IOWA HIGHWAY NEEDS 1960-1980

A PLAN TO PACE HIGHWAY DEVELOPMENT WITH ECONOMIC GROWTH

- A Report to the Iowa Highway Study Committee
- Prepared by the Automotive Safety Foundation, Washington, D. C., November 1, 1960
- Cooperating: Iowa State Highway Commission and Iowa Counties and Municipalities
- Financed as a Federal-aid Highway Planning Project

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DEDICATED TO EDUCATION AND RESEARCH FOR SAFE EFFICIENT HIGHWAY TRANSPORTATION

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November 1, 1960

Honorable D. C. Nolan, Chairman
Iowa Highway Study Committee
State Capitol
Des Moines, Iowa

Dear Senator Nolan:

Transmitted herewith is a report summarizing the 15-month engineering study entitled, "Iowa Highway Needs, 1960-1980."

The study was directed by engineers of the Automotive Safety Foundation in accordance with an agreement, dated July 29, 1959, between the Iowa State Highway Commission and the Foundation, approved by the Iowa Highway Study Committee.

Personnel of the Commission, counties and municipalities materially assisted in the study by freely providing basic facts, conducting special research and making appraisals under procedures and methods established by Foundation engineers. On their behalf I wish to express most grateful appreciation to your committee and all participants for their exceptional cooperation.

Results and recommendations reported herein are the sole responsibility of the Foundation engineers.

Very truly yours,

C. E. Fritts
Vice President in
Charge of Engineering

Registered Highway Engineer
State of Iowa No. 4092

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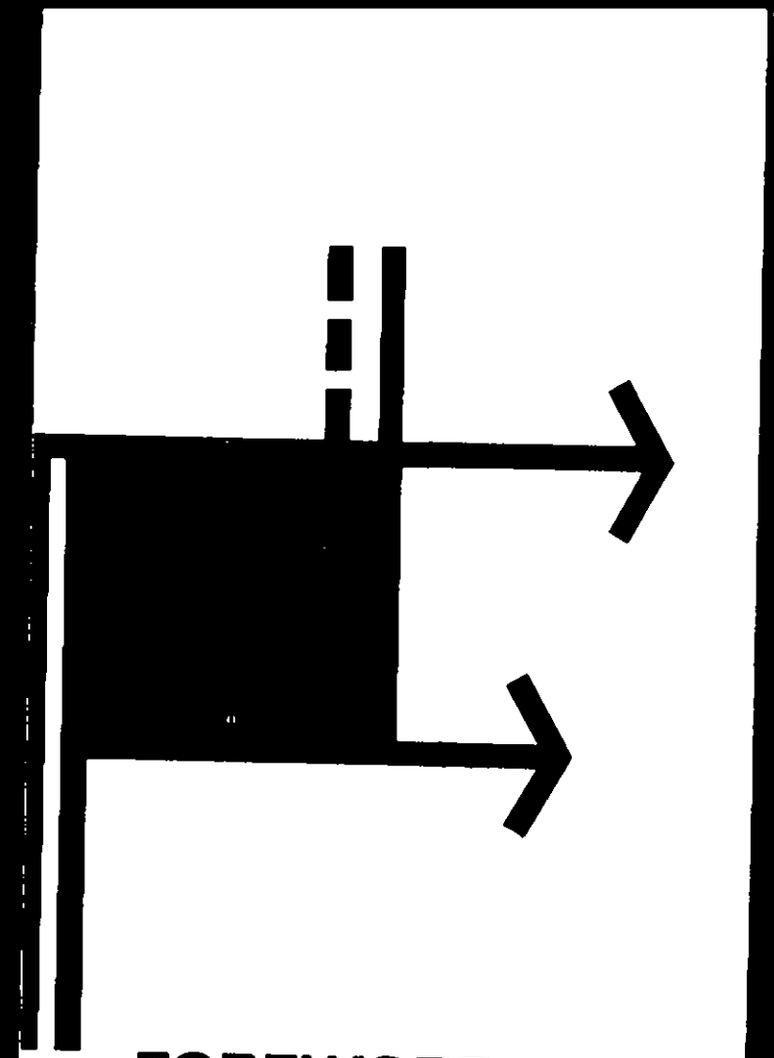


FOREWORD

SUMMARY

This is a brief summary of estimated needs on the 112,000 miles of roads and streets in Iowa in the 20-year period, 1960-1980. Basic recommendations for revision of system classification and for improved management and inter-governmental relations are also included. Details are shown in the following six chapters and Appendix.

The report is based on engineering analysis of existing status of roads and streets compared to standards of design and maintenance required for future traffic. Projections of past trends to 1980 indicate:

- A population gain of 400,000—all in cities—with a statewide total of 3,150,000
- A 40 percent rise in number of motor vehicles—reaching 1,800,000
- A 70 percent increase in total travel—reaching 20 billion vehicle miles annually.

Some 63 percent of all travel is on rural and urban State Primary Highways, 19 percent on other urban streets, and 18 percent on secondary roads.

System Classification

Revision of present road systems, and establishment of municipal street systems, were found to be essential for logical engineering analysis and as a basis for better management and proper financing. Proposed systems are recommended for legal adoption after further official study of details, but retain the basic principles and limits indicated in this report. Costs reported here are based on the recommended systems.

The proposed State Primary Road System should be limited by legislation to 8,400 miles, rural and urban. The State Highway Commission should be required to establish a rural and urban freeway system, not to exceed 2,000 miles (including the 700-mile Interstate System), within the State Primary Road System. Although 500 miles are not proposed for completion by 1980, this entire freeway system includes routes which sooner or later will require construction to standards similar to those on the Interstate System.

The Commission should be given full administrative and fiscal responsibility for all proposed Primary Roads inside municipalities, similar to its responsibilities in rural areas, thus changing its present permissive authority to a mandatory responsibility.

The general assembly should consider proper disposition of the 1,900 miles of existing State Primary Roads that provide mainly local, not statewide, service. These should be transferred to counties and municipalities, but if retained as a state responsibility, they should be treated like county roads or city streets, financed separately, with no other roads or streets added.

The existing 34,000-mile Farm-to-Market System should be reduced to about 32,000 miles by eliminating routes not part of the Federal-aid Secondary System. Then, about 12,000 miles of the more heavily traveled revised Farm-to-Market System should be established as a County Trunk Road System and the balance termed "County Feeder Roads." The general assembly should limit the total extent of County Trunk Roads, and require State Highway Commission approval of selection and revisions.

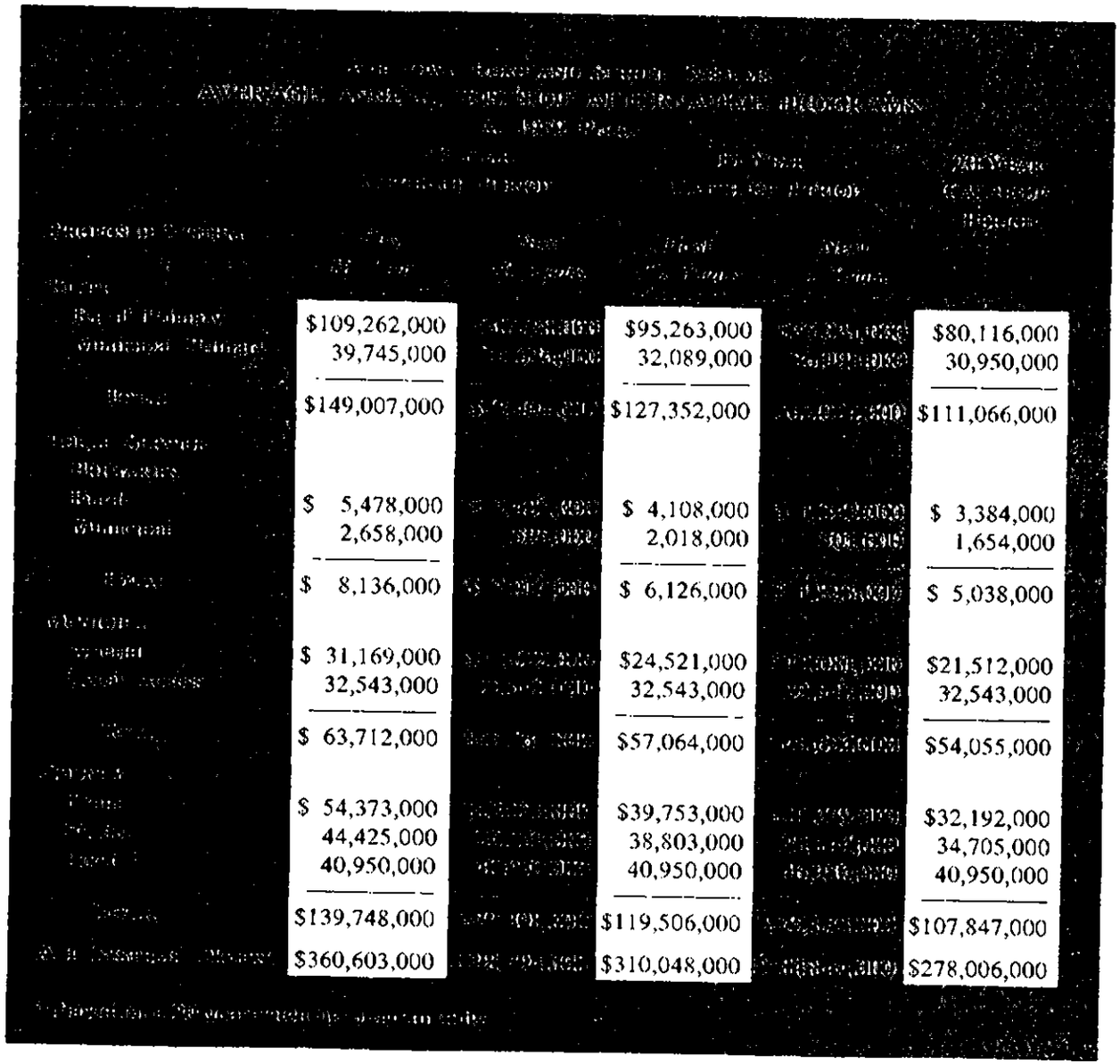
Similarly, legislation should require that the 12,000 miles of municipal streets be classified into State Primary, City Arterial and Access Streets. Primary routes, totaling about 860 miles, should be selected by the Commission, which should also assist and approve municipal selection of Arterial Streets, totaling about 2,300 miles. Legislation should limit combined primaries and arterials to 30 percent of total street mileage in any municipality.

Legislation should require local governments to establish, with State Highway Commission approval, minimum design standards for improvement of each class of roads and streets, other than Local Secondary Roads and Access Streets. When state aid is used for such improvements, the law should require construction to such standards, or better.

Other legislation recommended includes repeal of existing law prohibiting diagonal roads; authority for the Commission to transfer to other jurisdictions, without arbitrary restrictions, any Primary Road whose function has been superseded by new location; and clarification of responsibility for State Park and Institutional Roads. On this last point, it is suggested that the respective boards or commissions be made fully responsible for final decisions and for costs of improvements and maintenance. The State Highway Commission, however, should be required to provide desired services at cost.

Alternative Programs

At 1959 prices, the accompanying table shows estimated total costs, including construction, maintenance and administration, for 10, 15, and 20-



	$109,262,000	$95,263,000	$80,116,000
	39,745,000	32,089,000	30,950,000
	$149,007,000	$127,352,000	$111,066,000
	$ 5,478,000	$ 4,108,000	$ 3,384,000
	2,658,000	2,018,000	1,654,000
	$ 8,136,000	$ 6,126,000	$ 5,038,000
	$ 31,169,000	$24,521,000	$21,512,000
	32,543,000	32,543,000	32,543,000
	$ 63,712,000	$57,064,000	$54,055,000
	$ 54,373,000	$39,753,000	$32,192,000
	44,425,000	38,803,000	34,705,000
	40,950,000	40,950,000	40,950,000
	$139,748,000	$119,506,000	$107,847,000
	$360,603,000	$310,048,000	$278,006,000

year "catch-up" periods for each proposed system. Total costs from 1960 through 1980 would be about the same, regardless of which program may be adopted.

Summation of average annual costs for all systems indicates:

Per Year

$278,000,000 for a 20-year "catch-up" program
310,000,000 for a 15-year "catch-up" program
361,000,000 for a 10-year "catch-up" program

Higher annual cost over a period of ten years, for example, would permit acceleration of work to overcome the backlog of existing needs in 10, rather than 15 or 20 years, following which costs could be reduced for a time. Each "catch-up" program also includes new needs that would accrue in the period.

Those costs can be compared with the following 1959 expenditures, from all sources of revenue, on roads and streets, under the three general jurisdictions:

State *(Rural and Municipal)*	$109,500,000
Municipal	32,500,000
County	88,000,000
Total	$230,000,000

Other comparisons may be made as follows:

	1959 Expenditures	1960-1980 Annual Program Cost
Per Vehicle Mile	2 cents	1.7 cents
Per Registered Vehicle	$177	$178
Per Capita	$ 84	$ 95

Needs, 1960-1980

For proposed rural State Primary Roads, 5,600 miles of two-lane highways will require construction or reconstruction. About 1,500 miles of multi-lane highways will be needed prior to 1980, of which all but 213 miles would be Interstate and other Iowa freeways. Rural freeways, including Interstate, would cost $716,000,000—about 55 percent of all basic construction on rural Primary Roads.

About one-third of the proposed rural Primary Road System is now intolerable; the cost to improve this backlog is $373,000,000. Backlog costs of that system in municipalities totals $144,000,000. For other systems, backlog data follow:

System	Percent of Miles Intolerable	Construction Cost
County Trunk	70	$340,000,000
County Feeder	20	136,000,000
Local Roads	38	363,000,000
Arterial Streets	32	126,000,000
Access Streets	50	278,000,000

The 20-year programs contemplate that, when completed, all County Trunk roads would be paved, and a total of 9,000 miles of light paving or dustless surfaces would exist on Feeder Roads, compared to 1,000 miles now. Some 15,000 bridges would be built on all county roads.

Estimates provide for paving all Arterial Streets by 1980, and for dustless surfaces on all but 500 miles of Access Streets. The latter now have over 4,000 miles of gravel or earth surfaces.

Of 20-year total costs, maintenance is a substantial proportion, ranging from about 11 percent on State Primary routes to 45 percent on county Local Roads.

Safety

This study, in every phase, has considered feasible engineering means to cut the accident and death toll. Specifically, the following steps have been included to improve the situation:

1. A proposed rural and urban freeway system —the safest highway design
2. Improved design standards, on all roads and streets, encompassing the best known safety features economically feasible
3. Proposals for improvement of highways to those standards
4. Greater planned consistency of route development
5. Special studies of traffic operation needs for improved maintenance, signs, signals, and other control devices
6. Management proposals that would aid in improving coordination and action on highway development for maximum safety.

Safety must go hand in hand with efficiency and economy of highway travel. All have been considered jointly in making the report of costs and recommendations of this study.

Management

The scope and size of continuing programs just summarized require the most advanced management techniques and modernized laws possible.

State Highway Commission

By general standards of competency and efficiency, the Commission and its staff measures up to the work assigned to it by the general assembly. The Commission is in the process of continual self-examination, aiming for further improvements. Looking to the future, many recommendations of this study call for further adjustments, both in responsibilities and in methods of discharging them—building on the good foundation already laid.

It is recommended, however, that legislation be enacted to define the proper role of the Iowa State Highway Commission as a policy-making body, and to constitute an Iowa State Highway Department, whose chief executive officer should be the Chief Engineer, responsible to the Commission for carrying out its approved policies, for operating the Department, and for recommending revised policy.

Headquarters reorganization now underway conforms to accepted concepts of management, with business, planning and engineering functions, each consolidated under a head responsible to the Chief Engineer. District organization should be studied in a manner similar to that of headquarters. As a general policy, however, it appears that the Commission has adopted a centralized organization, delegating only limited duties to the districts, and leaving some confusion concerning authority, responsibility, duties and supervision. The Commission should consider further decentralization, including design functions, and clarify responsibilities along staff and line principles.

More broad-gauged advance planning of areas, regions and route corridors, and in cities, should be accomplished by Department engineers. Steps are now being taken to improve this work, as well as advance scheduling of project design and construction.

About $270 million worth of right of way is needed prior to 1980 for rural and urban Primary Roads. Improvements in laws relating to right of way are needed, including: a method of providing immediate possession, pending final settlement; exchange of unused land for other needed property; and provision of a revolving fund for advance purchases.

Legislation should also expand Commission activities in cooperative relations to municipal street programs—providing for similar responsibilities to those now established or proposed for county roads. This should include research activities financed from special funds, but exclude direct control of funds and letting of contracts, except on Primary Roads. At least one urban engineer should be appointed in each highway district, and state traffic engineering service should be provided to smaller municipalities at cost, upon request.

Cities and Towns

The general assembly should create an Arterial Street Fund, require five-year advance programs in larger cities, and provide for annual reports from all municipalities.

Larger cities should be required to provide competent continuous engineering supervision for street work, as a prerequisite to state aid. All municipalities should be required to designate one responsible official to represent the city when dealing with state or county officials on street matters.

Master planning activities should be stepped up in larger cities, including perpetual inventories of facilities and traffic along lines suggested by the National Committee on Urban Transportation.

Only about 10 percent of municipalities under 5,000 population regularly employ engineers or consultants for street work. Many towns are too small for efficient maintenance or construction activity. Legislation is needed to permit and encourage smaller municipalities to contract with adjoining cities or with counties to provide construction and maintenance service at cost. An alternative would be to give full responsibility for main streets, other than State Primary routes, to counties if complex fiscal and other inter-governmental problems can be resolved. To qualify for Arterial Street Fund state aid, each community should show evidence of adequate engineering service.

Counties

Legislation should provide that boards of supervisors be restricted to policy-making—not personal direction of maintenance or other activities that should be under direct executive charge of the county engineer.

Law should provide that the county engineer must be employed from among engineers approved by the State Highway Commission. Employment should be for a definite term of five years, after a one-year probationary period, with later removal only for cause. The county engineer should be given full executive control and be fully accountable and responsible to the board of supervisors. Five-year advance programs for each county road system should be prepared and kept up to date.

Equipment revolving funds should be established, and cost accounting, including appropriate rental rates for all equipment, should be required in all counties. Uniform accounting systems should be established in cooperation with the State Highway Commission, to provide correct construction and maintenance costs on each system—data not now available.

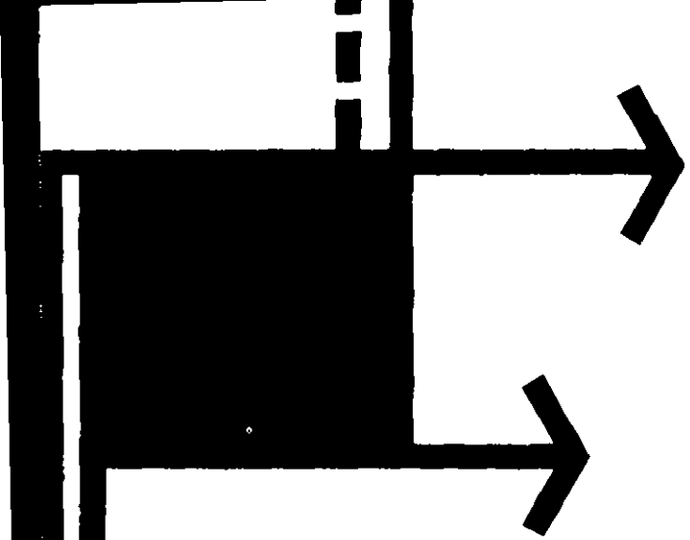
Maintenance standards should be developed, adopted and followed in all counties.

Both counties and cities are handicapped by lack of authority to deal adequately with growing suburbs of cities and towns. Legislation is needed to strengthen county planning laws, giving official power to control new road and street development, including establishment of minimum design standards and uniform platting requirements. Cities and counties should be authorized to work out joint arrangements in those matters that affect both agencies of government.

Finally, the basic data of this study should be revised periodically, kept up to date, and used for future development planning, management analysis and fiscal review, with reports to the general assembly on progress and problems.

Left: Iowa's dependence on highway transportation is made all too clear by heavy snows. Shown here are some 75 trucks near Davenport blocked by the blizzard of February, 1960. Such conditions are of short duration. Drifts are soon removed and traffic movements resume.

Above: Back in 1918 this truck, so called, had limited service in winter and was of little use during the spring breakup and periods of heavy rain. Iowa's determined attack on poor roads has paid tremendous dividends.



HIGHWAY USE AND BASIC RESOURCES

Where people live and how they make their living control the location and kinds of highway service they need.

Iowa's economy has changed vastly over the years. In the last decade industry has made notable gains; more and more people are living in urban areas. These and other factors are shaping Iowa's highway transportation future.

Basic resources are of little value unless there is transportation—the better the transportation the more useable resources become. The rich lands of Iowa attracted people who struggled with boats, wagons and horses to meet their early needs for transportation; later they turned to rails and still later to constructing mud-free, year-round roads.

Rapid transportation and communication of all kinds contribute to economic growth and exchange of the products of labor. They lower production costs to benefit more people. Transportation has brought Iowa economic health, wealth and world-wide markets.

Resources of Iowa—people, land, geography and productive capacity—are reviewed in this chapter to help understand prospects for the future. After more than a century of growth, what are requirements for highway service today and for the years immediately ahead?

Forecasts of Highway Use

Forecasts of probable future travel are needed for highway planning and design (on which costs are based) and for estimating income for road and street purposes. Projections of past trends in population, motor vehicle ownership and travel indicate a steady but unspectacular increase during the next two decades. This is consistent with the healthy outlook for Iowa's economy.

People

Iowa early gained reputation as a rich land when people discovered and reported that corn grew taller there than any other place in the world. Floods of farmers brought a rather uniform and complete occupation of the land by 1900 and formation of many small and some larger communities, primarily to serve agricultural needs. In that year, there were already 2,232,000 people in Iowa. The state was then a "mud road" state.

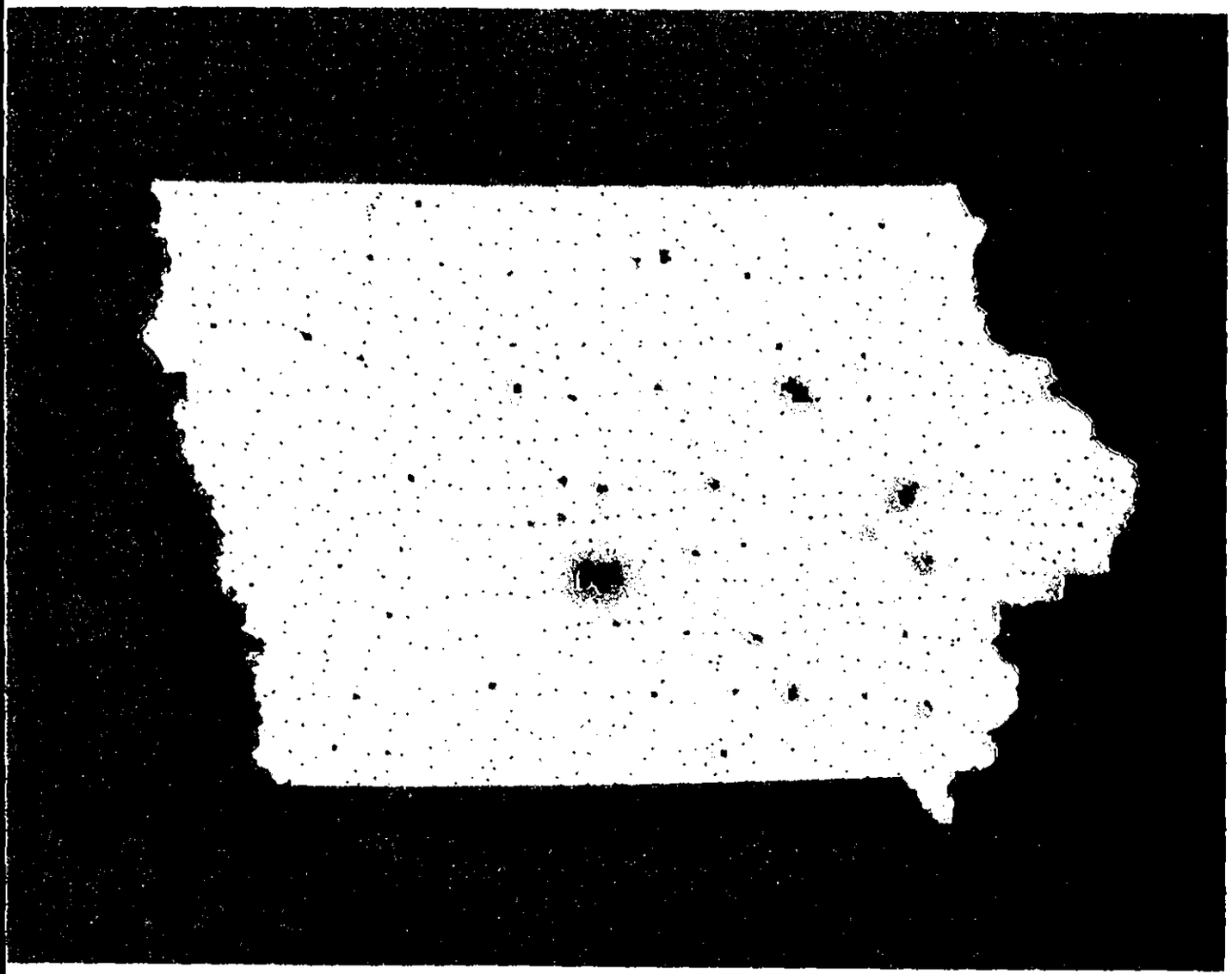
The population of Iowa in 1960 was 2.75 million. This was attained following a period of rapid growth prior to 1900 and slower growth thereafter, as shown in the chart on Page 13. In 1960, the population in cities over 2,500 slightly exceeded rural and small city population for the first time. Some two-thirds of the people live inside incorporated places. Based on expected growth of industry, and the gradual decrease in rural population prevailing over the last six decades, all of the 400,000 increase in population anticipated in Iowa by 1980 will go to cities.

