENTS

ATTEST:

By Bryan H. Hall
Secretary (Acting)

By
Committee Chairman

By the

METROPOLITAN TRANSIT AUTHORITY

RESOLUTION

WHEREAS, the Des Moines Metropolitan Transit Authority has been designated as the public transit operator in the greater Des Moines area by its member municipalities; and

WHEREAS, said Des Moines Metropolitan Transit Authority has received and reviewed the Transit Development Plan entitled, "Des Moines Area Transit Development Program Update" prepared and approved by the Central Iowa Regional Association of Local Governments.

NOW, THEREFORE, BE IT RESOLVED that said transit development plan entitled, "Des Moines Area Transit Development Program Update" be and the same hereby is approved.

Adopted by the Joint Board of Transit Trustees of the Des Moines Metropolitan Transit Authority at its regular meeting held August 13, 1975.

Dated at Des Moines, Iowa, this 15th day of August, 1975.

R. L. Sharpnack

R. L. Sharpnack, Secretary-Treasurer
Des Moines Metropolitan Transit Authority