Although there should be over 750,000 people still living in rural areas in 1980, the tendency toward city living will add to the burden on existing streets in many communities. Growth in city population usually requires more land to be occupied by urban dwellers. Roads and streets must be improved and new ones built to carry increased traffic between central business districts and other important points of traffic interest.

At the same time, while farms and small communities are decreasing slightly in total population, these areas will continue to require adequate highway service.

Motor Vehicles

In 1959 there was one registered motor vehicle for every 2.2 persons in the state. If all 1,296,000



This map reveals that density of population in rural areas varies little from county to county. Cities and towns are dispersed throughout the state, but in greater density in the eastern than in the western half. Rural population is portrayed in black; municipal population in red.

vehicles were in use at the same time, there would be only 455 feet of road or street for each.

Despite depression and wartime restrictions, the rate of increase in motor vehicle registrations during the last half century averaged about 250,000 vehicles per decade. That was two and one-half times greater than the rate of population increase in the same period, indicating the rapid spread of motor vehicle ownership.

As shown in an accompanying chart, the present outlook is for continuance of the long-term upward trend in total motor vehicle registrations, assuming economic conditions remain favorable. Probably 500,000 more vehicles will be owned in Iowa by 1980, bringing the total to nearly 1,800,000.

Travel

Passenger cars, trucks and buses in 1959 were driven a total distance of 11.6 billion miles on roads and streets of Iowa. This is equivalent to 9,000 miles for each motor vehicle registered. At 10 cents per mile of travel this means an expenditure of somewhat over a billion dollars—one-fifth of the state's income.

Volume of travel in 1959 was about six billion vehicle miles greater than it was in 1939, having more than doubled in that period, as may be observed in the accompanying chart. An increase of another eight billion vehicle miles is anticipated in the next two decades—a 70 percent increase over the 1959 amount. This will be the result of more people, more vehicles and greater individual use for continued economic growth—provided roads and bridges are adequate to permit such travel growth. About one-fifth of all travel is by trucks—a proportion which has been growing slowly for some time, and may increase slightly in the future.

Economic and social activities of farmers and

city people are so intertwined, partly through the more extensive use of motor vehicles, that all road and street systems provide a considerable service to both groups. Traffic studies reveal that residents of non-incorporated areas generate 36 percent of total travel. They produce one-third of all travel by Iowans on State Primary Highways, and, as would be natural, two-thirds of the travel on farm-to-market roads and three-fourths of that on local rural roads. But rural people also are responsible for 20 percent of the travel on municipal streets.

On the other hand, residents of incorporated cities and towns generate 64 percent of the total travel by Iowans. They produce two-thirds of the travel on State Primaries, one-third of the travel on farm-to-market roads, a fourth of that on local rural roads, but city and town people account for 80 percent of the travel on streets.

Economic Review

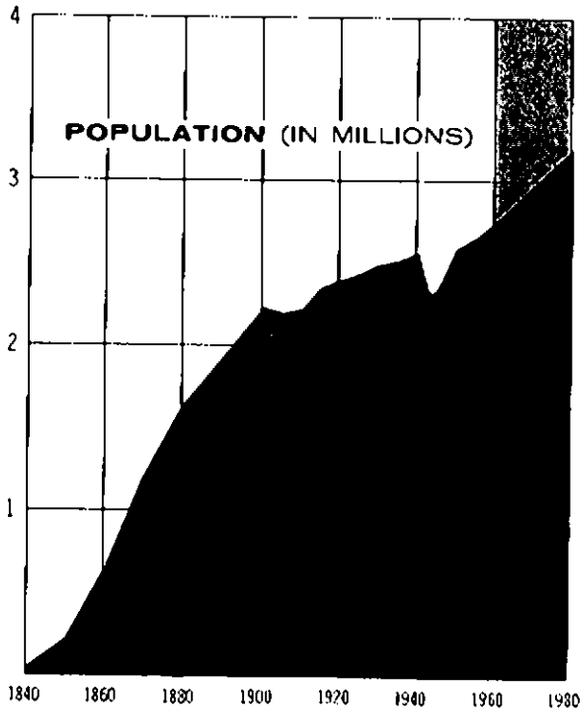
Natural resources, agricultural, industrial and business activities, and their distribution in the state, greatly influence highway requirements. The nature of Iowa's economy reveals solidly-based, well-diversified sources of income, dispersed generally throughout the state. This gives assurance of a steady growth in the state's economy and, as previously indicated, in vehicle ownership and travel—in themselves good indicators of economic conditions in localities, regions and the nation.

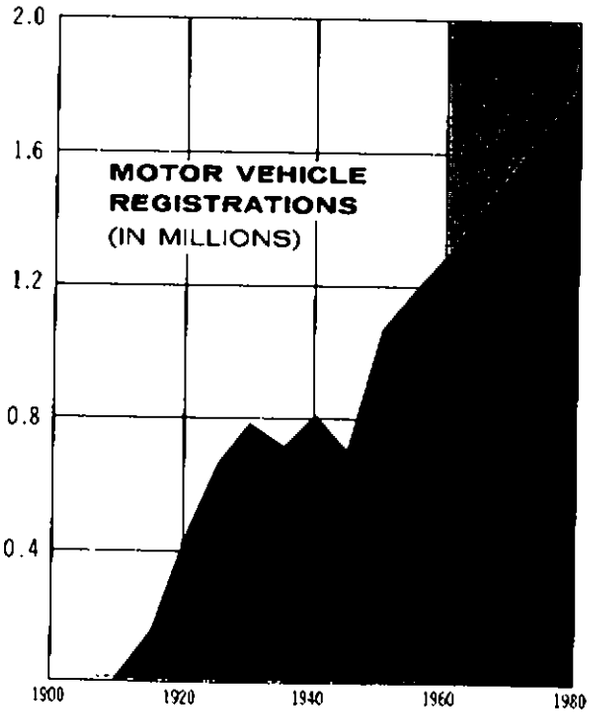
A 1958 report by the Governor's Commission on Economic and Social Trends in Iowa stated in part ". . . economic, industrial and agricultural progress of the State of Iowa will depend in great measure on the type and quality of transportation which its leaders provide for it."

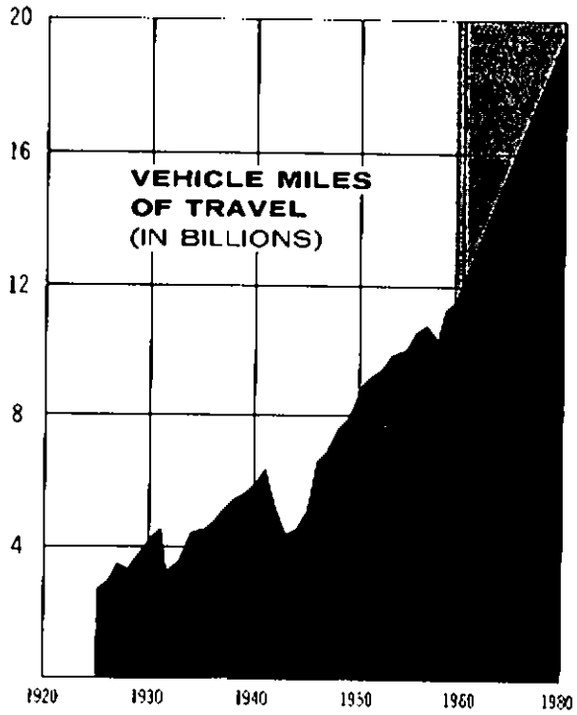
Personal Income Sources

Income of Iowa people in 1959 totaled $5.1 billion, of which nearly half was derived from salaries in industry, trade, transportation, business services and government. Another 30 percent came from property, non-farm proprietor's profits, pensions and insurance benefits.

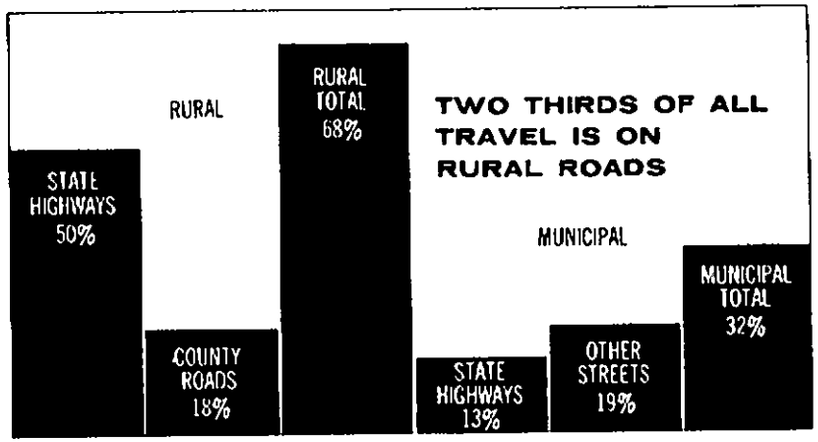
Farm proprietors and labor received about 21 percent, or nearly $1.1 billion—the largest single category of income, as shown in the table on Page 16.



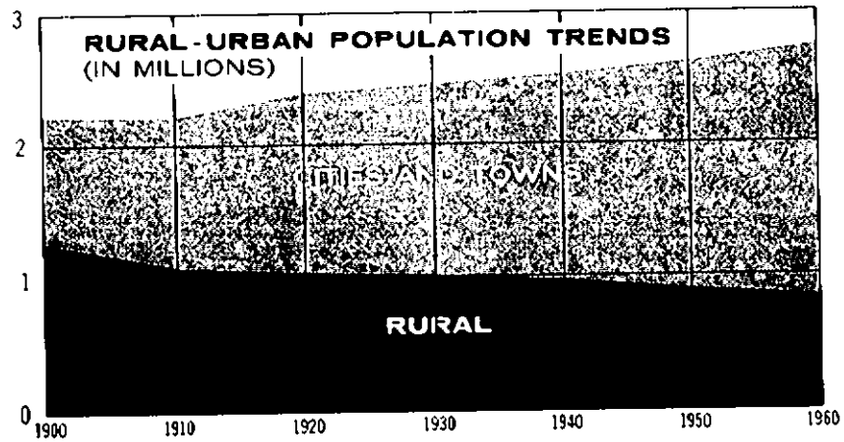




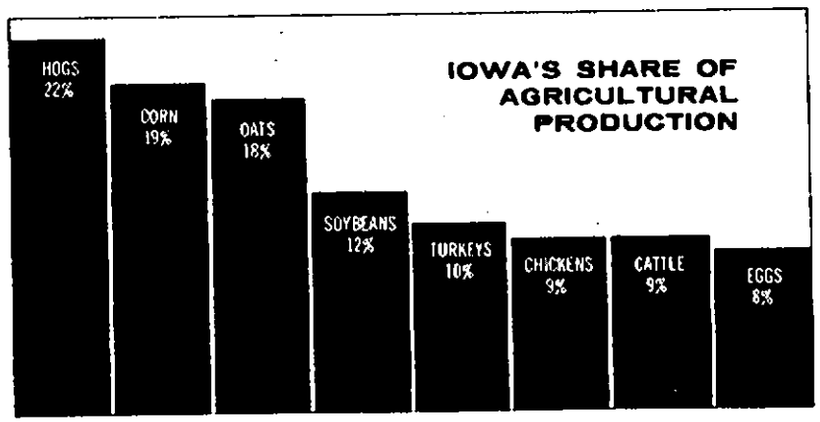
Of the 11.6 billion miles of motor vehicle travel in Iowa in 1959, 50 percent was on rural State Primary Highways, 18 percent on county roads, 13 percent on extensions of Primary Highways into and through cities and towns, and 19 percent on other municipal streets.



About two-thirds of the state's population now lives in incorporated cities and towns. Since 1900 the steady growth of urban population has more than offset the gradual decline of rural population. Trends in population growth indicate that three-fourths of the net increase in population between 1960 and 1980 will go to the seven largest cities. The balance will be divided among the smaller cities.



Iowa ranks second among the states in total value of agricultural and livestock production.



Manufacturing is the next largest single source of income. Its geographic distribution among a number of smaller centers means extra income possibilities for farm operators and farm labor. This helps to balance agriculture and industry—improving chances for economic stability and growth. Evidence is that, while Iowa does not have the potential for a rapid rise in manufacturing, nevertheless, nationwide decentralization of industry and increased farm mechanization, plus a good labor supply in Iowa, will encourage steady growth.

Examination of special aspects and geographical distribution of the components of Iowa's economy is necessary to measure their influence on highway travel and needs.

Natural Resources

Iowa's natural resources are few in number but of great importance to the state and the nation. Most important of all are the rich, dark soils which blanket much of the state. Twenty-five percent of the grade A agricultural soils in the United States are in Iowa.

These soils, and a climate favorable for growing cereal and forage crops, give Iowa first or second place in the nation for several agricultural products.

Mineral resources of Iowa consist of clays, shales, limestones, sand, gravel, gypsum, and bituminous coal. Clays suitable for one or more clay products are found in nearly every county. Shales for special clay products and for use with limestones in the production of portland cement are found in the central, north central, and eastern portions of the state. Limestones suitable for use as road metal or coarse aggregate for concrete are found in extensive deposits in the same areas and at widely separated locations in southwestern areas. Large deposits of gypsum are found in

Webster, Des Moines and Appanoose Counties. Bituminous coal is found in a single large area of about 20,000 square miles in south central Iowa.

Sand of varying qualities for highway construction and building purposes is widely distributed. Gravel deposits suitable for highway construction and maintenance are found principally in the central, northwestern, and northern parts of the state and along the Mississippi River.

The presence and distribution of limestone, sand, and gravel deposits are of great significance in highway construction and maintenance. Areas lacking deposits of any of these materials suffer high costs for importing them for highway purposes.

Agriculture

Farming is the leading industry in Iowa. In units operated, in employment and exploitation of natural resources, workers employed, in personal income received, and in contributions to the economy of the state and nation, it surpasses any other single industry in the state.

There are 193,000 farms in Iowa. Collectively, they encompass 95 percent of the 36 million acres of land in the state. In 1957 there were 336,000 farm workers employed. Receipts from sales of crops in 1954 were $440 million, and from sales of livestock products was $1.25 billion.

Although having only 1.89 percent of the total land area in the continental United States, Iowa receipts from sale of farm crops were about three percent of all such sales in the nation. Receipts from sales of livestock and livestock products were 11 percent of the national total, placing Iowa first among sales in this category, and second in combined sales of these products and farm crops.

Iowa annually supplies about seven percent of all farm products sold in the nation.

Initially, all farm produce in Iowa is moved over the highways, much of it to markets in nearby states.

Access to a public highway is essential to farm operations and to a standard of living on the farms comparable to that enjoyed by workers in other industries in the state. Farm operators depend exclusively upon highway transportation for initial movement of farm crops, livestock and livestock products to market. Over 90 percent of these products are moved by truck to markets in Iowa and surrounding states. About four million cases of shell eggs each year are distributed entirely by truck to 13 major markets, some as far distant as Boston, Atlanta, Los Angeles, and San Francisco; 98 percent of the 14 million pounds of frozen eggs that are processed annually in Iowa are trucked to eight major markets. The Iowa turkey industry, third largest in the nation, distributed 146 million pounds of processed turkeys, 90 percent of its production, by truck throughout the United States. Of all loaded dual-tired trucks on main routes in Iowa, 32 percent are carrying grain, feed, livestock or livestock products.

Farm land has attained full development in Iowa; all available land is occupied.

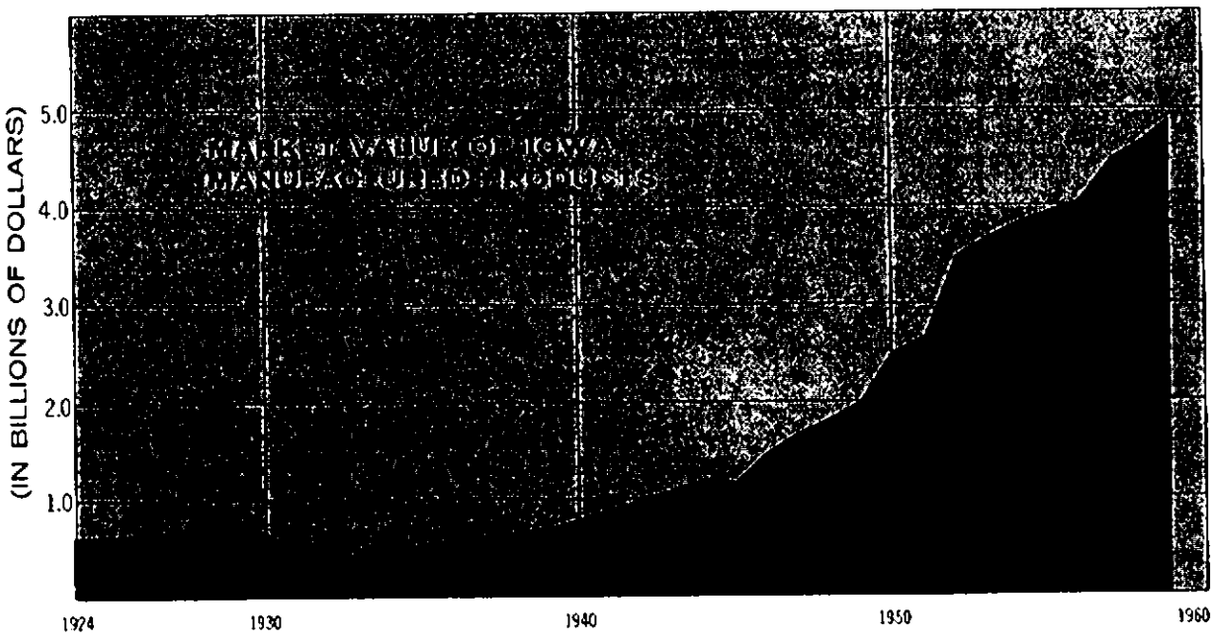
There is a small loss to city growth, to highway rights of way, and to industry. Agriculture is unable to expand in area. However, it can increase production, even with further reductions in acreage tilled and fewer farm workers.

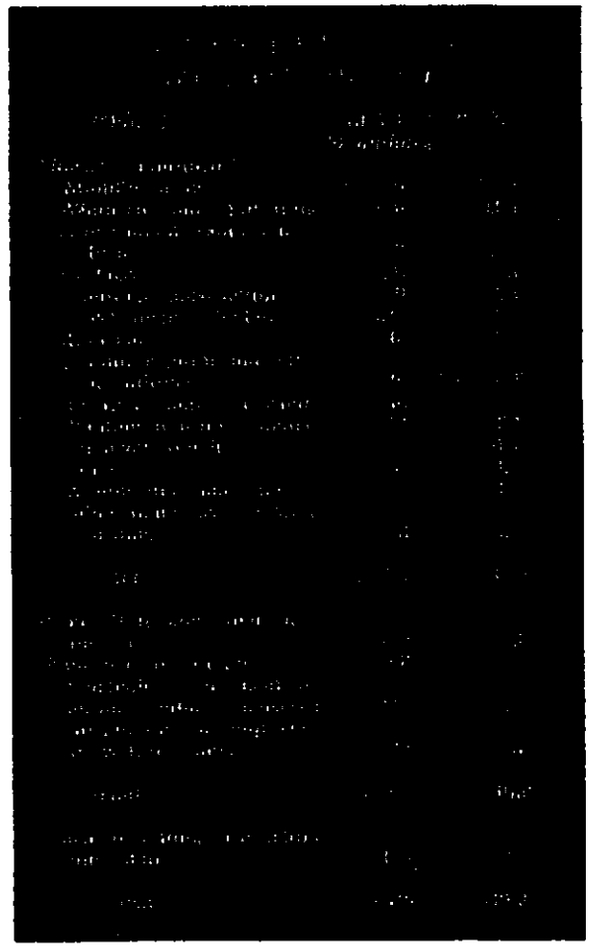
In 1954 the average farm in Iowa was 176 acres, which allows 3.6 farms per square mile of land area. This compares with 158 acres and 4.0 farms per square mile in 1930; farm population declined 20 per cent between 1920 and 1950.

Trends toward fewer and larger farms and fewer workers will probably continue for some time. This will tend to reduce the need for improvement of a few local roads. However, increased production will call for better main market roads on which traffic, particularly truck traffic, will be more concentrated.

Manufacturing

Manufacturing is an important segment of the economy of Iowa contributing much toward economic diversification, stability and employment opportunities. In 1959 there were 3,578 manufacturing and processing plants in the state. The 133 different groups of industries represented employed a total of 180,000 workers.





Total sales value of products was $5 billion, of which $1.6 billion was value added by manufacturing or processing in Iowa. Growth in manufacturing output is approximately three percent annually, about the same as for the nation. Much of the growth is due to shifts of industry to Iowa locations—mainly in or near the larger cities.

Some 22 groups of Iowa industries use agricultural products as inputs, and are especially important in the state's farm, as well as industrial, economy. Most plants in these groups are involved in preparation of food and kindred products. They employ about 30 percent of the workers engaged in manufacturing operations in the state. Eight of these groups of industries have outputs greatly in excess of consumption in Iowa. This includes meat, poultry, butter, animal feeds, and cereals.

There were 102 industrial groups with 2,226 plants in Iowa utilizing raw materials and products from outside sources. These industries make a wide variety of products for sale in other states, and employ about 70 percent of the workers in manufacturing.

Nine groups of industries utilize Iowa non-agricultural raw materials and products. The principal outputs of these groups are portland cement, brick, tile, clay pipe and block, concrete products, and gypsum board and blocks. These products are distributed principally to markets in Iowa and nearby states and to some regions more distant from Iowa. Mining and processing of gypsum is a rapidly growing industry. Iowa produces 11 percent of the national output of gypsum products.

Importance of Transportation

The location of this vast complex of industries in Iowa is based primarily on the strategic location of the state with regard to sources of raw ma-

Above: While the population trend is toward urban centers many people enjoy recreational travel on weekends and holidays.

Below: A mark of the modern era of highway transportation is the outlying shopping center—this one is near Des Moines.

terials and relation to markets. For some raw materials, such as gypsum, farm crops, and livestock, Iowa itself is the source. In these cases, processing is undertaken virtually at the site of raw materials. For other raw materials Iowa lies on the route between the sources and markets for finished products.

For great quantities of raw materials and products such as iron, steel, and other metals, Iowa lies on the fringe of the producing region which is, in turn, the market for the finished products. But in spite of small additional costs of transportation, Iowa has an advantage in lower wage scales, lower plant site costs, and lower taxes, and has better plant space and environment for workers than many plants in the market area. Expansion and development of industry in Iowa is mutually beneficial to industry and to the state. Maintenance and improvement of good transportation—air, rail and highway—is essential to continued growth and to help offset the disadvantage of being outside primary markets.

Nearly all of the 180,000 factory employees get to work by bus or private automobile. At least one company operates its own bus service, picking up employees miles away. Raw materials, parts, and sub-assemblies flow into plants on precise schedules. A large percentage of finished products go directly by truck to markets throughout the country. Overnight highway transport service from suppliers hundreds of miles distant enables wholesalers and merchants to maintain small inventories and yet offer complete lines of the newest and freshest merchandise. Similarly, manufacturers and processors are able to operate at full efficiency without heavy investment in stocks of goods and warehouse facilities.

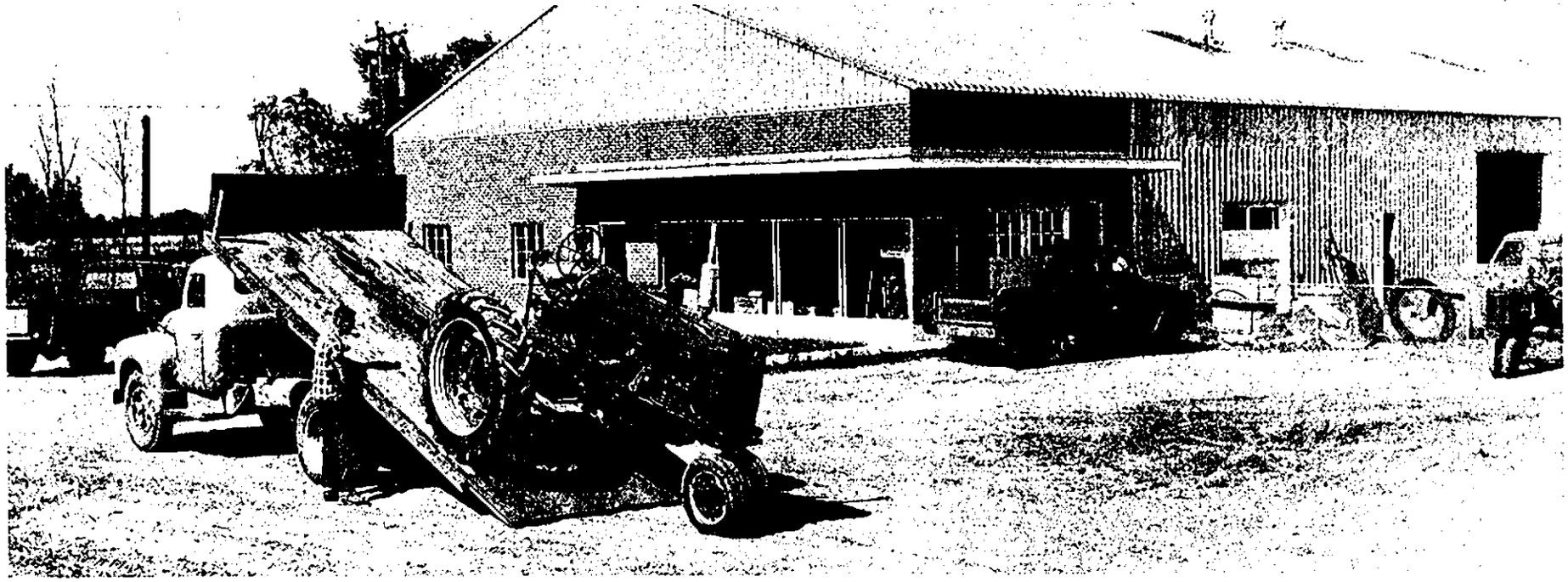
Such service depends on adequate highway facilities for convenience, freedom of movement, and efficiency of operation.

Other Activities

Much coal used in the state for generation of electric energy comes from the relatively small Iowa mining operations. Nearly all of the limestone, sand, and gravel used in the construction of roads, bridges, and buildings and for maintenance of the 112,000 miles of roads and streets come from Iowa quarries. All employ highway transportation extensively for the distribution of their products to markets or to points of consumption or fabrication into other products.

Printing, banking, insurance underwriting, wholesale and retail trading, and personal serv-

A commonplace sight today is transportation of farm equipment by truck—to the sales rooms and to the farm.



ices are important elements in the economy of Iowa. Collectively, income produced by this group of industries exceeds that from manufacturing and is second only to that from farming. Practically all periodicals, daily and weekly newspapers, and a great mass of printed material produced by the printing industry are distributed by highway transportation. The largest morning-evening daily newspaper relies on 450 trucks and cars for distribution to newsboy agent-managers. These vehicles travel a total of nearly five million miles annually. The newspaper which goes to press at 10 o'clock at night is in the hands of its subscribers in the farthest corners of the state at breakfast time the following morning.

Transportation Industry

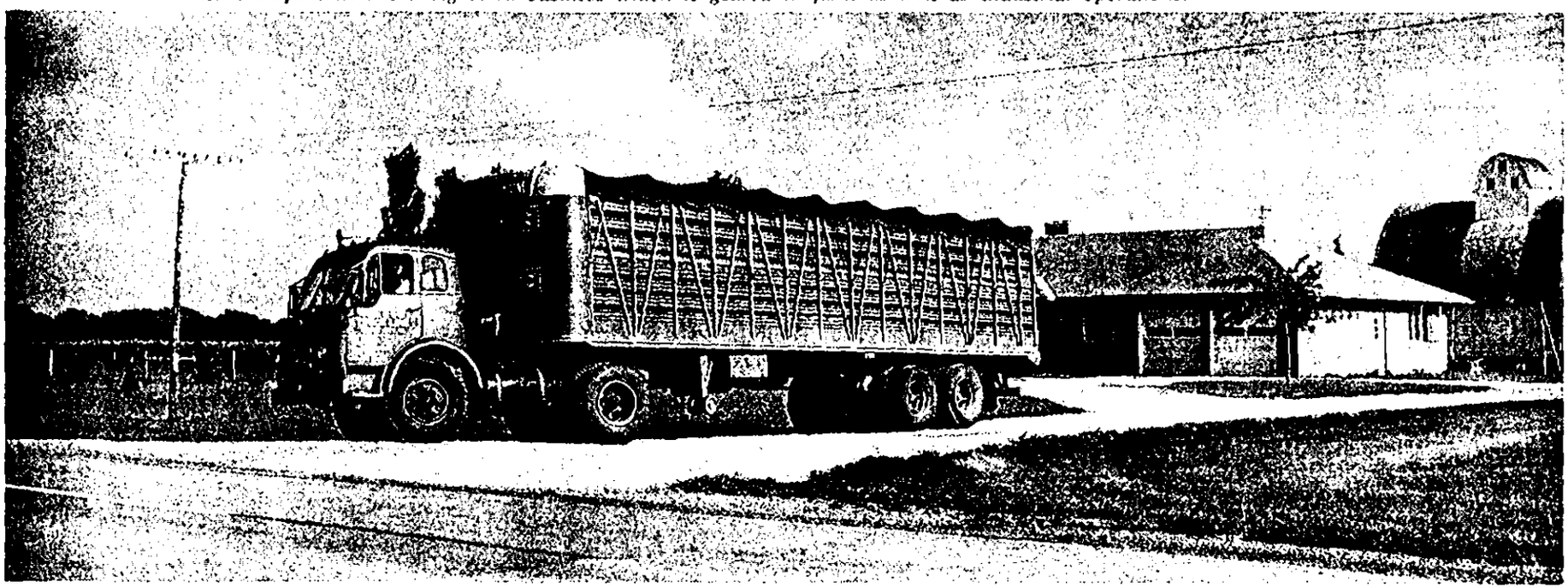
Truck transportation involving 240,000 commercial vehicles registered in Iowa, is a vigorous, thriving, and growing industry. It serves every farm, industry and activity in the state, including itself. Operators of motor vehicles of all kinds depend on tank trucks exclusively for delivery of gasoline and other motor fuel throughout the state to several thousand service stations. Thousands of homes are heated with oil delivered solely by truck. Iowa annually is now consuming a total of 1.75 billion gallons of gasoline and fuel oil, all delivered by truck transport from pipeline terminals. Huge storage facilities for individual outlets are unnecessary. Service stations and fuel oil depots, in effect, use storage tanks on wheels.

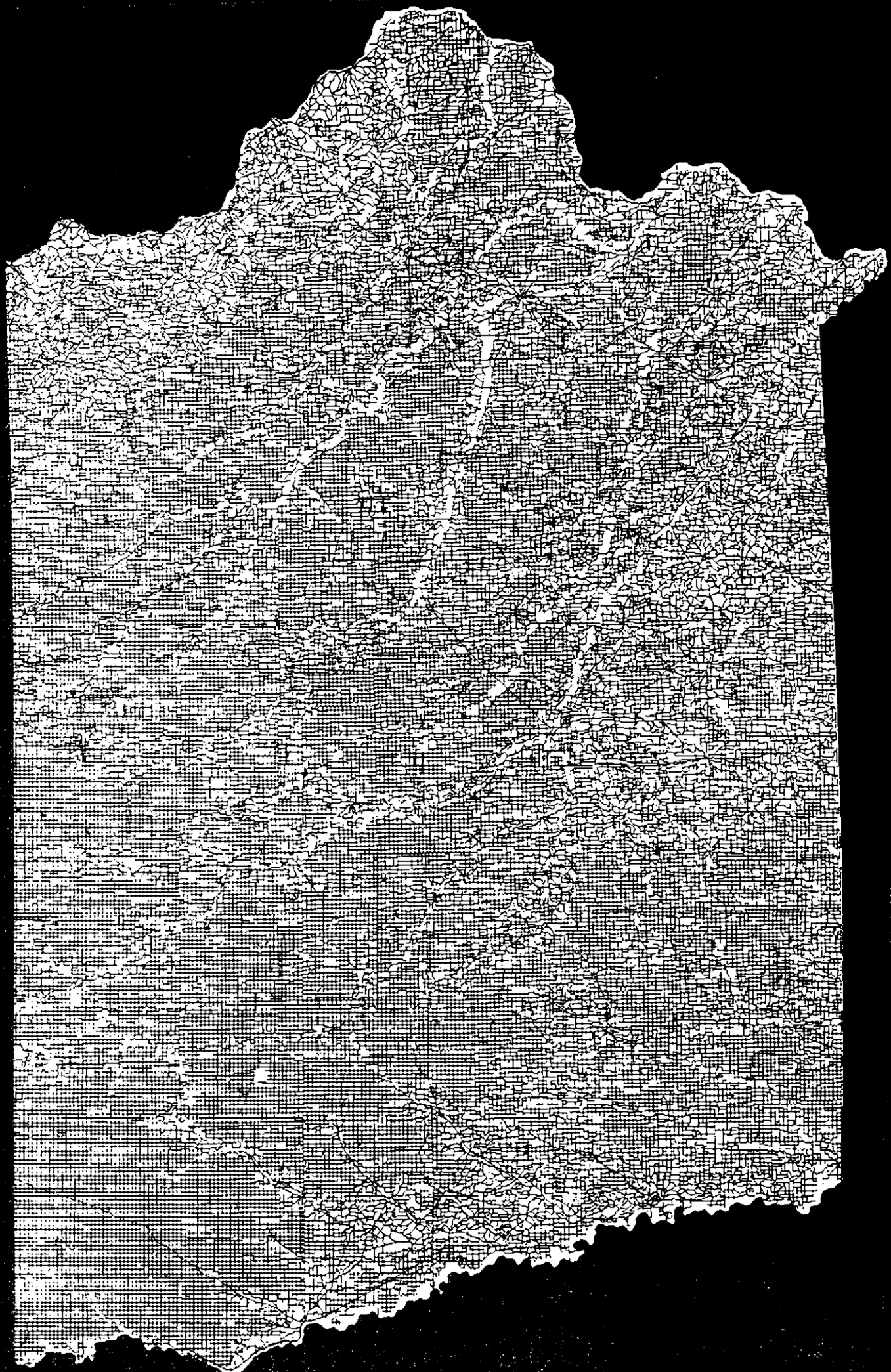
About 70 percent of all mail in Iowa is transported by truck. Over 65 percent of the rural highways in the state are covered by rural free delivery mail routes.

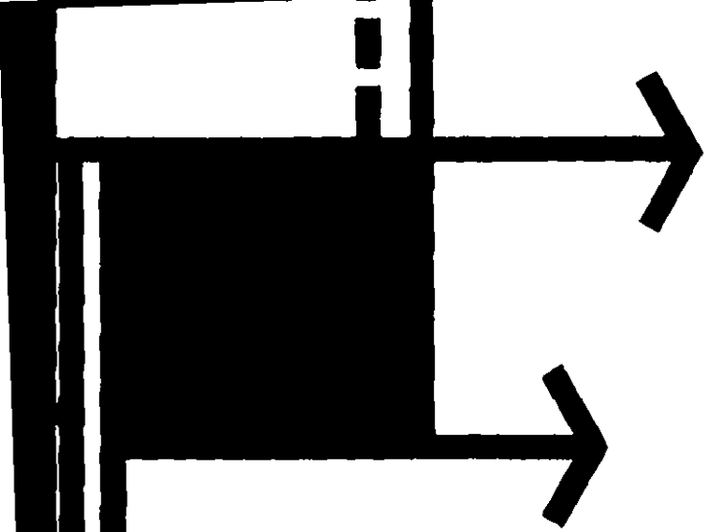
All motor vehicle transportation, including passenger automobiles and buses, involves current expenditures of over a billion dollars annually in Iowa. About one of every seven jobs in Iowa relates directly to highway transportation--sales and servicing of vehicles, building and maintaining highways, and related activities. Highways must be prepared to provide maximum efficiency, safety, service and economy to contribute to economic growth. Conversely, the influence of economic trends on future motor vehicle demand is great.

This review aids in setting the stage for classifying highways into efficient systems based on their function of serving people where they live and work, and in providing necessary interchange of goods, business and social activity essential to a bright economic future.

Truck transportation is a big Iowa business which is geared to farm as well as industrial operations.







PLANNED ROAD AND STREET SYSTEMS

To best serve Iowa's economy and traffic needs, roads and streets should be organized into systems, each consistent throughout with state, county or city transportation needs. Although efforts have been directed to that end over the past 50 years, existing systems still do not provide a completely adequate basis for planning, financing and management actions to provide maximum service at minimum cost.

This chapter points out the problems that have arisen, establishes criteria for an objective reorganization of systems, shows the specific roads and examples of streets proposed for each system, and points to the benefits that can be achieved. Moreover, the proposed systems are the basis for reporting needs and costs shown in the balance of the report.

Why Organize Systems?

Iowa's 1.3 million vehicles daily travel 33 million miles on the state's 112,000 miles of roads and streets. Most of the rural roads, shown on the accompanying map, were laid out during the last century and have been improved under, first, township and, later county and state management. A few streets carry traffic volumes in excess of 20,000 vehicles per day. Nearly 10,000 miles of roads serve less than 10 vehicles per day.

Many roads and streets serve primarily to provide access to land; others collect and distribute traffic to or from these access roads. Some carry relatively large volumes of trucks and passenger cars, many of them traveling long distances between major centers.

Roads or streets serving similar purposes should be grouped together, systematically interconnected throughout the areas they serve and then assigned to government agencies having primary interest in the type of service each system provides. That process is known as highway classification.

Organizing roads and streets into logical systems according to their predominant service function makes better management possible. Grouping like purpose roads and streets together greatly assists in providing equal service where conditions are similar. It gives legislators and administrators opportunity to recognize and meet the most essential needs in the order of their importance. When roads and streets are uniformly and consistently classified, it tends to reduce pressure for system changes, thereby giving each system stability and needed freedom from continual change. This in turn materially aids sound, long range planning and provides a logical basis for proper system financing.

Existing Systems

Present Iowa highway law provides for three basic rural road systems—State Primary Road System, Farm-to-Market and Local Secondary Road Systems (the latter two combined are known as the Secondary Road System). The law also provides for State Park and State Institutional Roads. Further; the law contains a general basis for selection of roads included in each system.

The State Highway Commission is responsible for selection of Primary System routes, and also must approve routes selected as Farm-to-Market Roads by the respective county boards of supervisors. It is evident that the intent of the law is to group rural roads on the basis of their relative importance to the state as a whole or to individual counties and local communities.

The law is remarkably silent about street systems in cities and towns, although some cities by

local ordinance or resolution have adopted arterial street systems and each city and town is given jurisdiction over streets inside their corporate limits. The law authorizes (but does not require) the State Highway Commission, subject to approval by respective city councils, to select, build and maintain "extensions of the primary road system" within cities and towns.

The accompanying table summarizes the mileage in each legal category and identifies the administratively responsible agency of government.

History of Highway Systems in Iowa

Prior to 1913 all rural roads were under township control. The first classification of rural roads into systems came in 1913 with the establishment of County Road Systems, composed of 10 to 15 percent of the rural road mileage, selected by and under control of county boards of supervisors. All other rural roads remained under township control.

A Federal-County Cooperation System was authorized in 1917 and a 6,000-mile system was designated in 1919, primarily to take advantage of 50-50 financing provisions of the Federal-aid Act of 1916. In 1919, the Federal-County Cooperation System was re-established as the State Primary Road System under the general supervision of the State Highway Commission. However, each county continued to build and maintain the mileage within its borders.

Significant changes occurred in 1929. Led by those who saw the broadening of community interest in rural roads and the greater efficiency of larger road units, complete control of all township roads was transferred to the counties. Full control, selection and administration of the Primary Road System had been transferred from the counties to the State Highway Commission two years earlier. In that year the Primary System included 6,800 miles of main rural roads and the County Trunk (formerly County Road) System, about 12,000 miles. The remaining 84,000 miles of rural roads constituted the Local Road System.

In 1939, legislation authorized a Farm-to-Market System to include the County Trunk System plus certain other local roads. In 1948 the Farm-to-Market Road System was enlarged to 34,000 miles. In 1957, the names County Trunk and County Local Road System were dropped. All roads under county control were designated as Secondary Roads, divided into Farm-to-Market Roads and Local Secondary Roads.

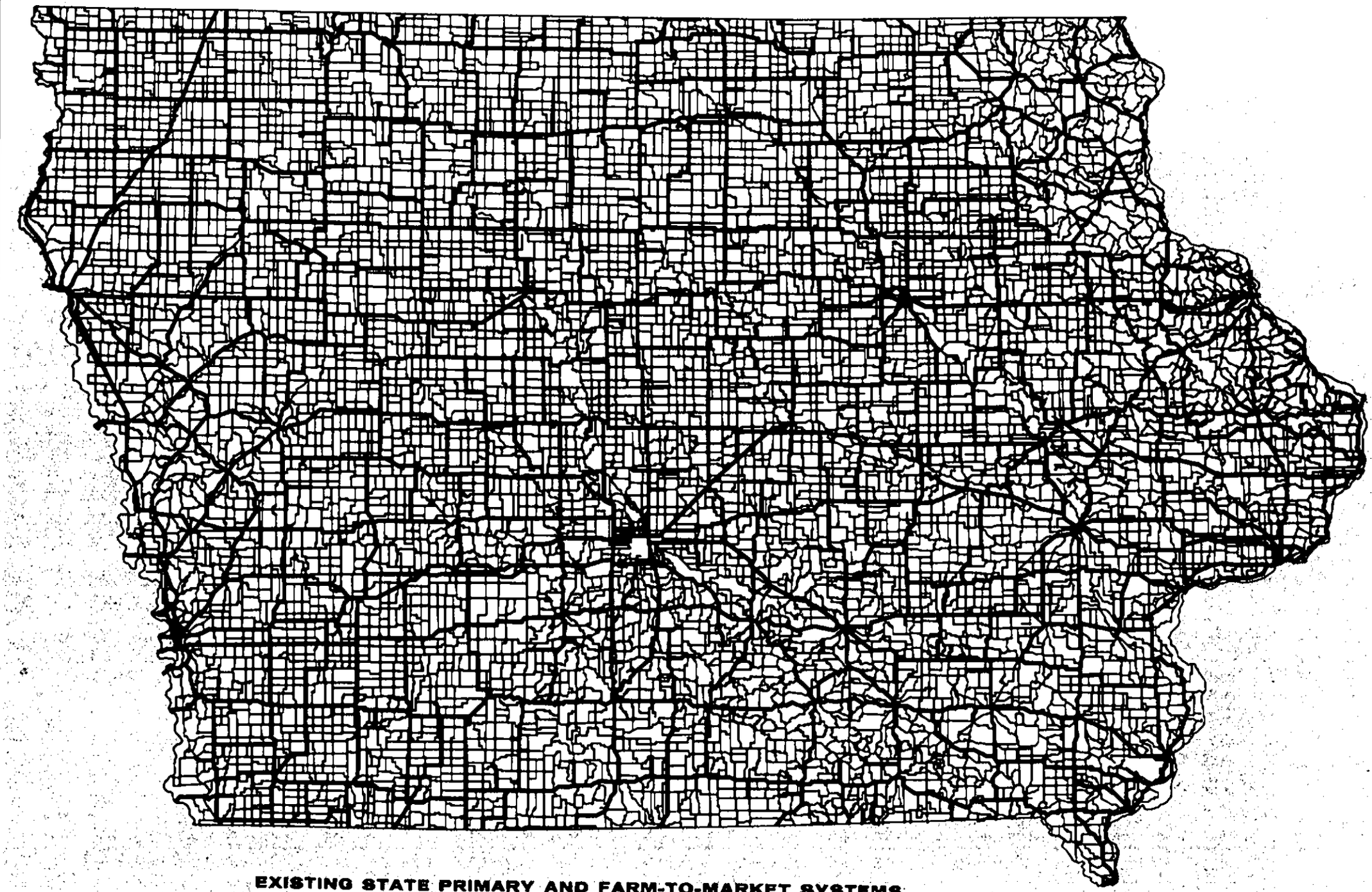
PRESENT ROAD AND STREET SYSTEMS

SYSTEM	RESPONSIBLE JURISDICTION	MILES
Rural		
Primary Road	State Highway Commission	8,706
Secondary Road	County Boards of Supervisors	33,973
Farm-to-Market Road		56,714
Local Secondary Road		
Total Secondary		90,687
Total Rural		99,393
Incorporated Cities and Towns		
Primary Road Extensions	State Highway Commission City or Town Councils	1,081
Streets	City or Town Councils	10,767
Total Incorporated		11,848
Special Areas		
State Park Road	*Board or Commission in charge of state park or institution	124
Institutional Road		150
Total		274
GRAND TOTAL		111,515

*Special provision for concurrent jurisdiction of State Highway Commission or county boards of supervisors on State Park Roads

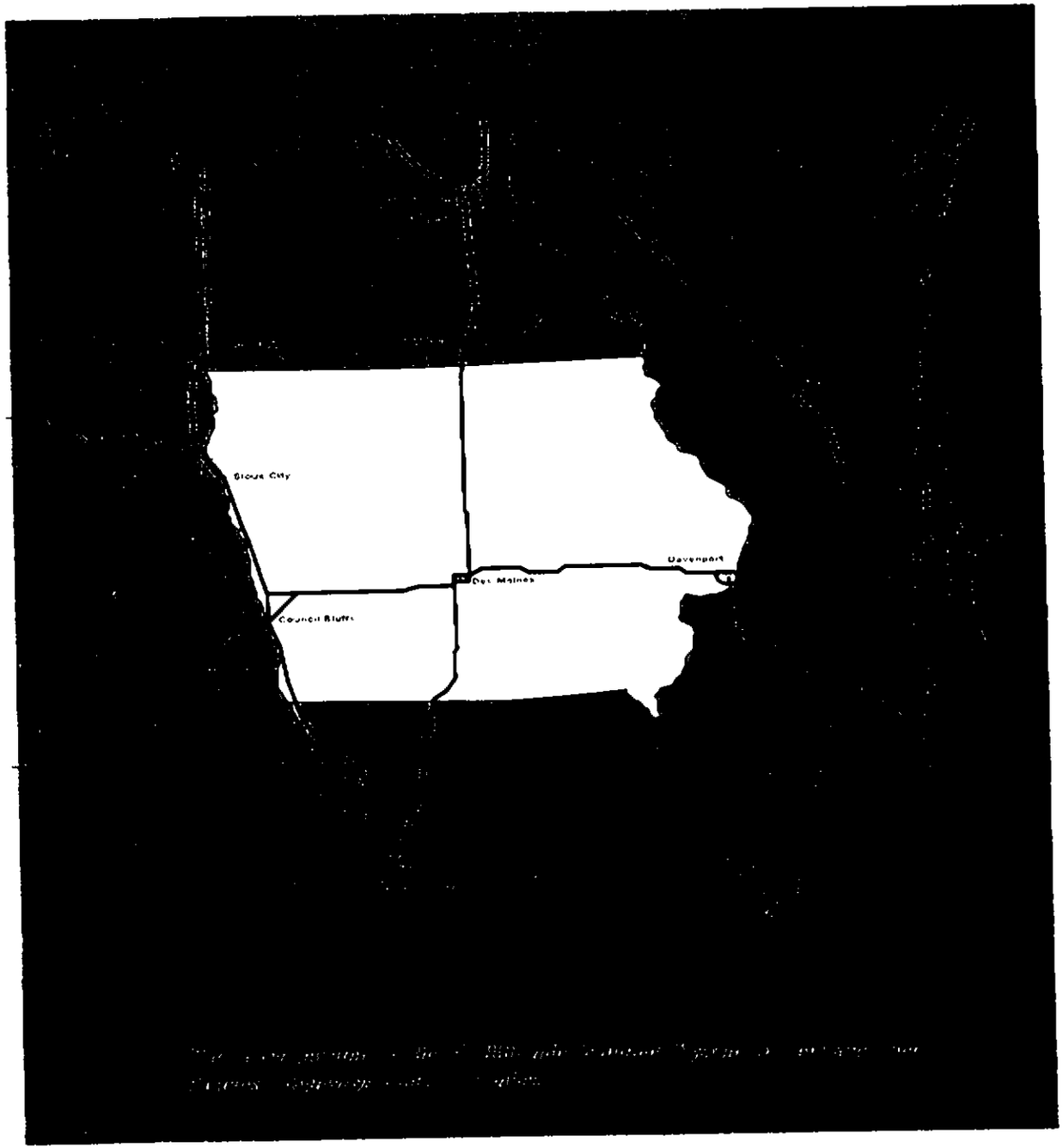
Federal Systems in Iowa

Since 1916 the Federal government has played an important role, cooperating with the states to improve specific classes of roads and streets. The Federal role has been limited to supporting improvement of major state, county and city roads or streets by providing Federal funds to match state or local funds in equal amounts up to the level of the Federal funds authorized. To insure prudent use of funds, Federal legislation specifies certain minimum requirements for eligibility of funds, including establishment of Federal-aid systems (these may or may not be coincident with state and local systems) minimum design standards, preparation of annual improvement pro-



EXISTING STATE PRIMARY AND FARM-TO-MARKET SYSTEMS

State Primary Roads are shown in black; Farm-to-Market roads in red. State Primary Roads, including extensions through municipalities, total 9,787 miles in length. The established Farm-to-Market Systems of the 99 counties total 33,973 miles.



grams, accounting for funds used, and proper maintenance following construction.

The Iowa portion of the Federal-aid Primary System authorized in 1916 was first selected in 1919. It included about half the roads in the Primary System. With the passage of time other routes were added until today this system, with few exceptions, is coincident with the existing State Primary System.

The Federal-aid Secondary System is today nearly coincident with the existing Farm-to-Market System (34,000 miles), and is the largest such system in any state. However, there are approximately 500 miles of Federal-aid Secondary routes on Local Secondary Roads and also 2,300 miles of Farm-to-Market Roads not a part of the Federal-aid Secondary System.

In 1944, the United States Congress passed a measure creating a 40,000-mile (later raised to 41,000-mile) National System of Interstate and Defense Highways to include those roads which are of greatest importance to the nation as a whole for purposes of interstate travel and national defense. The Iowa portion of this system has 711 miles covering three major routes as shown in the accompanying map. For the first time in 1954 the Federal government revised the traditional 50-50 matching formula and agreed to pay 60 percent of construction costs when matched with 40 percent funds supplied by the states. In 1956 the formula was revised to 90 percent Federal and ten percent state.

Basic Problems

More than 30 years have passed since the last comprehensive review of road and street classification in Iowa. Substantial changes in the state's economy, plus a threefold increase in motor travel are largely responsible for certain significant problems.

Local Service Primary Roads

While most Primary Roads provide mainline statewide service, detailed studies reveal some whose light traffic uses are similar to the more important Secondary Roads, and thus are improperly classified as Primary Roads.

Among these lightly traveled Primary Roads are 1,160 miles of short spurs whose sole function is to connect small towns (average size slightly over 300, none larger than 1,500) to main state highways.

Also, there are 740 miles of low traffic, non-continuous primaries whose only function is to provide cross connections between two main highways in sparsely populated rural areas.

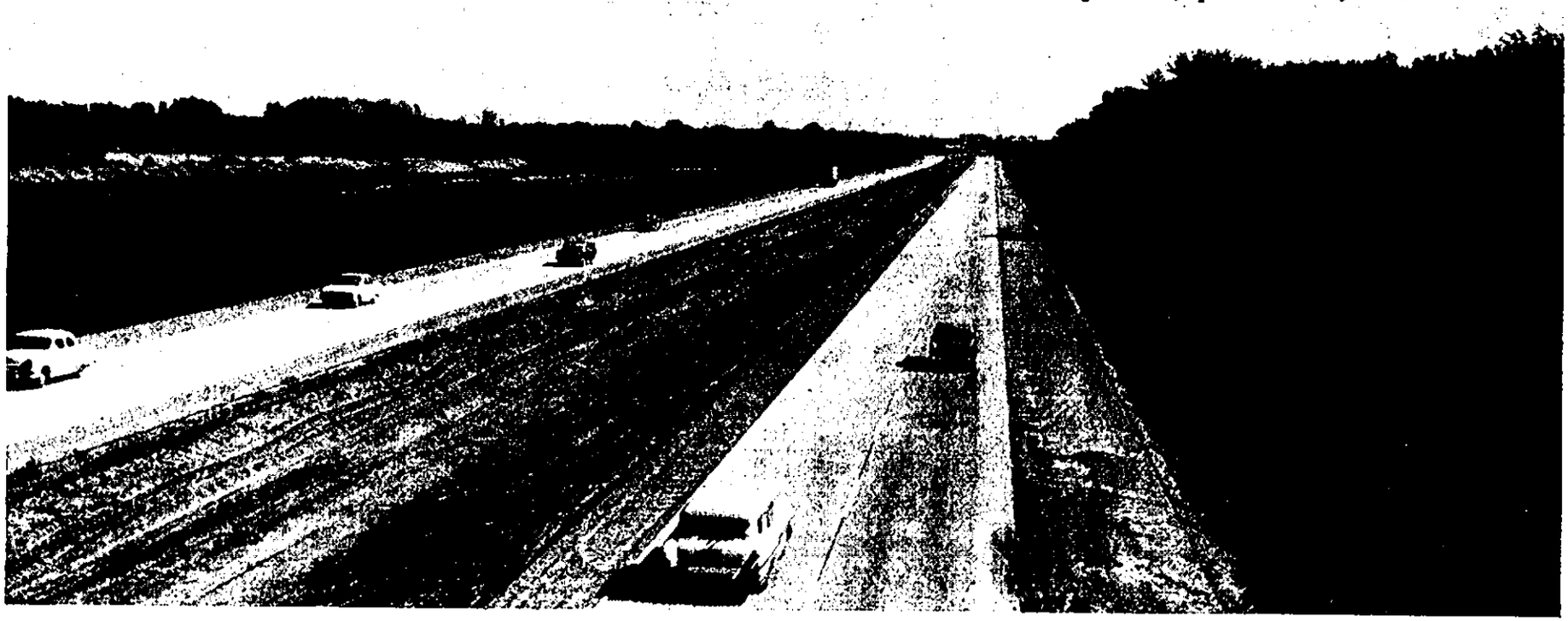
These 1,900 miles of lightly traveled spurs and cross connectors, now being built to state highway standards in rural areas and municipalities are needed and are important to the people located in the immediate area. However, since they serve only to collect traffic from small towns and local county roads, they should be improved to the standards of other roads in the state providing similar service; that is, to standards for Farm-to-Market Roads, or streets, not state highway standards. A substantial net statewide savings in construction and maintenance costs would result.

Rural—Municipal Continuity

By law, the Primary Road System is established as a rural system. Even though permissive legislation has been enacted authorizing urban extensions, the philosophy that the Primary System is a rural system has not disappeared. To achieve a fully adequate statewide transportation network, limitation of state interest on urban extensions to the ". . . width . . . of the (rural) primary road system" no longer is reasonable. This unbalanced interest in the component parts of the Primary Road System is typically expressed in the law—

"(Rural) Primary roads shall be maintained by the state highway commission and the cost thereof paid out of the primary road fund. Extensions of primary roads in cities and towns may be maintained by the state highway commission . . ."

Present and impending concentrations of traffic warrant the freeway type of design on many miles of Iowa highways in addition to those planned for construction on the Interstate System. Freeways speed traffic and bring three or four times greater safety than ordinary roads.



The needs of state highway traffic today require that a state system include, as full partners, the extensions of the Primary Road System into and through cities and towns.

Directness of Travel

To add one extra mile to the trip length of a route carrying 5,000 vehicles daily adds (at three cents a mile) $150 per day to the cost of gasoline and oil used by the motorists. This totals about $55,000 annually. The highway engineer is therefore under great obligation to highway users—especially on more heavily traveled routes—to give careful attention to directness of travel. Restrictions such as ". . . the state highway commission shall not purchase right of way and construct a new system of diagonal highways radiating from any city with a population over one hundred thousand" are not only discriminatory but operate to the financial disadvantage of all users. This provision should be repealed.

System Size

The large size of Iowa's Farm-to-Market System raises the question as to whether there has been orderly and logical improvement within the system.

A following section describes how the Farm-to-Market System was divided, for the purpose of this study, into two parts according to use and function. Examination of past progress on these two segments of the Farm-to-Market System shows that in six counties about the same progress has been made in improving both parts of the Farm-to-Market System—although the portion proposed in this report as the County Trunk System accommodates more travel and serves a more important county-wide function than the other, proposed as the County Feeder System.

In 91 counties less progress has been made on the more important trunks than on feeders. In only two counties has there been more progress made on improving trunks, while still making substantial progress on feeders and Local Secondary Roads.

This indicates that a number of counties have failed to give priority to those roads which provide greater service to larger numbers of users.

Municipal Street Classification

Cities now lack the benefits of clear-cut system designation, such as those called for by state law in rural areas.

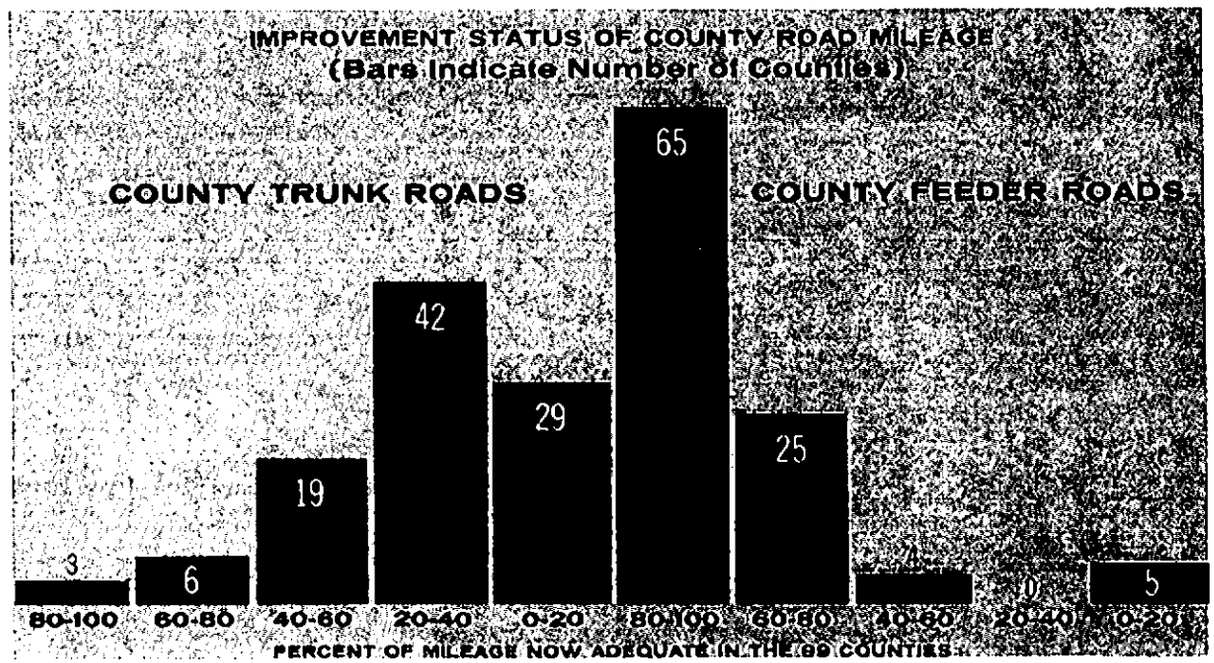
Creation of city street systems is needed to sort out in orderly fashion those streets which are of statewide or citywide interest as distinguished from those of local importance. In this way, the most essential city street needs will be clearly identified, the framework for a more effective aid program established and a foundation laid for better street management.

Proposed Systems

In the light of steadily changing conditions, and since a large body of factual information has accumulated in recent years defining the function and use of Iowa's roads and streets, existing legal provisions for system classification are in need of updating. Revisions of present systems, and establishment of systems where none now exist, are overdue.

How Systems Were Selected

As a basis for solution of the problems just discussed, the predominant function and use of each road and street in Iowa were determined in this study. Each was then grouped with others



having a similar function, to form interconnected systems.

The accompanying criteria were used to select main routes in both rural and urban areas. Resulting systems are recommended for assignment to the unit of government having the most immediate and primary interest; that is, the system including roads of statewide interest and importance should be assigned to the State Highway Commission, regardless of rural or municipal location; systems of community and local importance should be assigned to cities or counties. Systems recommended for adoption are shown in the table to the right.

In Cities and Towns	In Rural Areas
State Primary Roads	State Primary Roads
Arterial Streets	Farm-to-Market Roads County Trunk Roads County Feeder Roads
Access Streets	Local Secondary Roads
Special Areas	
State Park and Institutional Roads	

To better identify routes of statewide interest the corridors accommodating interstate and major intrastate travel were identified and the desires for travel on these routes were determined. Measured traffic volumes were an important consideration, but not the sole criterion, for selection of all systems.

Among the criteria considered for the proposed State Primary Road System were interstate and intrastate travel, the destinations desired, traffic volumes and other factors. Two-lane State Primary Roads should be built to standards such as pictured here, 24-foot pavement, wide shoulders and good sight distance.

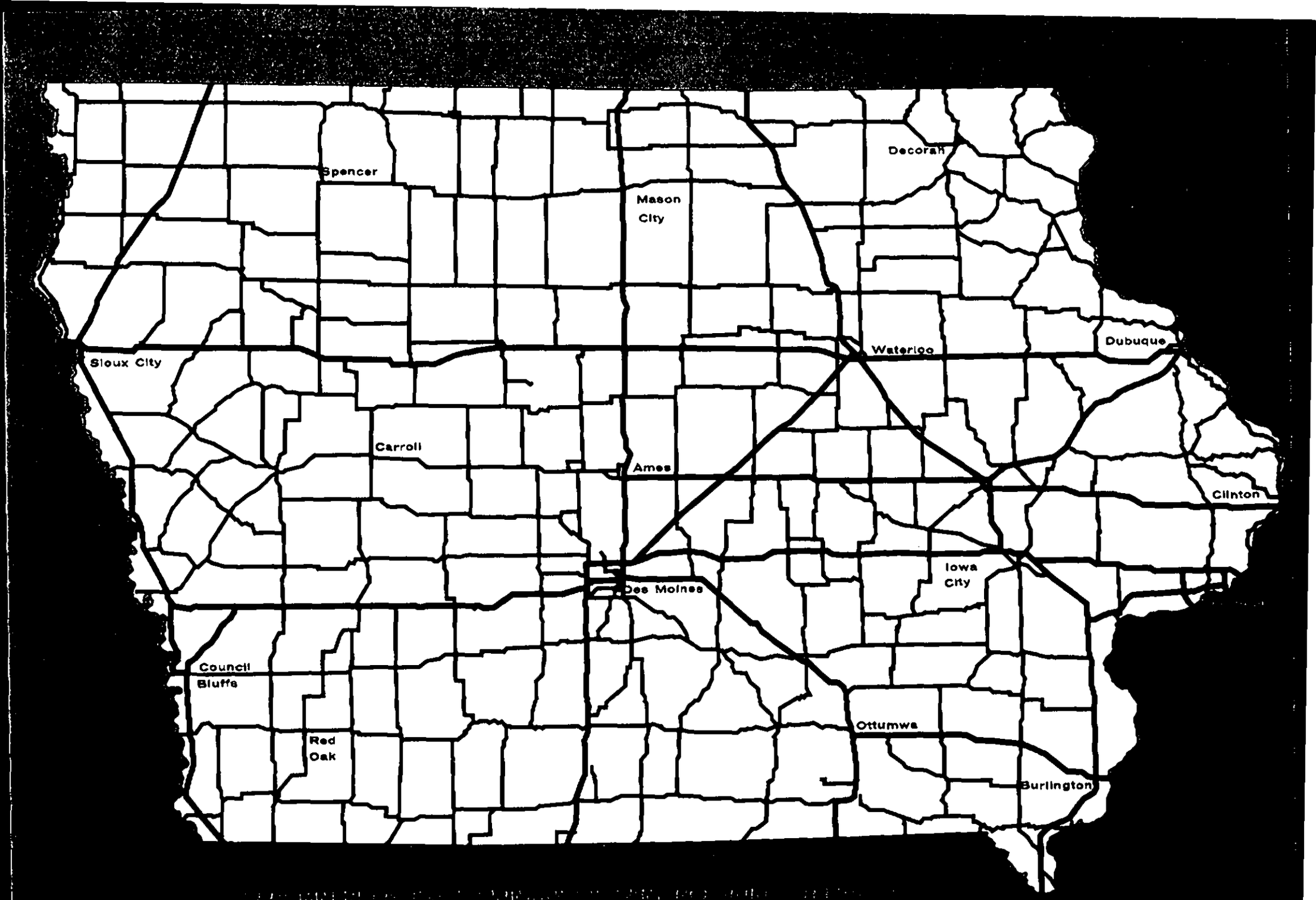
CRITERIA FOR SELECTING MAJOR ROAD AND STREET SYSTEMS

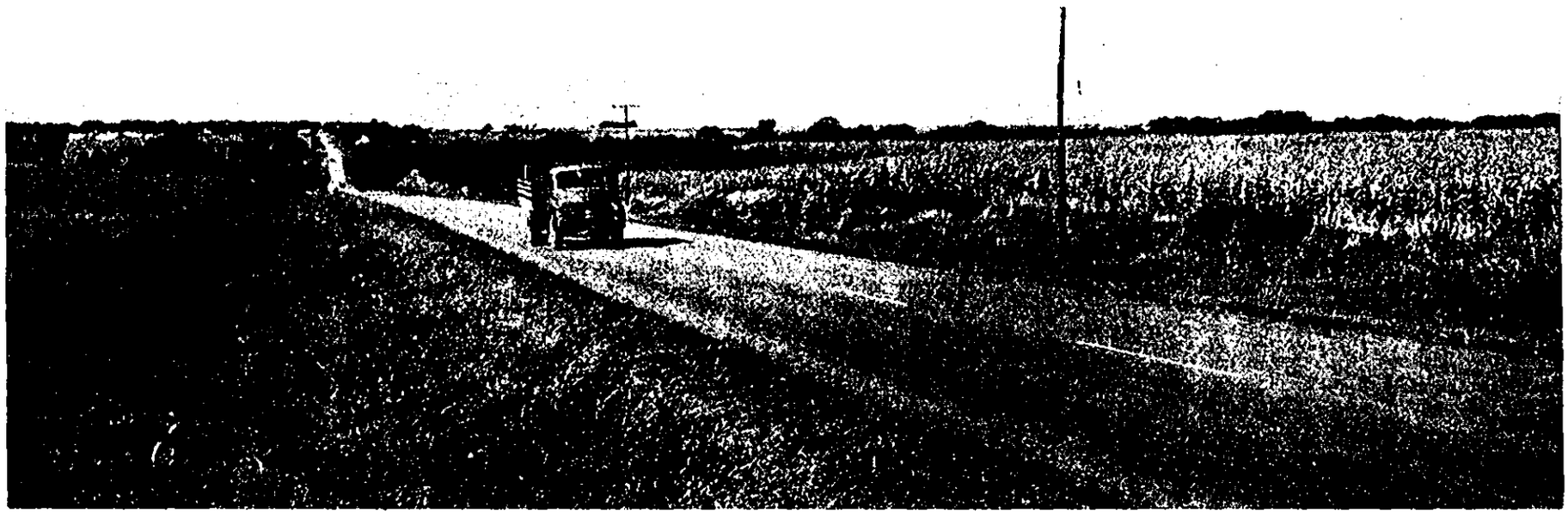
1. Connect Points of Traffic Interest
2. Serve Maximum Trip Routings
3. Provide Service With Least Miles
4. Provide System Continuity
5. Serve the Larger Traffic Flows
6. Provide Balanced Area Service
7. Accommodate Special Road Uses
8. Interconnect System With System
9. Observe Mileage Limit Controls
10. Utilize Existing Systems

Especially for county systems, use characteristics (school bus, mail delivery, milk pick-up, petroleum transport, recreation, etc.) were analyzed. Service to farms and homes was carefully measured to test the adequacy of system service.

Major systems were limited in size for reasons of economy and consistency.

Each tentatively selected system was reviewed with engineers of the unit of government responsible. Suggestions for changes were carefully studied to achieve agreement and integration with neighboring jurisdictions—within the context of the established criteria. This brought to bear the


Spencer
Mason City
Decorah
Dubuque
Waterloo
Sioux City
Carroll
Ames
Clinton
Iowa City
Des Moines
Council Bluffs
Red Oak
Ottumwa
Burlington



The 12,000-mile proposed County Trunk Road System interconnects smaller towns, shipping points and markets and with other county and state roads. The entire County Trunk System eventually should be paved.

personal knowledge and judgment of local officials so as to achieve practical, logical and feasible road and street systems.

Proposed State Primary Road System

Research and analysis has determined the need for a statewide highway system in Iowa totaling about 8,300 miles, rural and urban. This excludes about 1,900 miles and adds about 115 miles now under other jurisdictions and about 300 miles not now existing.

The 7,477 miles of rural state highways needed to interconnect Iowa cities and towns and provide statewide service are shown on the accompanying map. This proposed Primary System carries 67 percent of all rural travel on seven percent of the rural road mileage. Some 70 percent of all of Iowa's rural inhabitants live alongside or within three miles of these routes. More than 700 Iowa cities and towns (including all over 1,500 population and 96 percent of the city and town population) are either served directly or are within three miles of one or more of these highways. Average population of cities more than three miles from the Primary System is only 330. Each of these, however, is served by a connecting main county road.

To provide comparable state highway service to and through those Iowa cities served directly by state route, about 859 miles of highway routes in cities and towns are needed, as determined by this study. Criteria should be developed and published by the Commission for use as a general guide to aid in selection of routes to adequately serve traffic of statewide interest in, through and around cities. Such a general approach should be supplemented by detailed traffic and economic studies to aid final decisions.

Meanwhile, the routes selected by this study should serve as a basis for future programs.

Proposed Freeways

Included in the State Primary System are some more important routes interconnecting the state's major metropolitan areas and those of adjacent states. Metropolitan areas of greatest importance to Iowa are:

Council Bluffs—Omaha
Davenport—Rock Island—Moline
Des Moines and environs
Cedar Rapids—Marion
Waterloo—Cedar Falls
Sioux City

These more important routes include all the

Local Secondary Roads as at left, total 58,500 miles but carry only eight percent of the traffic. Improvement necessarily must be less than for County Trunks, illustrated at the right.

Interstate System in Iowa (711 miles), plus 1,200 additional miles of Primary Roads. These are the routes which ought to be improved to full freeway standards, in order to extend to all important areas of Iowa the same safety, ease of movement and preservation of investment as is being provided by the development of Interstate routes.

The selected freeways should penetrate to or near the central business district of regional centers. In addition, some cities may require circumferential freeways to accommodate large volumes of traffic having origins or destinations other than the central business district. While these highways may pass near other major urban centers in the state, no attempt should be made to bring these routes into or near the business districts of smaller places. However, arterial streets, other state highways or major county roads would provide connections from such cities to the freeways.

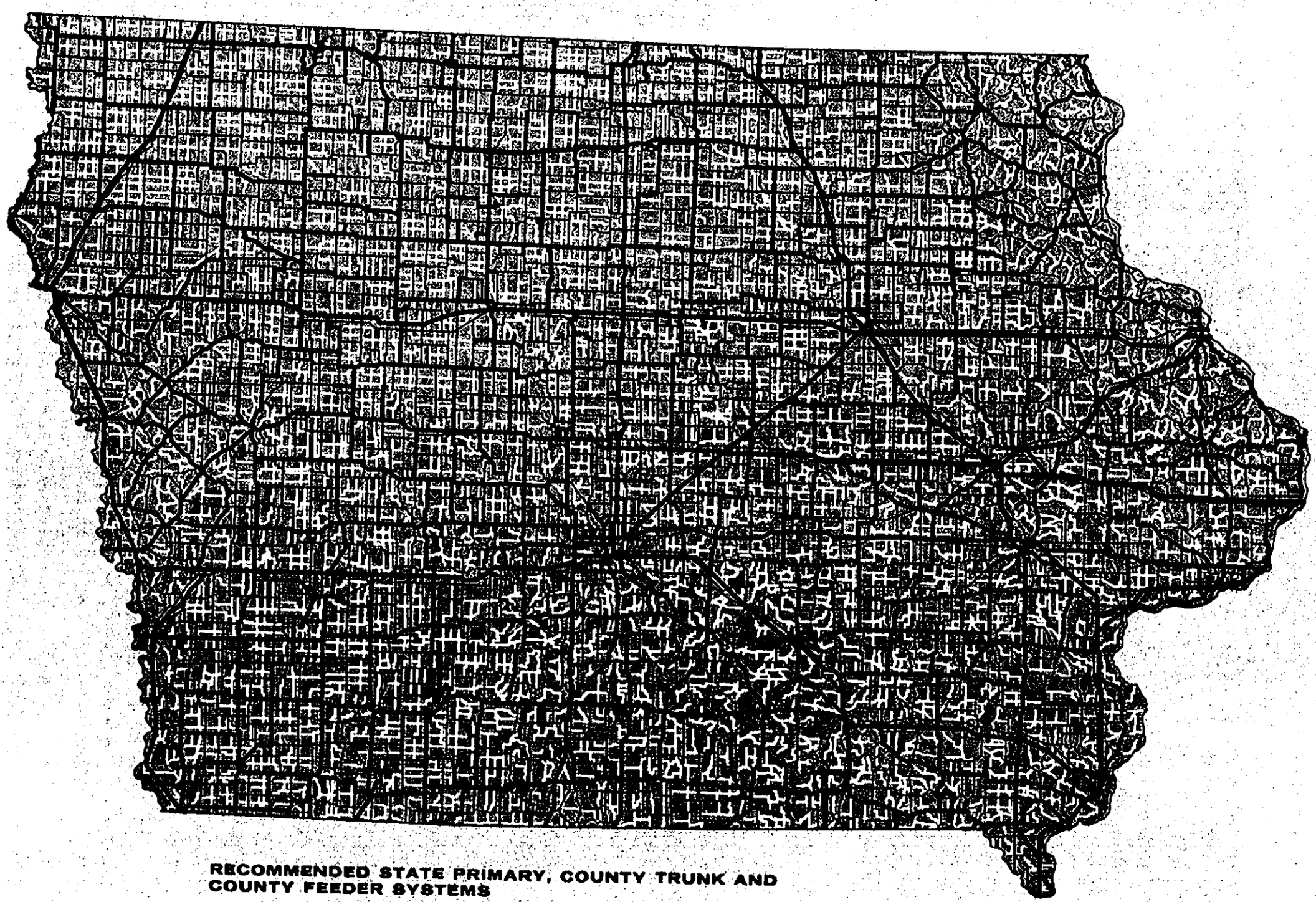
Proposed County Trunk Road System

Recognizing that the existing Farm-to-Market System is an unusually extensive system and that the function of roads within the system varies to a recognizable degree, the more important roads in this network have been selected with the cooperation of each county engineer and designated as the County Trunk Road System.

This 12,000-mile system serves 18 percent of all rural traffic. It interconnects smaller towns, shipping points and markets within each county and adjoining counties. It connects with other County Trunk Roads and State Primary Roads to form an interconnected and integrated network of main rural roads. Routes on this system carry generally the heaviest volumes of rural traffic, except for State Primary traffic, in the county.

The system forms a network across the state with an average spacing between routes of about five to six miles.

A logical goal for the years ahead should be to provide a dustless surface on the more heavily traveled county roads. With this in mind, design standards for the County Trunk System were established which provide for paving the entire system, ultimately. In the average county, 83 percent of the rural dwellings would then either be on or within one and one-half miles of a paved road.



RECOMMENDED STATE PRIMARY, COUNTY TRUNK AND COUNTY FEEDER SYSTEMS

Recommended State Primary routes are shown in black; County Trunk roads in red and County Feeder roads in white. Roads shown in the wider red lines are "local service" existing Primary Roads.

Proposed County Feeder Road System

As mentioned earlier, the Farm-to-Market System and the Federal-aid Secondary System in Iowa are nearly coincidental. That they do not entirely coincide creates special problems. In addition to the burden of considerable additional administrative work, accounting for the mileage not on both systems, there are restrictions which prohibit the use of Farm-to-Market funds for improving a few Federal-aid Secondary routes, totaling about 500 miles. Likewise, there are 2,300 miles of Farm-to-Market Roads not eligible for Federal-aid Secondary funds.

To remedy this defect, the County Feeder Road System was selected. The Feeder System includes all roads in the existing Farm-to-Market System which are also Federal-aid Secondary routes—after deducting the County Trunk System.

Thus the 12,000-mile County Trunk and 20,000-mile County Feeder Systems together make up what is now the Farm-to-Market System less 2,300 miles of roads not on the Federal-aid Secondary System.

The County Feeder Road System accommodates eight percent of the rural travel in Iowa. Average spacing between routes, including County Trunk and State Primary Roads, is two to three miles, as may be seen in the map on page 31 Most roads on this system carry in the range of 50 to 100 vehicles per day.

Local Secondary Roads

Remaining county roads not included in the County Trunk or County Feeder Systems constitute the Local Secondary Road System. Included therefore are 2,300 miles of the Farm-to-Market System which are not Federal-aid Secondary routes, as well as those routes now Federal-aid Secondary (500 miles) not in the Farm-to-Market System.

This 58,500-mile system carries only eight percent of all rural travel but is of great importance in providing access to rural dwellings and farm lands which comprise Iowa's most important industry. However, more than three-fourths of these roads carry less than 50 vehicles daily and require standards of relatively inexpensive construction. About 10,000 miles carry under 10 vehicles daily, and need little or no improvement.

Arterial Streets

Arterial streets are those which provide through connections between focal points of traffic interest in a city or town, or provide connections between these points and important outlying areas. Unlike residential streets which primarily provide access to abutting property, arterial streets accommodate intercity and major intracity travel. These streets, accordingly, are of citywide interest and are distinguished from residential streets which are primarily of interest to abutting property owners.

The urban portion of the Primary System generally should be the backbone of the proposed Arterial Street System in a city or town served by a state highway. Other Arterial Streets, the responsibility of the city, connect with these main highways to provide a planned, interconnected and integrated transportation network. Arterial Street Systems were also selected so that each County Trunk and County Feeder Road joins an Arterial Street. Good connections between rural and urban areas are particularly important in Iowa to promote continued development of agriculture and agriculture-related industry. Arterial Streets selected by the study in all cities and towns of Iowa total 2,300 miles, including 300 miles of primary "local service" streets.

Access Streets

Those streets which are not a part of the proposed Primary Road System or which are not Arterial Streets constitute the Access Street Systems. The 8,700 miles of residential, business and industrial access streets in the 942 cities and towns of Iowa directly serve the homes of approximately 1.9 million people plus innumerable stores, offices, industrial plants, schools and the like.

State Park and Institutional Roads

The roads or streets within state-owned parks and institutions total 274 miles. They are basically the responsibility of the state, and the State Highway Commission is the appropriate agency to provide the service desired by those responsible for the areas. No special study of system designation was deemed necessary. Management responsibility should be clarified, however.

Recommendations

Legislative actions needed in Iowa to adjust for changed conditions and to remedy existing deficiencies are as follows:

1. The general assembly should direct the State Highway Commission to review the State Primary Road System and, within one year, select existing and proposed routes, both rural and urban, not to exceed a total of 8,400 miles, that meet the criteria used in this study. Such routes should then be designated as the official State Primary System. It is suggested that the specific routes designated in this study as the proposed State Primary Road System, both rural and urban, represent a desirable system, and that the general assembly might so state in its official action.

   The Commission should retain authority

to make minor changes in the initial selection whenever necessary to meet changing conditions, but total mileage of the system should not be exceeded. Legislative intent should state that the system is to be stabilized as finally selected. Existing routes along corridors of proposed new locations should be retained only until new facilities supersede their functions. (See Recommendation No. 5)

The Commission should be required to hold public hearings before finally adopting routes inside incorporated places of 2,500 population or more, but should be given final authority to designate such routes. At least one state route should penetrate and serve the business areas of all such places, in addition to any bypass routes that may be desirable.

2. The general assembly should enact legislation requiring the Commission to designate and plan certain state routes, both rural and urban, as a freeway system to be included in the selected State Primary Road System. Freeway routes selected should meet reasonable criteria established by the Commission. The freeway system should serve to interconnect the regional centers of Iowa and its size should not exceed 2,000 miles, including Iowa's portion of the existing Interstate System, as might be stated by the general assembly in its action.
3. The general assembly should repeal existing law prohibiting diagonal roads to cities over 100,000 population.
4. The general assembly should consider the appropriate disposition of existing Primary Roads found not to meet the criteria of the study. It is suggested that, should the general assembly consider that such roads should be returned to county jurisdiction, fiscal arrangements should be revised to permit counties to give them proper priority in conjunction with other county roads of similar importance.

   On the other hand, if the general assembly elects to require the Highway Commission to retain full responsibility for such roads, they should be designated as a wholly separate group, with a separate allocation of funds for their improvement and maintenance, limited by law to Farm-to-Market, or equivalent, standards. Moreover, the law should not permit other roads to be added to this group, thus fixing the limit of state responsibility.
5. The State Highway Commission should be given full authority to transfer to county or city jurisdiction any road or street whose primary function has been taken over by construction or improvement of other facilities, such as a nearby parallel route or any other location which diverts appreciable traffic from the old route. Arbitrary restrictions, such as the present law limiting such transfers to roads carrying less than 400 vehicles daily, discourage new facilities, or would require the state to maintain increasing mileages of both state and local service roads.
6. The State Highway Commission should be given full administrative and fiscal responsibility for the proposed Primary Roads through all incorporated places, similar to responsibilities the Commission now has in rural areas. However, the Commission should not be held responsible for law enforcement, street cleaning, utilities in the right of way, and similar items. It is intended that Commission responsibility would be primarily for construction and maintenance of the traveled way—generally curb to curb—and traffic operation controls.
7. The general assembly should further clarify

Arterial streets pose a growing problem as cities and towns grow larger. Other city arterials capable of handling heavy traffic flows must be improved to supplement those which are extensions of the State Primary Road System.

responsibility for State Park and Institutional Roads. It is suggested that the respective boards or commissions having responsibility for each park or institution be made fully responsible for final decisions on road matters, and for the costs of improvement and maintenance. However, the State Highway Commission should be required to render necessary engineering consultation, design, construction and maintenance services on request at cost. Through Primary Roads, however, should remain the full administrative and fiscal responsibility of the State Highway Commission.

8. The general assembly should require cities and towns over 5,000 population to establish Arterial Street Systems and Access Street Systems, in addition and complementary to extensions of state routes within the municipalities, in accordance with criteria developed jointly by representatives from cities and towns and the State Highway Commission. Arterial streets in municipalities of less than 5,000 people may consist only of extensions of County Trunk and Feeder Roads, as suggested by this study. Arterial Street Systems including extensions of Primary Roads should be limited to not more than 30 percent of the total street mileage in the municipality.

   Within a reasonable time limit, each city and town should be required to submit a map showing its proposed Street Systems. Such maps should be reviewed and approved by the State Highway Commission if found to reasonably conform to criteria. Meanwhile, the Arterial Streets determined for this study should be constituted as the official systems. The Commission should maintain a file of approved city and town street maps and these maps would constitute the official Street Systems of all cities and towns. Provision should also be made for further changes to keep the official systems realistic as conditions change.

9. The general assembly should revise the Farm-to-Market System by requiring that all roads included in the system must also be included in the Federal-aid Secondary System. Moreover, no route should be included in the Federal-aid Secondary System unless it reasonably satisfies criteria for the Farm-to-Market System, in order that these two systems may be coincident.

10. The general assembly should require subdivision of the revised Farm-to-Market System into County Trunk and County Feeder Road Systems. Criteria for selection of the County Trunk System should be worked out jointly by representatives from the Iowa County Engineers Association and the State Highway Commission, with final approval by the State Highway Commission. The maximum size of the County Trunk System should be established by law, preferably not to exceed 12,000 miles or 14,000 miles if "local service" roads are transferred to the counties. All remaining rural roads on the proposed Farm-to-Market System would then be designated County Feeders—approximately 20,000 miles.

    Within a reasonable time limit, each county should prepare a map showing the roads selected for inclusion in the County Trunk System, together with County Feeders and Local Secondary Roads, and submit said map to the State Highway Commission for final approval. The Commission should review each county's map and make necessary changes if needed to meet the established criteria and to provide continuity in each system across county lines. Meanwhile, the systems selected by this study should be constituted as the official systems.

    Provisions for future additions and deletions should be included to allow for changing conditions.

11. The general assembly should require establishment of minimum design standards by counties and cities with the approval of the State Highway Commission, for improvement of roads and streets of each class other than Local Secondary Roads and Access Streets. When state aid is used for such improvements, the law should require construction to such standards, or better.

THE ENGINEERING ANALYSIS OF NEEDS

Road and street needs are recommended in this report for the systems proposed in Chapter II. Needs were measured using uniform principles of engineering analysis.

Needs are defined as physical work necessary to improve, maintain and administer roads and streets to standards of service essential to serve present and future traffic in the period 1960 to 1980. Cost of doing that work was estimated based on 1959 contract prices and the 1959 cost of labor, equipment and materials. The total represents a summation of cost to remedy deficiencies—existing now or in the future—on the several classes of roads and streets in each governmental jurisdiction.

Needs and costs were determined in logical steps:

1. Traffic volumes and characteristics of traffic were analyzed, together with population and economic data, and estimates of travel trends to 1980 were made. (See Chapter I)
2. Existing road and street systems were reviewed. The total highway and street mileage was classified and arranged into systems providing similar service as a logical and firm basis for further analysis. (See Chapter II)
3. Standards of road and street design and maintenance suitable for various conditions of traffic service were established for each system, based on engineering experience and economic considerations.
4. Construction needs were determined by inspecting and comparing the physical and use characteristics of all roads, streets and bridges, as of January 1, 1960, with the appropriate standards. Urgency depended on the degree of deficiency or tolerance below standards.
5. Costs of meeting indicated construction needs on each system were computed on the basis of correcting major deficiencies so as to provide adequate facilities for today's and future traffic use.
6. Special studies of road maintenance and future replacement needs and costs were made.
7. Construction costs plus maintenance and administrative costs were programmed year-by-year, and average annual expenditures for alternative 10, 15 and 20-year programs were computed. During each of these alternative programs the backlog of work would be done first, but new needs arising as each year passes would also be met on schedule in order to provide fully adequate systems at the end of the program period.

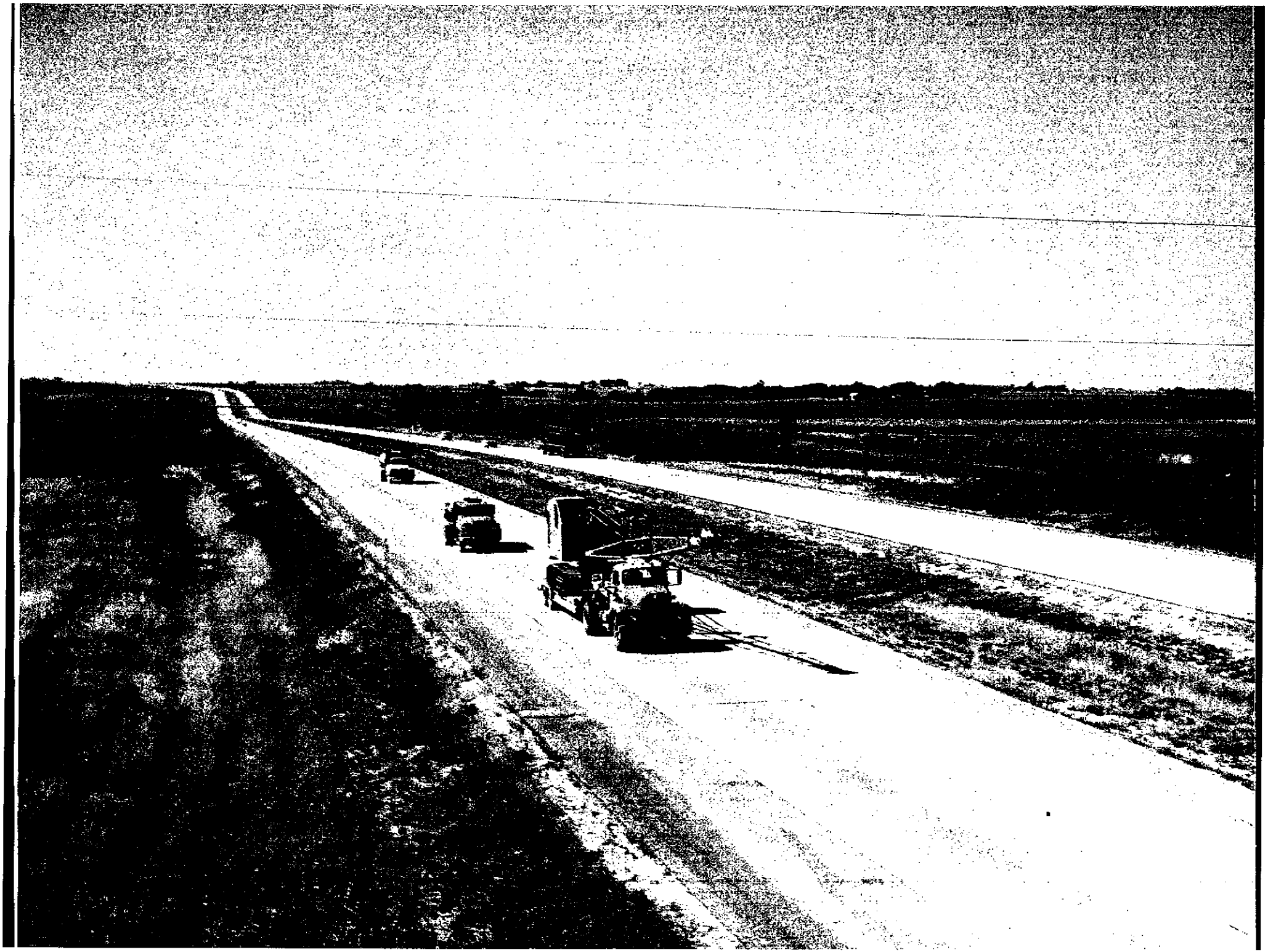
Approximately 300 engineers from Iowa cities, counties and the Highway Commission participated in the study, reporting facts, appraising the adequacy of roads and streets under their management and estimating costs for their respective jurisdictions.

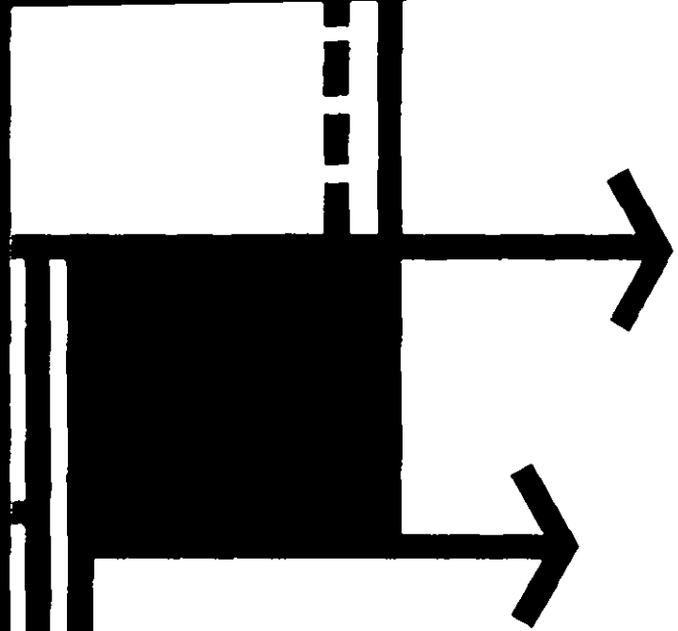
To guide this work on a uniform and practical basis according to sound engineering principles, the Foundation prepared manuals of procedure, including standards by which roads, streets and bridges were measured as to adequacy and improvement needs. These manuals are available as separate, published documents.

The Foundation appointed three engineering advisory committees, composed of the state, county and city engineers to aid in development of road and street standards appropriate to Iowa's needs and in planning methods of procedure best suited to Iowa conditions. These provided for complete, detailed entry of necessary data and computations in an orderly manner on work sheets for each separate structure and for each road or street section.

Staff engineers under Foundation supervision directed and correlated operations for each jurisdiction (state, city, county) whose engineers prepared the detailed reports, and also made direct appraisals in some jurisdictions lacking engineering service. Staff and Foundation engineers reviewed and checked these data for all systems to verify adherence to principles and standards and for validity of costs. Computation of long-range programs was accomplished with the aid of an electronic computer.

All data are available on more than 125,000 business machine punch cards. These and other basic records, work sheets and procedures remain with the State Highway Commission for future reference and assistance to the state, counties and cities. This adds materially to the amount of data accumulated since 1935 principally through the Highway Planning Survey. Without such data this study could not have been accomplished.





STATE PRIMARY ROAD NEEDS

The State of Iowa has made much progress in improving and maintaining Iowa's Primary Roads for traffic movement that has nearly doubled since 1946, yet there remains about one-third of the existing rural Primary Road System that does not meet today's minimum needs.

Careful engineering estimates of requirements now and in the future show that continuing reconstruction of two-lane roads to modern standards as to width, curvature and surface is the most widespread need.

A greatly expanded program of street widening, construction of some new facilities and better traffic control is required on primary routes in cities and towns—with initiative and responsibility taken by the state in cooperation with the municipalities.

Continued work on the 700-mile Interstate program of multi-lane freeways, both rural and urban, is vital and a top priority program in both the state and national interest. To meet Iowa's special needs for major routes between metropolitan and regional centers, an expansion of the freeway principle should be started immediately on an additional 1,200 miles connecting these centers.

The costs shown in this chapter contemplate a logical program that can be accomplished—if past performance is any guide. The only question is how rapidly can the necessary improvements be achieved. That is mainly a question of finance which separate studies are reviewing and only the general assembly can resolve. The engineering study itself, however, points to need for rescinding the present legal limit of 25 percent of Primary Road funds that may be spent in municipalities. The amount should be a matter for Commission decision.

Alternative Annual Programs

To meet the major objectives just stated, to provide an improved level of maintenance essential to preserve investments, and to provide optimum traffic service on the proposed Primary Roads

- —an average of $111 million per year is needed for the next 20 years
- —to catch up with the backlog of deferred work somewhat sooner, over a 15-year period, the cost would be $127 million per year during that period
- —to meet all presents needs within 10 years and to keep up with new requirements would cost $149 million annually during that period.

As shown in the table on page 38, these programs include all costs for the proposed Primary Road System in cities and towns, which requires 27, 25 and 28 percent of the totals, respectively.

The figures in the table include all estimated expenditures, at 1959 price levels, essential to produce an adequate highway system for the 20-year future traffic estimates shown in Chapter I.

Costs for existing State Primary Roads not included in the proposed system are shown separately, later in this chapter. Costs for State Park and Institutional Roads are not included in any state totals, in view of the recommendations contained in Chapter II.

Total costs through 1980 would be about the same regardless of the alternative chosen. Acceleration, to catch up the backlog of improvements needed now, clearly requires more funds in early years but less in later years. This is the opposite of the gradually increasing income that governments can expect as population and traffic rise.

Proposed Primary Road System
Average Annual Costs of Alternative Programs

	10 Year Catch-Up Period — First 10 Years	10 Year Catch-Up Period — Next 10 Years	15 Year Catch-Up Period — First 15 Years	15 Year Catch-Up Period — Next 5 Years	20 Year Catch-Up Period
Rural					
Construction	$94,468,000	$36,943,000	$80,701,000	$21,744,000	$66,283,000
Maintenance	8,741,000	10,951,000	9,279,000	11,318,000	9,385,000
Administration	6,053,000	2,834,000	5,283,000	1,969,000	4,448,000
Total	$109,262,000	$50,728,000	$95,263,000	$35,031,000	$80,116,000
Municipal					
Construction	$35,016,000	$17,826,000	$27,728,000	$22,858,000	$26,627,000
Maintenance	2,699,000	2,694,000	2,708,000	2,701,000	2,716,000
Administration	2,030,000	1,156,000	1,653,000	1,434,000	1,607,000
Total	$39,745,000	$21,676,000	$32,089,000	$26,993,000	$30,950,000
Total					
Construction	$129,484,000	$54,769,000	$108,429,000	$44,602,000	$92,910,000
Maintenance	11,440,000	13,644,000	11,987,000	14,019,000	12,101,000
Administration	8,083,000	3,991,000	6,936,000	3,403,000	6,055,000
Total	$149,007,000	$72,404,000	$127,352,000	$62,024,000	$111,066,000

Each "catch-up" period includes the accumulation of basic construction necessary to remedy existing inadequate conditions. For the amount termed "backlog" cost to remedy the 10 years [illegible] twice the annual cost required if the work were spread over 20 years. Other costs in each program are for new needs, on new [illegible] that will arise in the respective periods, and for maintenance and administration.

However, the economic well-being of the state and the safety and convenience of its people call for the earliest possible improvement consistent with a sound financial position.

Accomplishments that should be possible by adoption of any one of the alternatives are summarized in the balance of this chapter.

Planned Improvements

Within the next 20 years nearly all the proposed rural and urban Primary Road System will require some form of improvement, ranging from simple resurfacing to major construction of new freeway facilities. Moreover, it is estimated that 1,353 structures, two-thirds of all on that system, will have to be built or remodeled, and 911 new structures will be needed on freeways.

Iowa State Highway Commission engineers carefully studied every mile in relation to the standards and procedures established by the engineering staff of the Automotive Safety Foundation, with the advice of the State Highway Engineering Committee. Review of the Commission's work by Foundation engineers insured uniform competency of the analysis, in the same manner as done for all other road and street systems.

These estimates indicate about $1.9 billion of capital investment between 1960 and 1980, for basic improvements, including right of way, some resurfacing and minor reconstruction on roads built early in the period, and temporary stopgaps to keep roads in service until funds are available for basic improvement. Totals, rural and municipal, are shown in the table on page 40 .

The study revealed segments of the Primary Road System that require much greater improvement than the bulk of the road mileage. Especially significant are problems of traffic congestion in cities and the need for development of freeway routes throughout the state, along with the few

supplemental four-lane highways to relieve specific points of rural traffic congestion.

Rural Construction

About 80 percent of the proposed rural mileage will remain two-lane highways in 1980, serving the people of Iowa in much the same way as these roads do now. Of the "basic improvement" capital construction costs in rural areas, 45 percent is related to this continuing need for modernizing old roads to standards which provide greater safety and convenience. There will be some relocation required, but for the most part the work will entail widening, improved curves and sight distances, better drainage, firmer shoulders and stronger surfaces to carry increasing numbers of trucks—generally making maximum use of the existing highways and the investment already made in them.

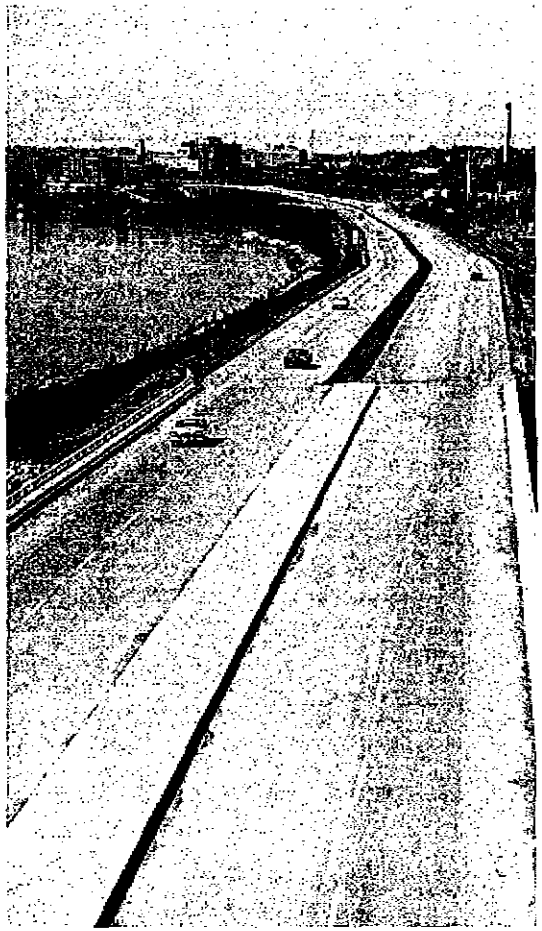
On the other hand, multi-lane highways are needed to relieve traffic bottlenecks on 1,533 miles, including proposed freeways. These locations constitute only 20 percent of the proposed rural Primary System, but require 55 percent of the basic cost.

Municipal Primary Road Needs

Within the 404 cities and towns of Iowa through which the proposed Primary Road System passes, cooperative studies of state, municipal and Foundation engineers determined that a total of $518 million worth of basic construction improvements by the state is necessary within 20 years to serve the combined state and local traffic needs.

Most urgent are major projects for congestion relief, including the Interstate, the Iowa freeway system and supplemental routes in the seven largest cities where such routes should penetrate the built up areas. This includes construction of 102 miles of new freeways at a total cost of $371,000,000.

The State Highway Commission continues to have a prime responsibility for serving the business areas of larger communities. As a result, this study found a further need for construction, widening or resurfacing of 501 miles, costing



Top left: Many State Primary Roads are deficient on one or more counts. This heavy traffic volume route has many no-passing zone sections which delay traffic and cause impetuous drivers to take chances to save time.
Above: Interstate System construction is well under way in Iowa with about 20 percent of the state's total mileage completed and open to traffic. This is a portion of Interstate Route 29 near Sioux City.

$147 million within 20 years, mainly on established signed routes, but with the addition of some new facilities to improve traffic flow.

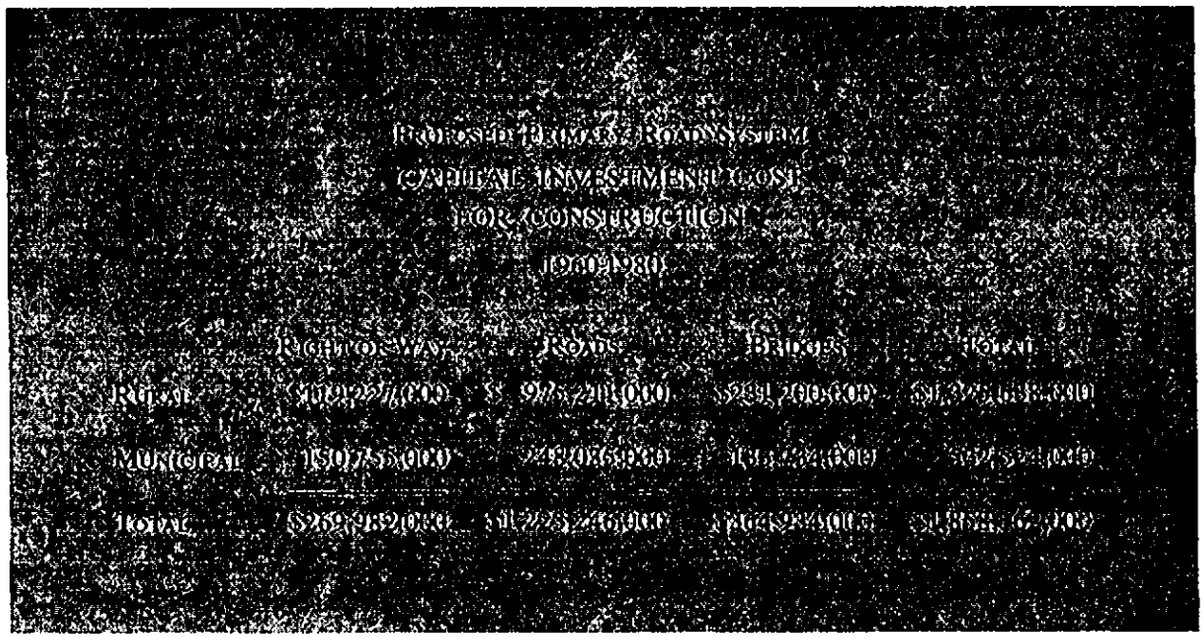
This work contemplates the need for full integration of Primary Roads with the Arterial Street Systems established as part of the planning process. In effect, master plans for development have been produced for all cities and towns of Iowa during the course of this study. As with any such broad gauged analysis, further detailed surveys will be necessary before making final conclusions on specific location and design. Meanwhile, the study furnishes a solid base for estimating purposes, as well as a general framework for future physical planning.

Freeway Development

Iowa now has about 140 miles of Interstate freeways open to travel. Prior to January 1, 1960, contracts had been awarded on 77 miles more, in whole or in part. Included in the costs, therefore, is the completion of 570 miles of the Interstate System in Iowa, including both rural and urban sections. The amount, as reported to the Bureau of Public Roads, totals $372,980,000.

It is expected that the proposed Iowa freeway system, combined with the Interstate System, would carry 27 percent of all highway traffic in the state on its 1,900 miles, totaling less than two percent of all road and street mileage. This concentration of traffic, coupled with existing deficiencies on routes now serving these corridors, warrants early development of the proposed Iowa freeway routes. Such facilities not only speed traffic, but provide three to four times greater safety than ordinary roads. Moreover, full control of access guarantees the long-term preservation of safety and investment without early obsolescence.

Iowa freeway basic cost, including Interstate requirements, totals $1,086,595,000 within the 20-year period. This would provide for about 1,400 miles of completed multi-lane freeways by 1980, as shown in the map on page 42. In addition, land and access rights would be purchased for another 200 miles, but only two lanes would be built--pending ultimate completion to full freeway standards after 1980. Along corridors of the proposed freeway system, existing roads totaling over 300 miles require no major work in the next 20 years. The estimated status is summarized:



PROPOSED FREEWAY DEVELOPMENT
Prior to 1980

INTERSTATE SYSTEM	
Completed	711 miles
IOWA FREEWAY SYSTEM	
Completed	710 miles
Partial	197 miles
No Major Work	310 miles
Total	1,928 miles

Planning should proceed as rapidly as possible to identify the final location of all routes, so that land can be purchased or reserved to minimize future costs.

Whenever routes serving principal traffic in these corridors reach a stage of obsolescence or deterioration that urgently requires work to be done, new construction generally should be channeled to development of the proposed freeways rather than reconstruction of the old road. Moreover, such major improvements would divert traffic from other roads, and reduce the need for their improvement. Costs have therefore been devel-

oped on the basis of reduced future traffic increases on parallel routes.

The map also shows 213 miles of supplemental four-lane highways which exist or are needed to serve isolated congested locations which do not necessarily require full freeway design—at least within the foreseeable future.

Timing Improvements

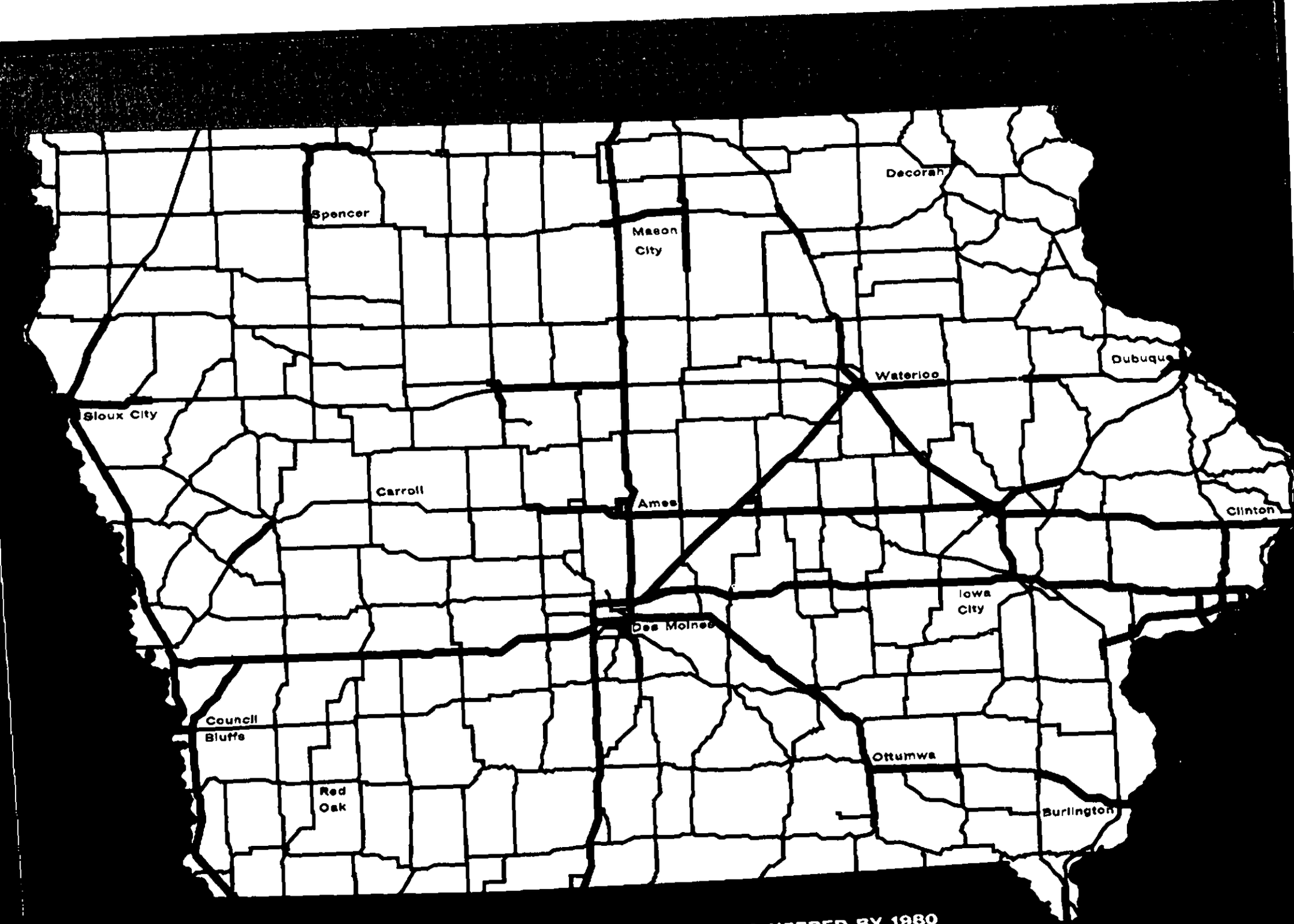
The Iowa general assembly has wisely called for advance planning and a published program on a five-year basis, to be accomplished by the State Highway Commsision for the Primary Road System. It has indicated the use of "sufficiency ratings" in determination of project priority. Such ratings are valuable tools in analysis of the urgent needs of the highway system, but do not take into account many other important considerations which are essential in the development of a program. There is no entirely satisfactory mathematical method which can conclusively prove the priority of highways or their position in an advance construction program.

Objective, impartial engineering analyses, seeking to define the relative degree of deficiency in each section in the road system, are prime objectives. However, in studying project priority, the Foundation has utilized not only the sufficiency ratings developed by the Commission but has considered also some of the other current problems which should influence timing of improvements.

The principal question is: What weight should be given to various kinds of defects that are found to exist? Should traffic congestion be relieved first? Should rough, bumpy, cracked and weakened pavements be replaced or resurfaced first? Should dangerous curves, narrow pavements and narrow shoulders be cause for priority? Obviously, if all these conditions exist on the same section there is little question about urgent need. This is seldom the case; therefore reasonable judg-

Above: One of Iowa's busiest roads is U. S. 30, yet much of it has pavement widths scarcely wide enough for trucks to pass and there are frequent no-passing zones.

Below: Sharp curves not only slow down traffic but are a constant threat to safety, particularly at night.



1,500 MILES OF MULTI-LANE RURAL HIGHWAYS NEEDED BY 1980

To provide adequate traffic capacity 1,533 miles of divided multi-lane rural highways, shown in black, are needed prior to 1980. All but 213 miles would be Interstate and other Iowa freeways.

Decatur
Mason City
Iowa Falls

ment should be applied and a balance achieved on all these matters, with special attention to the economic benefits to be derived by motor vehicle users, feasibility of proposed solutions and continuity of modern design.

The Foundation identified those factors which, singly or in combination, produce an intolerable situation which should be remedied at the earliest possible date. Some sections, for example, having only severe traffic congestion, or having only very poor structural condition, are given top priority consideration—regardless of their over-all sufficiency rating. In other cases, only a combination of less severe defects would warrant similar concern.

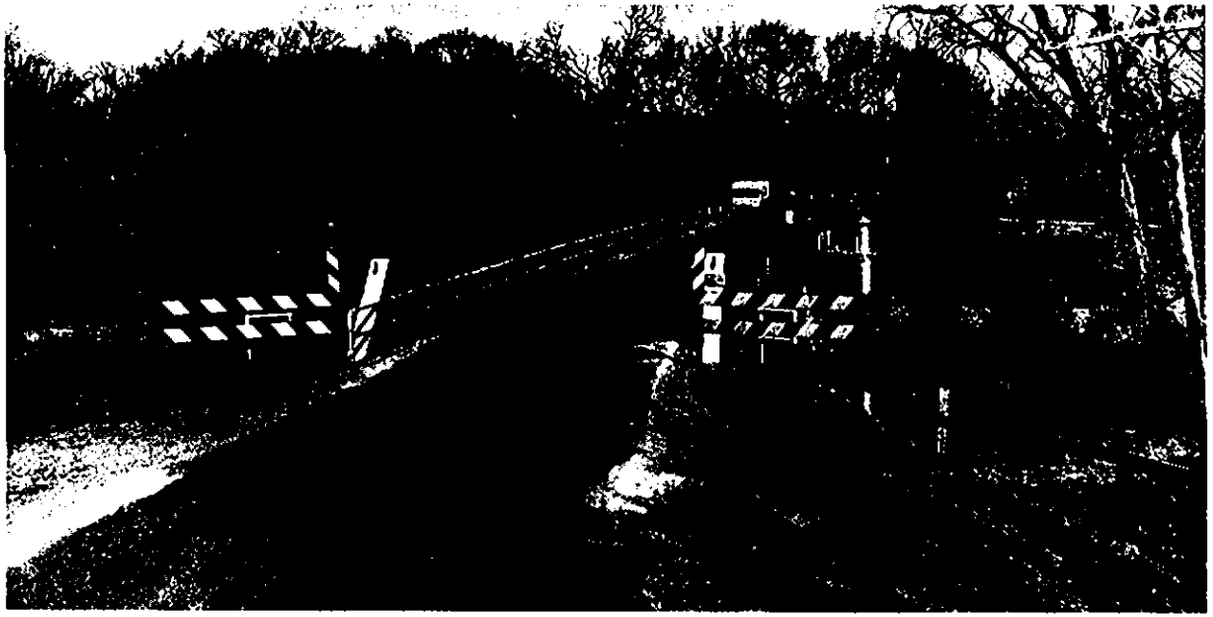
All told, 2,500 miles of proposed rural Primary Roads were found to be intolerable for present-day traffic. On these locations there is a backlog of deferred, urgently needed work, the cost of which totals $373 million, some 30 percent of 20-year basic rural needs. The municipal backlog totals $144 million or 25 percent of the total Primary System basic municipal needs. All remaining mileage and costs have been identified in one of four future five-year periods, when traffic growth or age will require construction or reconstruction.

The rural backlog has been further analyzed, by similar ratings and considerations, to determine top priority locations, shown on the accompanying map, whose improvement costs would total about one-third of backlog needs. Interstate routes were excluded in this review, since the work is fully programmed over the next ten years.

Such limited analysis still does not constitute an effective working program. Most important is consideration of the funds to be made available, and the question of relative urgency among rural and municipal portions of the Primary System.

Those are matters for the general assembly and the State Highway Commission to decide. Cer-

These are typical of inadequate bridges built years ago on Primary Roads which should be replaced as soon as possible.



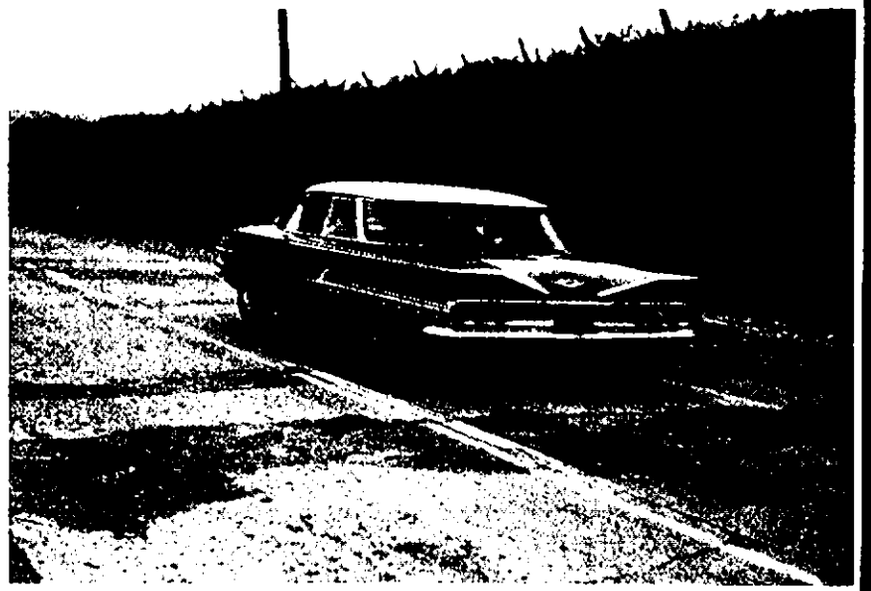
tainly the facts presented in this report and the accompanying fiscal report should provide a basis for arriving at sound conclusions.

After those major policy questions have been decided, there are numerous technical problems which may advance or delay top priority projects as determined from a purely engineering analysis. Throughout the country, great attention is now being given to more systematic programming procedures which will take all pertinent factors into account and greatly aid in developing a smooth-working advance construction program. It is recommended that the State Highway Commission continue to give close attention to these developments and initiate the most advanced techniques possible as they emerge. In this work the Commission needs the sympathetic understanding of the general assembly, the executive departments and the people of the state.

Many railroad underpasses are dangerously narrow and too frequently are approached by sharp curves.

	$5,478,000	$4,108,000	$3,384,000
	2,658,000	2,018,000	1,654,000
	$8,136,000	$6,126,000	$5,038,000

Many sections of existing pavement are structurally obsolete, resulting in excessive maintenance costs.



Maintenance and Operation

The total annual costs, of course, include funds for required maintenance of the proposed systems, rural and urban. Commission engineers, working with the Foundation, have made special studies of past maintenance practices and expenditures to determine whether these were adequate to preserve the investment in the highway system and to provide sufficient traffic service, such as snow and ice control, signs, signals and markings.

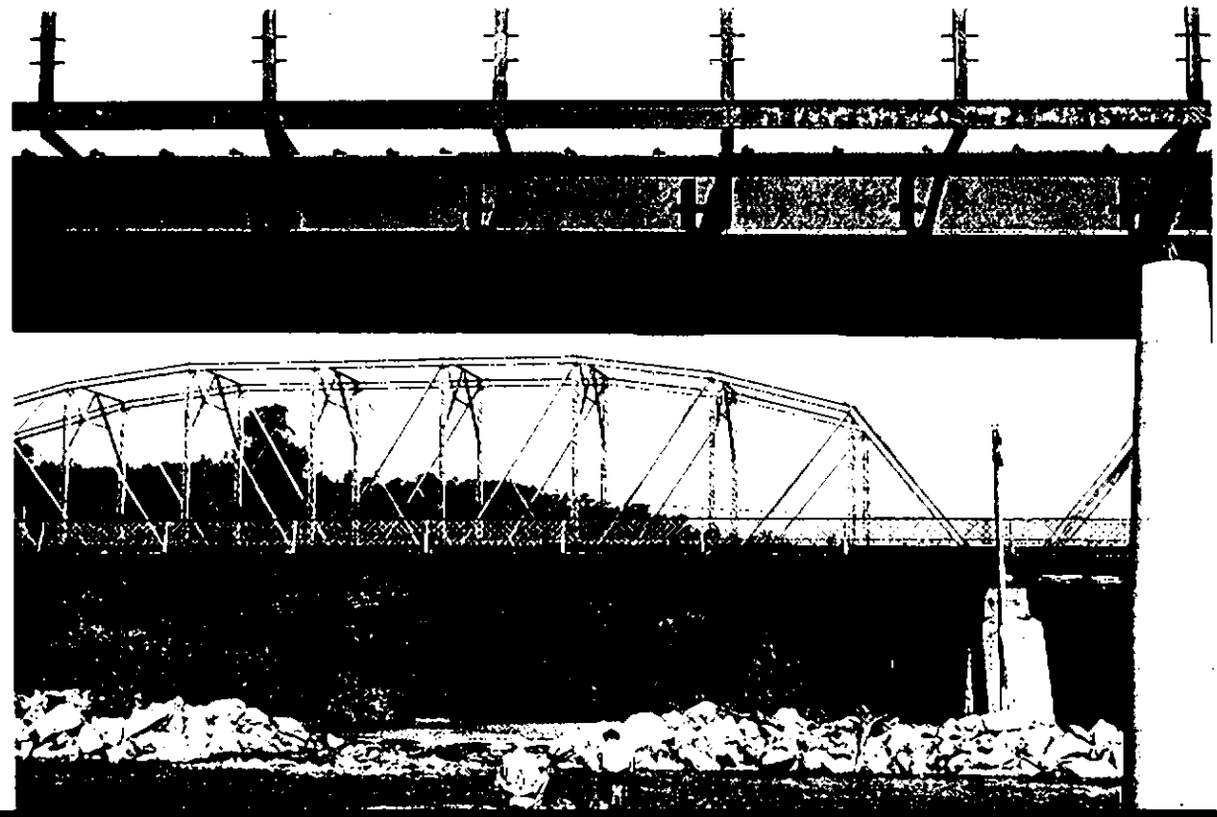
It is concluded that the expenditures in the year 1958-59 should be increased between 15 and 20 percent (except for snow removal) to provide optimum service. It is estimated that costs per mile would range from $890 per mile on high type, two-lane rural roads to $6,000 per mile on municipal freeways.

The cost of converting existing signs and signals on the proposed Primary System (rural and municipal), to state standards totals $15 million. About $500,000 annually for five years has been allowed for replacement of signs with maintenance forces and funds—leaving a net $12.5 million in capital investment needed. Because of the direct affect on traffic safety, this work should be done as soon as possible, preferably to be completed in five years.

As Primary Roads are improved and greater working efficiencies achieved, partly as a result of special research now being conducted by the State Highway Commission in cooperation with the Bureau of Public Roads, it may be expected that certain types of maintenance expense will decrease. This is particularly true of expensive surface maintenance now applied to poor pavements and gravel roads. However, new design standards provide for wider pavement, shoulders, median strips and rights of way, together with numerous structures and interchanges. Such additional areas and facilities to be maintained will more than offset the items where costs can be reduced. The annual programs indicate the average annual amount required for adequate maintenance of the changing road system.

"Local Service" Primaries

For the 1,900 miles of existing Primary Roads and municipal extensions which should be segregated from the proposed Primary Road System, as discussed in Chapter II, similar studies were made by Commission engineers under policies laid down by the Foundation. Since the functions of such roads and streets are similar to those of County Trunk Roads and city Arterials, design standards,



The old and the new — in the background an outmoded structure with narrow roadway — in the foreground a modern bridge under construction.

and construction and maintenance costs, applicable to trunks and arterials were used in the analysis. Alternative program costs are shown in the table on page 45.

Regardless of whether these roads and streets remain a state responsibility or are transferred to the counties and municipalities, the costs reported here are appropriate to their needs.

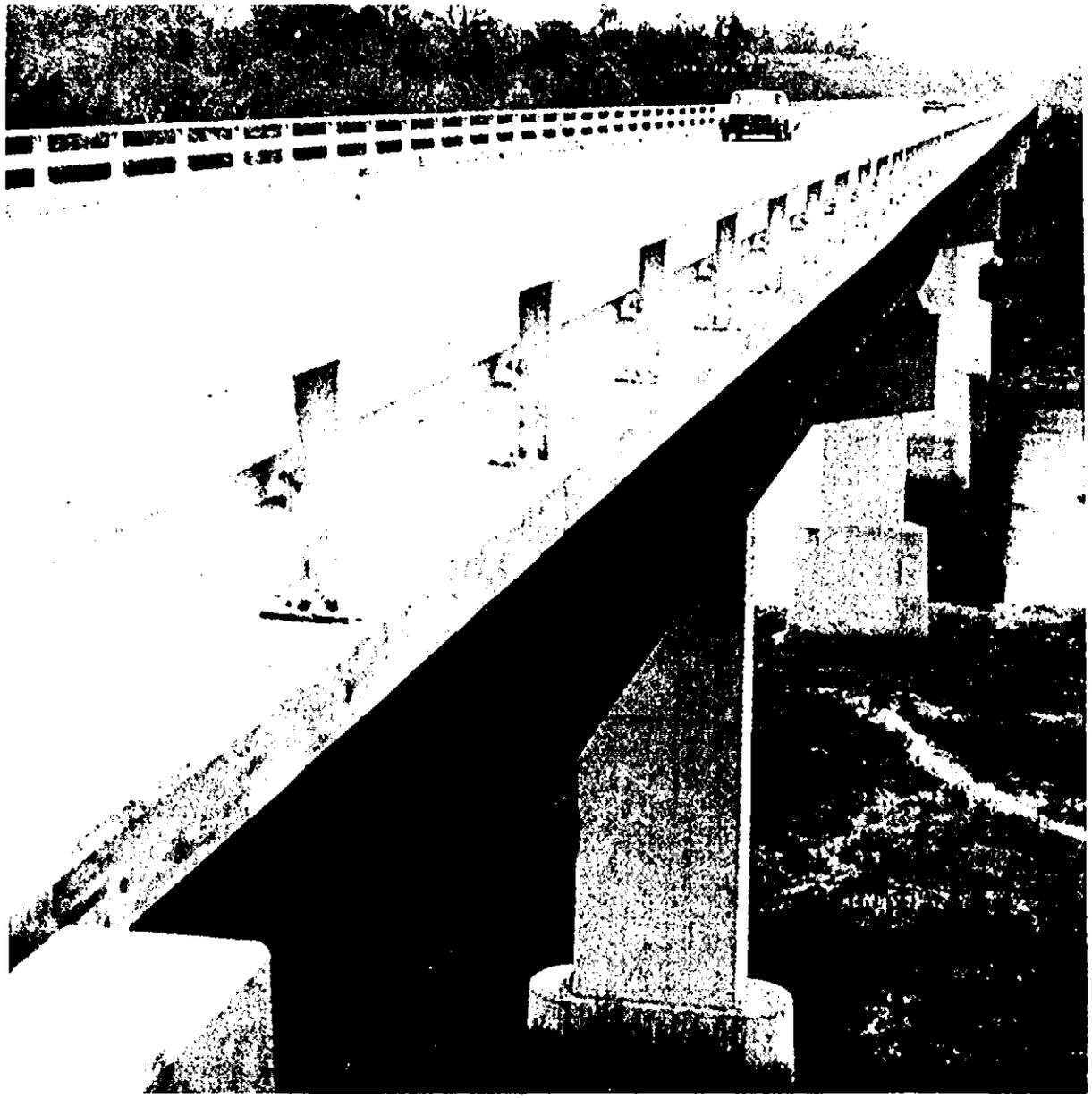
Because they do not provide statewide service, no attempt was made to study their priority, except to identify the "backlog" which constitutes 664 miles, and 60 percent of the 20-year total basic construction cost. Certainly "local service" Primary Roads would generally have the lowest priority of any in the existing Primary Road System. They are locally important, however, and should be considered in relation to other county and municipal needs.

Conclusion

The proposed Primary Road System is the backbone of the state transportation system, both rural and urban. From a statewide point of view, it deserves the closest attention of the general assembly and the people of the state. Alternative program estimates, showing yearly costs averaged over several periods of time, provide a basis for making fiscal plans that will determine the rate of progress towards providing and maintaining adequate facilities in keeping with traffic needs.

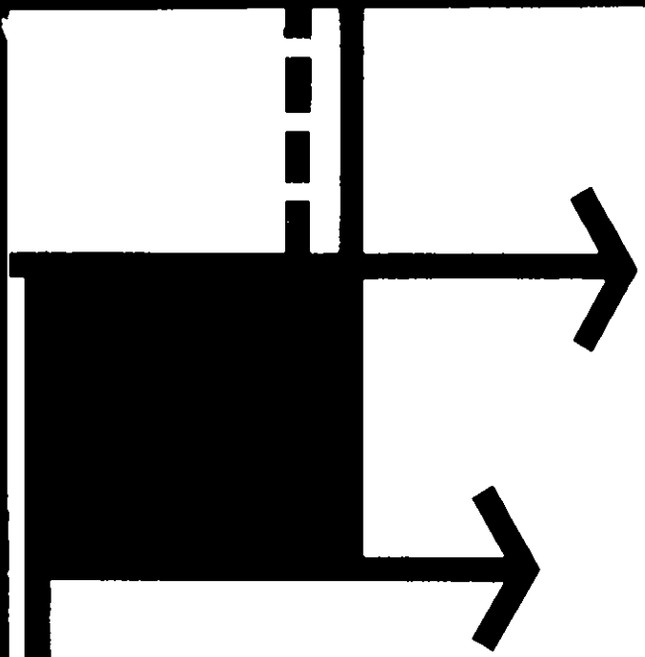
However, the system cannot be considered in a vacuum—for without the sustaining Secondary Roads and city streets the Primary System would be of little value. This is one of the great assets of highway transportation: to provide flexibility and service to an expanding economy, and to all corners of the state and the nation.

The needs of other road and street systems are described in succeeding chapters. The Primary Road System is placed in perspective to the entire problem in the concluding chapter of this report.



This new bridge across the Des Moines River is wider than the approach pavement — a feature of modern design to provide increased traffic safety.


MILLER & HOHL
WORLD'S
LARGEST
UPSTAIRS
CLOTHIERS



MUNICIPAL STREET NEEDS

The 942 incorporated municipalities of Iowa contain the widest variety of problems—ranging from mud and dust on 4,600 miles of streets to severe congestion on some heavy traffic streets in larger cities. Some places are in excellent shape to meet their traffic needs; others are far behind. These differences are the inevitable consequence of such a large number of separate and individual responsible authorities. Each has to face different topography and growth patterns, financing ability, management and engineering arrangements. Policies and standards have little in common.

This study recommends, in Chapter II, two important moves that would greatly benefit cities and towns in achieving greater uniformity in meeting their needs: (1) give the State Highway Commission principal responsibility for proposed Primary Road extensions inside municipalities, and (2) establish Arterial Street Systems. Further suggestions are made in Chapter VI.

Program costs for construction, maintenance and administration of the proposed Primary Road extensions have been shown in the preceding chapter; they constitute about 37 percent of total municipal street needs between 1960 and 1980. Other Arterial Streets require 25 percent, and Local Access Streets total 38 percent.

The basic objectives of the alternative programs shown in this chapter are (1) to provide reasonably free-flowing arterial streets, designed to provide 30-35 miles per hour average speed in outlaying areas, and about 20-25 miles per hour in downtown areas, (2) to provide paved surfaces of reasonable width for all residences and business, except those in outlying areas of communities under 5,000 population, and (3) to provide adequate traffic control for Arterial Streets and proper maintenance for all facilities.

Alternative Annual Programs

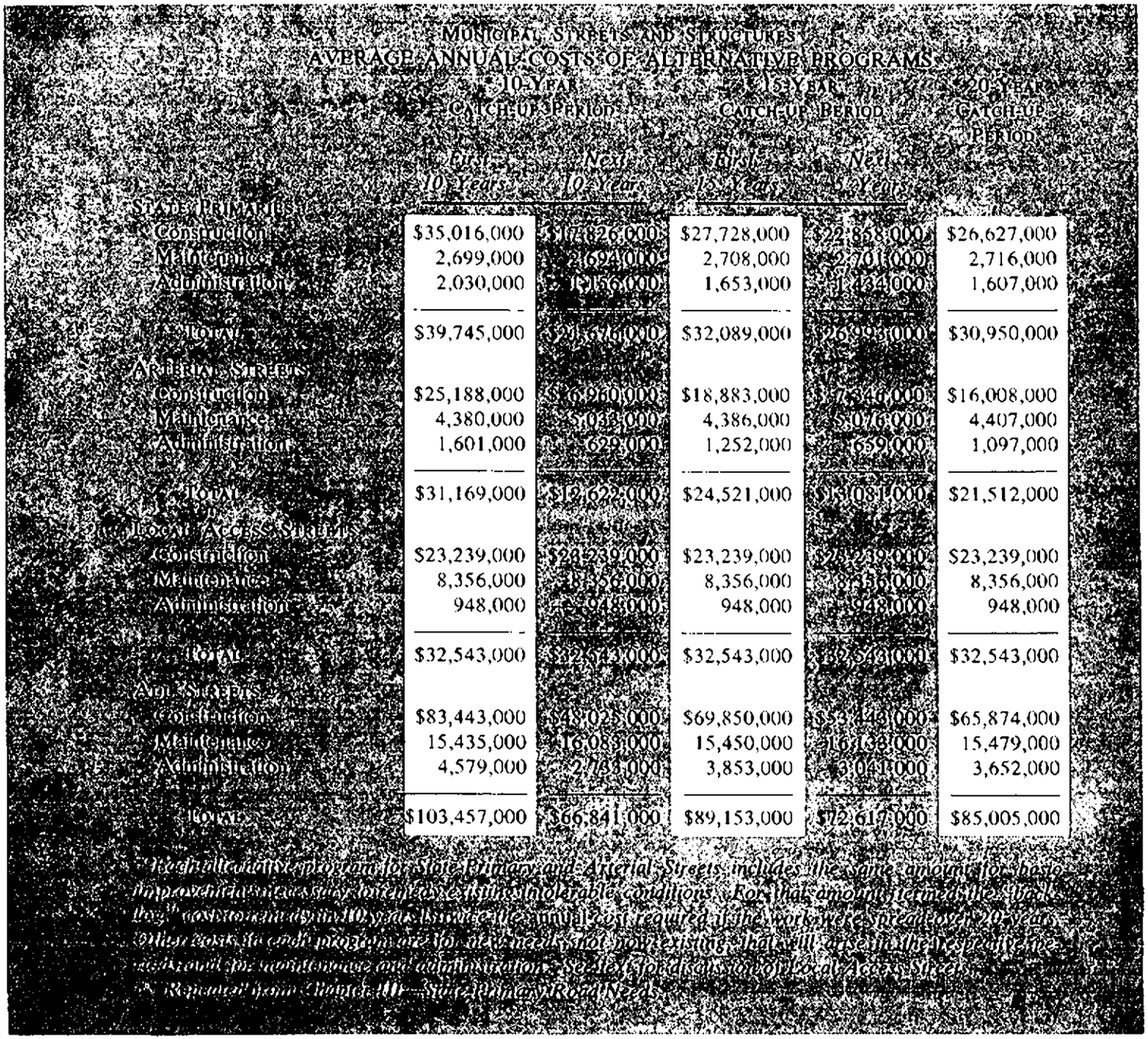
As shown in the table on page 50, the objectives of improved transportation service in municipalities can be met by expenditures, at 1959 prices, of the amounts indicated for each system. The "State Primary" costs were shown in Chapter III, and are repeated here to provide a complete view of the entire problem within municipalities.

Higher costs in the shorter term programs for State Primary and Arterial Streets result primarily from spreading the fixed costs of "backlog" work over fewer years. Backlog work is that which is needed to remedy intolerable conditions that exist now. In the long run, total costs will be about the same, regardless of which program is selected, but obviously the benefits can be obtained sooner with an accelerated program.

Only a 20-year program was calculated for Local Access Streets, since these are normally developed gradually in line with population growth, and improved when desired by a majority of abutting property owners. The study evaluated the over-all needs of such streets over the 20-year period, and it is estimated that such work would proceed at an average rate of about five percent each year.

Program Costs

The study analyzed the problems of each community separately, with particular reference to ability of existing streets to carry present and future traffic, and determined the status of Local Access Streets. Alternative average annual program costs in the seven largest cities over the next 20 years, and totals by population groups in smaller places are shown in the Appendix.



MUNICIPAL STREETS AND STRUCTURES

AVERAGE ANNUAL COSTS OF ALTERNATIVE PROGRAMS

	10-Year Catch-up Period		15-Year Catch-up Period		20-Year Catch-up Period
	First 10 Years	Next 10 Years	First 15 Years	Next 5 Years	
State Primaries					
Construction	$35,016,000	$17,826,000	$27,728,000	$22,868,000	$26,627,000
Maintenance	2,699,000	2,694,000	2,708,000	2,701,000	2,716,000
Administration	2,030,000	1,156,000	1,653,000	1,434,000	1,607,000
Total	$39,745,000	$21,676,000	$32,089,000	$26,993,000	$30,950,000
Arterial Streets					
Construction	$25,188,000	$6,960,000	$18,883,000	$7,946,000	$16,008,000
Maintenance	4,380,000	5,033,000	4,386,000	5,076,000	4,407,000
Administration	1,601,000	629,000	1,252,000	659,000	1,097,000
Total	$31,169,000	$12,622,000	$24,521,000	$13,681,000	$21,512,000
Local Access Streets					
Construction	$23,239,000	$23,239,000	$23,239,000	$23,239,000	$23,239,000
Maintenance	8,356,000	8,356,000	8,356,000	8,356,000	8,356,000
Administration	948,000	948,000	948,000	948,000	948,000
Total	$32,543,000	$32,543,000	$32,543,000	$32,543,000	$32,543,000
All Streets					
Construction	$83,443,000	$48,025,000	$69,850,000	$53,443,000	$65,874,000
Maintenance	15,435,000	16,083,000	15,450,000	16,133,000	15,479,000
Administration	4,579,000	2,733,000	3,853,000	3,041,000	3,652,000
Total	$103,457,000	$66,841,000	$89,153,000	$72,617,000	$85,005,000

Total cost of this program for State Primary and Arterial Streets includes the same amount for basic improvement necessary for all existing intolerable conditions. For that amount, termed the "Backlog" cost, construction is spread over 10 years. Instead, the annual cost required if the work were spread over 20 years is shown. Other costs in each program are for new needs not now existing that will arise in the next 20 years, and will be maintenance and administration. See text for discussion of Local Access Streets.

Reprinted from Chapter III—Street Primary Road Needs.

Planned Improvements

Arterial Streets, totaling 2,027 miles, are the chief problem of the municipalities as a whole, some 32 percent being rated as intolerably poor for today's traffic. Such streets differ from main rural roads in two ways: they can often be overloaded to stagnation of traffic by a relatively small increase in number of vehicles, and opportunities for relief are severely limited by restricted or high cost right of way on which to make improvements.

Local Access Streets, now totaling 8,740 miles, represent a sizeable work load to improve and maintain. About half are now in very poor condition and need repaving or new surfaces. Some 800 miles of new streets are estimated to be built prior to 1980.

Capital investment costs needed for construction in the next 20 years are shown in the table on page 51. Because of the great variety of planned improvements, costs are the best common denominator, on a statewide basis, to define the work planned.

Arterial Streets

Excluding State Primary routes in cities and towns, Arterial Street capital investment needs for construction are about 30 percent of the municipal total program costs for 20 years. They range from 12 percent in places under 2,500 population, to 45 percent in Des Moines.

Special attention was given to analysis of problems in the 51 cities of more than 5,000 people. Within the framework of the basic engineering analysis applicable to all systems, staff engineers recognized the wide variety of possible solutions to traffic problems. This required a comprehensive over-all approach that can be described as master street planning.

Staff organized personal conferences with officials of the cities, state and affected counties, made use of local planning studies, and identified basic problems and practical solutions.

For the seven largest cities, new techniques of estimating future traffic demands along main corridors were applied. Such demands in all cities were matched against ability of present streets to carry traffic efficiently. Special attention was given to possible improvement of flow by traffic engineering methods—making better use of existing facilities through improved parking controls, signs, traffic channelization, signal control, routing and one-way operations.

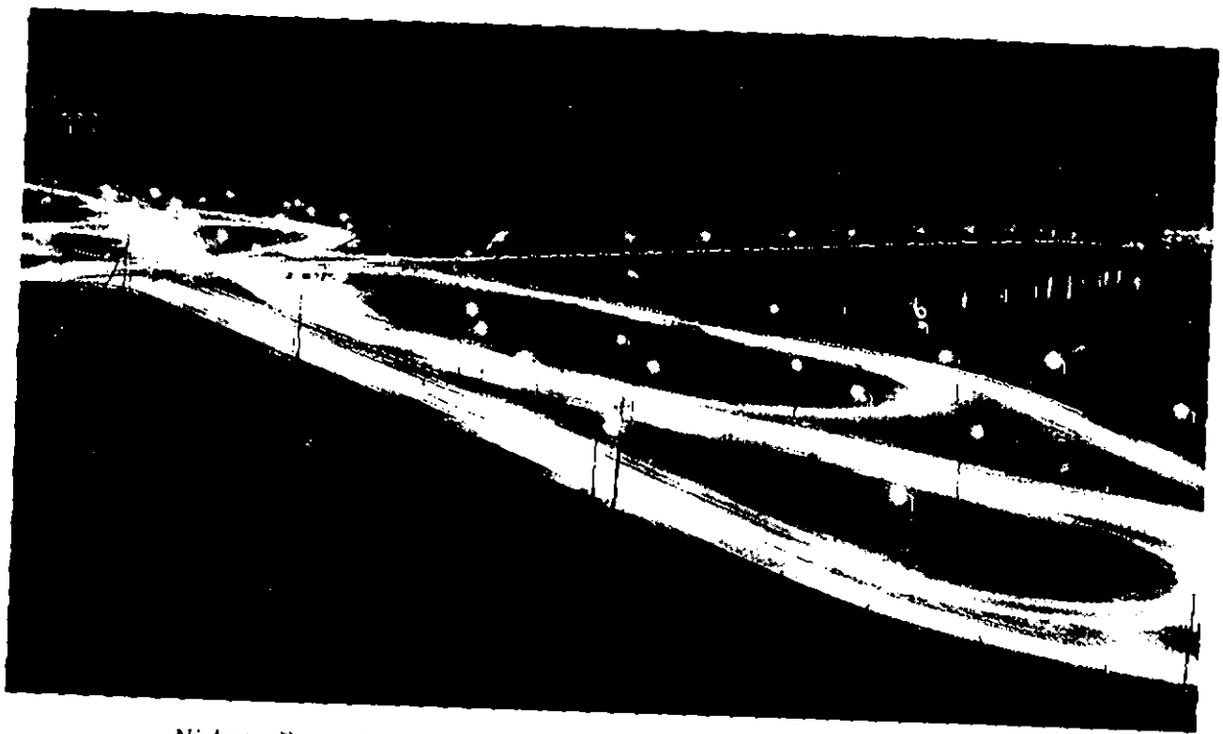
Bottlenecks and congested areas that could not be resolved by those means were thereafter planned for major construction improvement, taking into account relief that would be afforded by proposed State Primary improvements, which were included in the general urban area studies. Finally, development of arterials to at least minimum standards of width and paving was planned wherever existing streets failed to meet them.

Larger City Needs

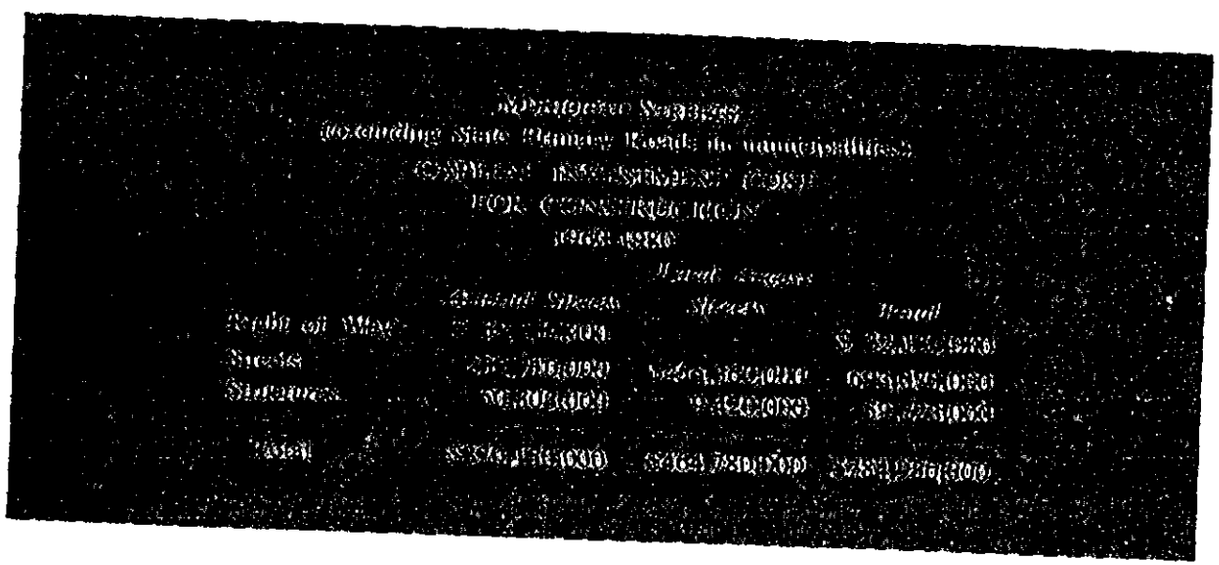
Total capital investment needs on Arterial Streets (not including State Primaries), in the 51 largest cities are $227,318,000 over the 20-year period 1960-1980. That is about 87 percent of all such work in all municipalities, and these cities constitute 64 percent of the population of all cities and towns.

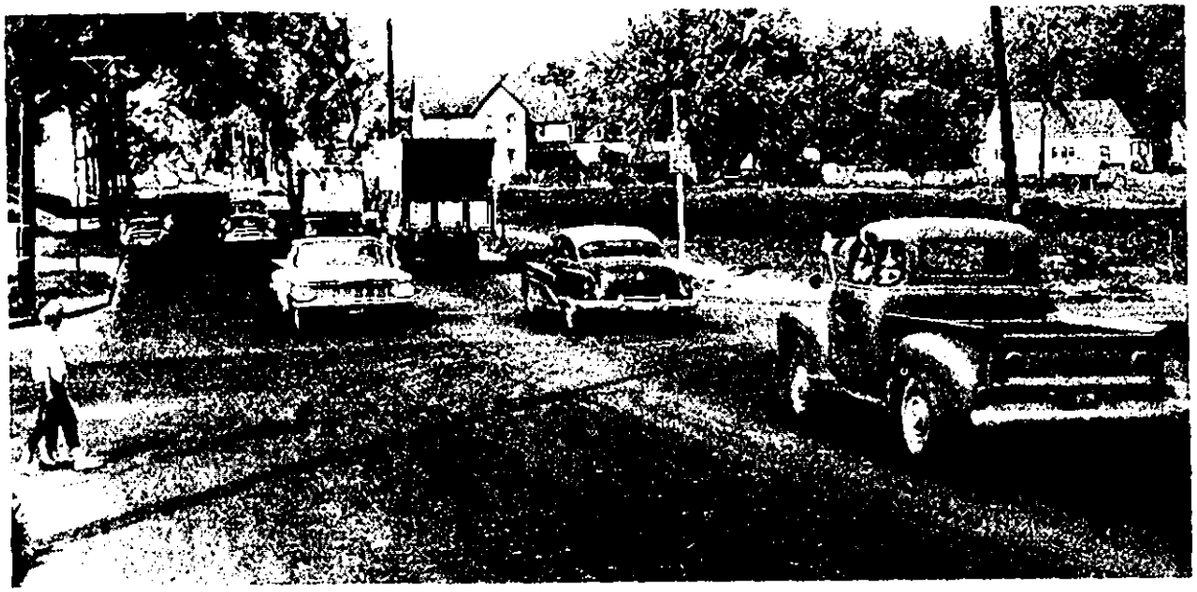
Some 158 bridges and grade separations will be required at a cost of $46,657,000, in addition to those on State Primary routes. These are generally critical needs, since they bridge severe water or rail barriers that have often hampered city growth, development of better traffic flow patterns, and improved safety.

About 39 percent of the total 20-year construction cost is needed to correct existing deficiencies.

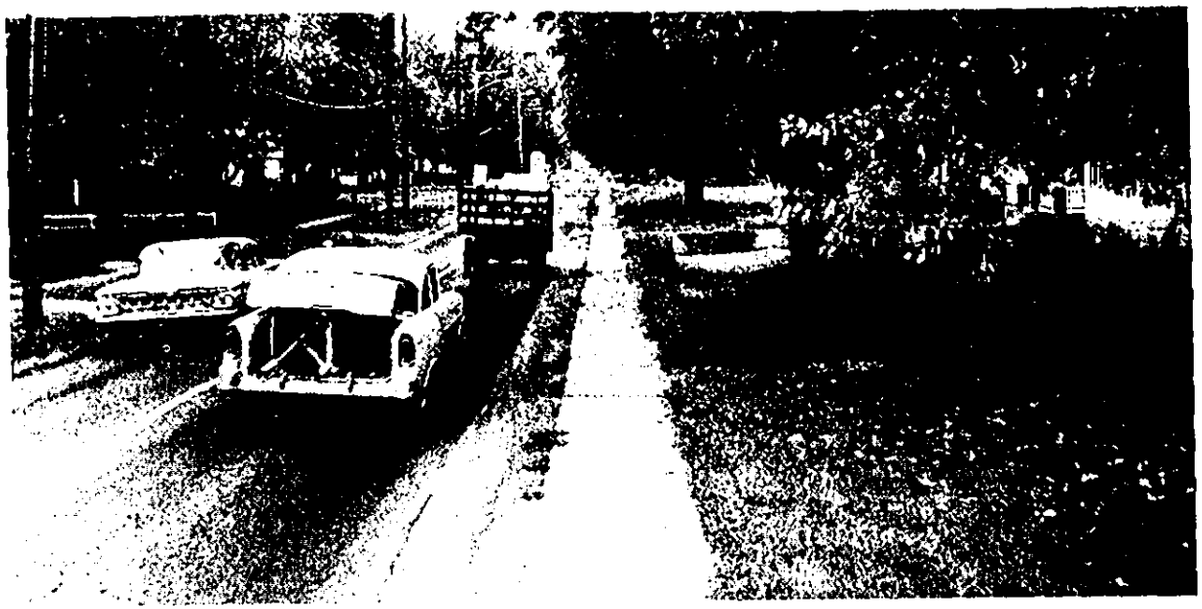


Night traffic outlines this interchange on the Interstate System in Sioux City.





Here are two arterial streets which are inadequate for the traffic volumes carried at present, and which would much better serve city and rural people were they modernized.



Smaller City Improvements

The principal need in smaller cities, aside from the proposed State Primary routes, is for durable, smooth-riding arterial streets, generally of greater width than normal residential streets, in order to attract main traffic to arteries that can be protected by signs and signals, be maintained in superior fashion, and that can divert trucks and larger volumes away from purely residential streets. Most such arterials connect with county roads, and tie in business areas with them and with state routes.

Improvement programs are planned for much better drainage—now commonly poor—and improved surfaces with curb and gutter, except where light traffic and little development within corporate limits would permit a rural-type roadway.

Total capital investment for construction needed on Arterial Streets only over 20 years, in the 891 municipalities under 5,000 people, is $42,832,000, about 13 percent of the total arterial costs, for 36 percent of the municipal people. A total of 84 bridges at a cost of $3,447,000 are also needed.

About 45 percent of the total 20-year construction costs is needed to remedy the existing backlog of deferred work.

Local Access Streets

The present inventory of residential and business Access Streets shows:

	Miles
Unpaved	4,074
Surface Treated	1,991
Paved	2,675
Total	8,740

Of the total mileage, the 51 larger cities contain 42 percent, including one-third of the unpaved streets.

Of all treated and paved surfaces, about 15 percent, nearly 700 miles, are in poor condition. A few are exceptionally narrow. This study contemplates the reconstruction of that mileage to reasonable standards of width and pavement, depending on size of the city and whether the streets are serving downtown business, intermediate or suburban areas.

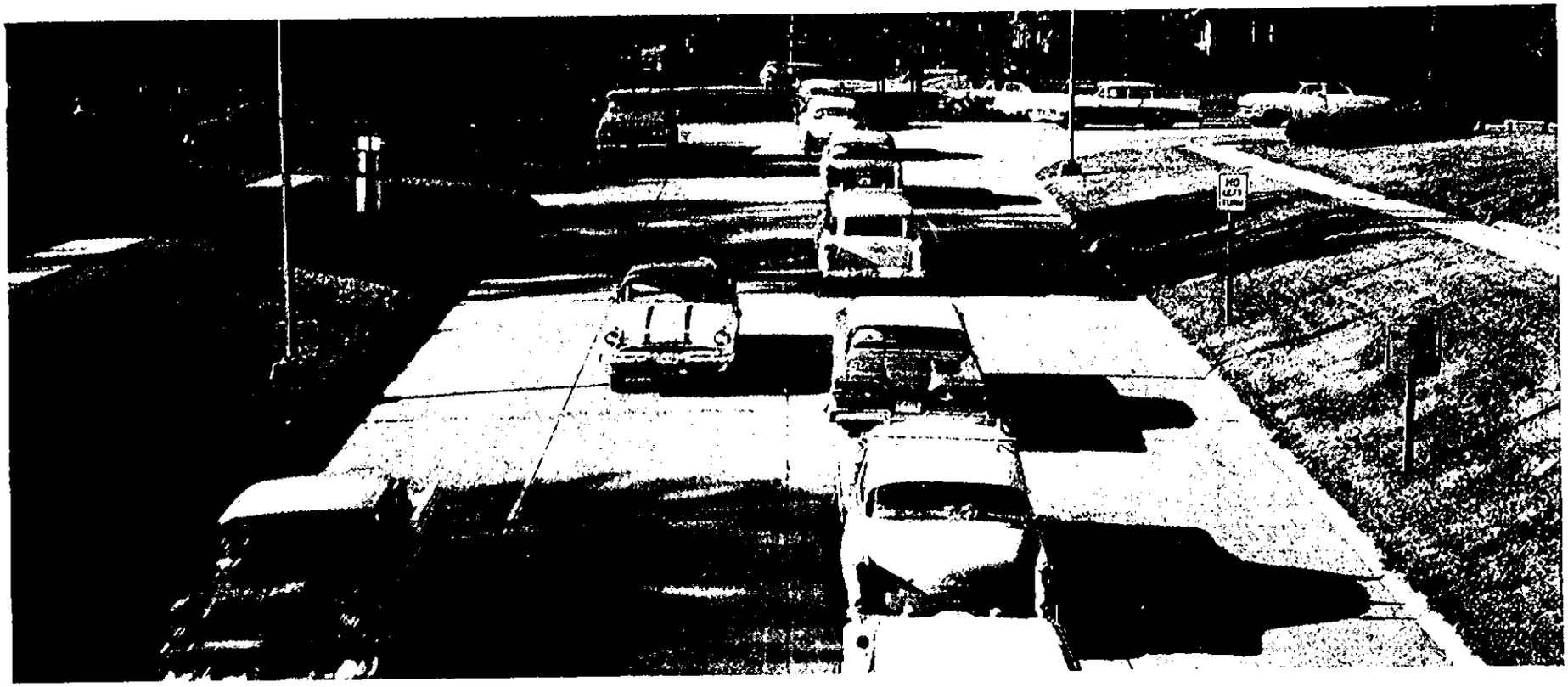
Moreover, standards call for paving or surface treatments with curb and gutter on all unpaved streets, except in outlying areas of communities of less than 20,000 people. There, either rural-type paving or gravel streets will suffice where development is sparse. In 1980, the study estimates only about 550 miles of unpaved streets.

In addition, it is estimated that population growth will require about 800 miles of new paved Access Streets within the next 20 years — 600 miles within the seven largest cities and 200 miles in the 44 remaining cities of over 5,000 population.

There are 449 bridges on such streets, but many will be satisfactory for 20 years. Estimates indicate that construction work will be needed on 248 of them, at a cost of $8,960,000.

Total capital investment needs, as shown in the table on page 51, include necessary investment for eventual reconstruction of the 85 percent of pavements, and the structures, considered satisfactory now.

Where city Arterial Street systems are inadequate, congestion and delay are bound to occur. Urban communities must plan now to construct additional arteries for their inevitable population growth.



Few cities keep adequate records of maintenance costs that will permit an analysis of cost related to type and character of streets, operations performed or efficiency of work.

Special studies were made of a few places that appeared to be accomplishing good work. Available data were analyzed by experienced maintenance engineers. Quality of work, related to type of facilities, was reviewed and unit costs for various operations were estimated and compared to general records of expenditures.

Such data were reviewed and compared with costs of performing similar work on state routes and in other cities. The wide variety of existing widths, types and traffic in various sizes of municipalities was considered.

Resulting costs for Arterial Streets vary from about $900 per mile per year in smaller communities to $3,850 for major arterials in large cities, the amounts including snow removal and ice control, traffic signals, appropriate highway illumination, pavement and base repair, and numerous other items.

On Access Streets, costs range from $300 to $1,400 per mile.

Iowa's population increase will take place largely in urban areas—this means provision of local access streets as well as adequate arterials.

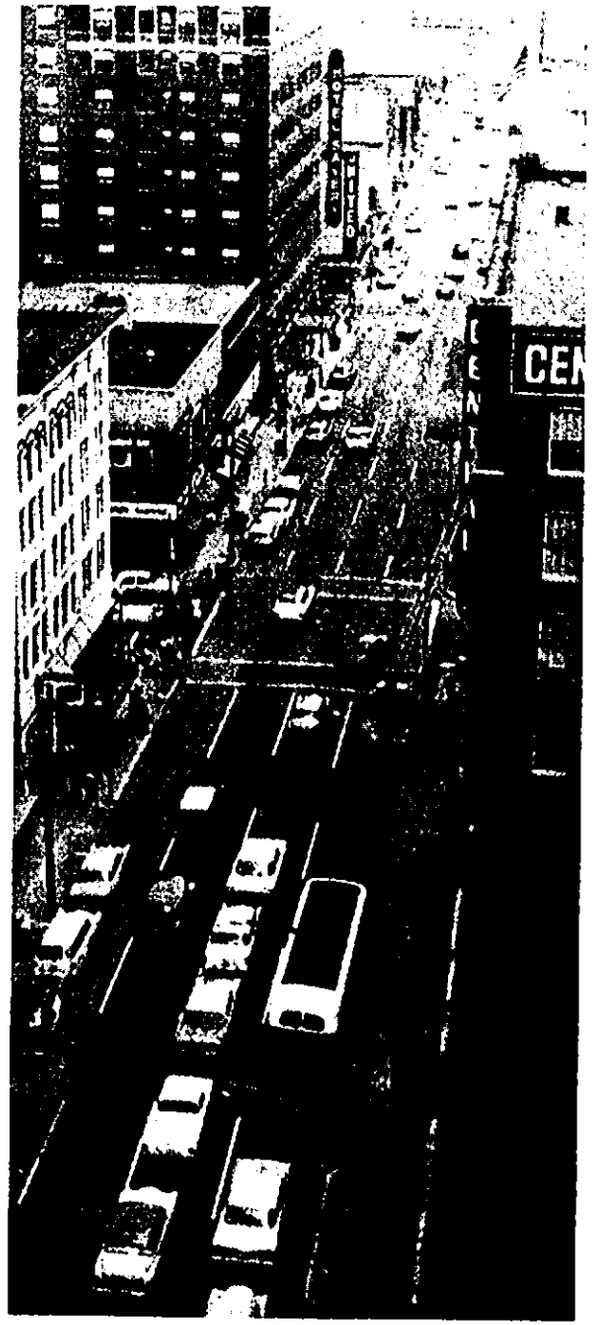
Conclusion

Developing adequate municipal street systems for a growing population, now representing two-thirds of Iowa's people, is one of the most urgent and complex problems confronting the municipalities of the state, especially in the larger cities.

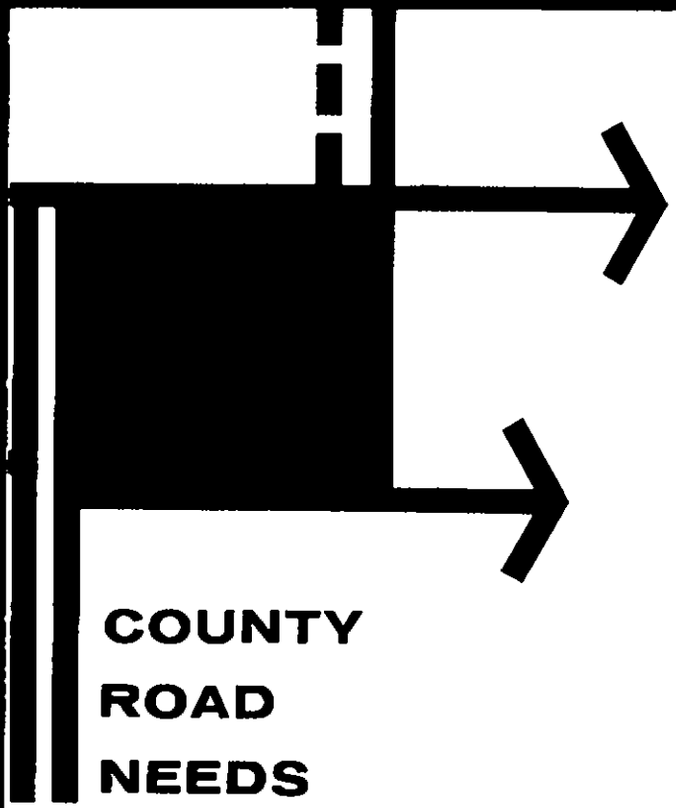
Solutions involve expansion of the responsibilities of the State Highway Commission and close coordination between the Commission and the several municipalities. Moreover, the cities themselves need to expand their planning approach, since highway planning engineers need to know and understand the interrelations of highways and streets and other facets of community life and growth. More about these problems will be discussed in Chapter VI.

Arterial Streets, along with state routes, should be the major concern, for they are the real key to good transportation. Local Access Streets, while very important to those who live on them, can be developed satisfactorily with a great variety of designs, depending mainly on the desires of abutting property owners. All streets, however, become a general charge for maintenance.

This study has shown clearly the lack of adequate data—inventory, traffic, growth patterns—on which to base competent future planning. Much of the minimum data essential for the study was compiled for the first time by city engineers and study staff. Results provide reasonably valid estimates of over-all needs, and a basis for future refinements of physical plans. Detailed studies should be continued indefinitely, and adjusted to future changing conditions.



The economic health of the downtown business district depends very largely on the ability of people to reach the area conveniently and safely. Cities, large and small, have the challenge of providing good access to both downtown and other traffic generators.



COUNTY ROAD NEEDS

Today the county, or "secondary," roads in Iowa include 76,200 miles with gravel, crushed stone, or light bituminous surfacing, 3,100 miles with a paved roadway, and only 12,200 miles of earth roads. Consequently, the goal set twelve years ago (an all-weather surfaced roadway to every reasonably located rural home) is near at hand and is soon attainable at current rates of construction.

This is a great achievement. It brings Iowa near the end of the mud roads era.

It is a transient victory, however, for new county road needs and problems have arisen. Increases in the volumes, weights and speeds of county road traffic made possible through better roads, and changes in the concepts of comfort, convenience, and safety of highway transportation have made many miles of the more important roads obsolete even before the earlier goal can be reached.

Classifying country roads in three systems — County Trunk, County Feeder, and Local Secondary—as described in Chapter II, offers the best opportunity to concentrate higher type development where it is needed most.

Good gravel roads, well maintained, will serve needs adequately and economically on most Local Roads, totaling 59,000 miles. But for the 32,000 miles of Trunk and Feeder Roads, this study has determined a need for new construction or reconstruction, over the next 20 years, of

11,400 miles of pavement
8,800 miles of light dustless surfaces
6,700 miles of reconstructed gravel.

About 15,000 new or rebuilt bridges will be required on all three systems.

This chapter deals with an evaluation of current and future deficiencies and needs on all county roads, and with the formulation of programs to provide improvements over the next two decades.

Alternative Annual Programs

To eliminate the backlog of improvements needed now on all county or secondary roads,

To meet future needs for improvements on these roads as they develop, and

To maintain these roads at levels essential to preservation of the capital investment in them

will require an annual expenditure of $108 million if the backlog of deferred improvements, needed now, is absorbed over a 20-year period; $120 million, if over a 15-year period; and $140 million, if over a 10-year period. These programs are detailed in the table on page 58. All estimates are based on 1959 price levels for all classes of work.

Total expenditures on each system over the 20-year period would be about the same for all three programs. Expansion of activities for faster elimination of the existing backlog of work would require more funds in early years and less in later years. The economic well-being of the people of the state, and the comfort, convenience and safety of highway transportation on county roads would be served by earlier improvement of the more important of these roads, consistent with a sound financial position.

Almost two-thirds of Local Roads are adequate now, and a majority will remain so with proper maintenance. It is estimated that improvement of the remainder would progress at the rate of about five percent per year, and therefore only a 20-year program was estimated for local roads.

Accomplishments that should be possible for each of the three county road systems on a statewide basis, by adoption of any one of the alternative programs, are summarized in the balance of this chapter.

All County Roads And Structures:
Average Annual Costs of Alternative Programs

	10 Years (Catch-up Period)		15 Years (Catch-up Period)		20 Years Catch-up Period
	First 10 Years	Next 10 Years	First 15 Years	Next 5 Years	
County Trunks					
Construction	$45,535,000	[illegible]	$31,594,000	[illegible]	$24,406,000
Maintenance	6,137,000	[illegible]	6,171,000	[illegible]	6,178,000
Administration	2,701,000	[illegible]	1,988,000	[illegible]	1,608,000
Total	$54,373,000	[illegible]	$39,753,000	[illegible]	$32,192,000
County Feeders					
Construction	$32,543,000	[illegible]	$27,100,000	[illegible]	$23,157,000
Maintenance	10,169,000	[illegible]	10,201,000	[illegible]	10,213,000
Administration	1,713,000	[illegible]	1,502,000	[illegible]	1,335,000
Total	$44,425,000	[illegible]	$38,803,000	[illegible]	$34,705,000
Local Roads					
Construction	$21,412,000	[illegible]	$21,412,000	[illegible]	$21,412,000
Maintenance	18,344,000	[illegible]	18,344,000	[illegible]	18,344,000
Administration	1,194,000	[illegible]	1,194,000	[illegible]	1,194,000
Total	$40,950,000	[illegible]	$40,950,000	[illegible]	$40,950,000
All County Roads					
Construction	$99,490,000	[illegible]	$80,106,000	[illegible]	$68,975,000
Maintenance	34,650,000	[illegible]	34,716,000	[illegible]	34,735,000
Administration	5,608,000	[illegible]	4,684,000	[illegible]	4,137,000
Total	$139,748,000	[illegible]	$119,506,000	[illegible]	$107,847,000

Each alternative program for County Trunks and County Feeders includes the same amount for basic improvements [illegible] existing intolerable conditions. [illegible] over 20 years. [illegible] and for maintenance and administration. See text for discussion of Local Roads.

Variations Among Counties

It is unlikely that all 99 counties, if left to themselves, would achieve the same rate of progress in road improvement. Because of differences in road use among the counties, not all roads in a statewide county system should be alike; standards applicable to any system provide for various types of roads for different conditions. Moreover, past progress in some counties has been slow; in others, rapid. Counties which have done a good job will require more reconstruction, shouldering and resurfacing in the future. Others will require more grading and new surfaces, but less rebuilding and resurfacing. These differences tend to equalize over any long period of years—such as the twenty years used for this study.

For greatest benefit, all roads and bridges on a given system should be brought to appropriate standard in all counties in about the same time period. This, however, is a matter of legislative decision and affects distribution of state-aid funds within the 99 counties. To aid such considerations, the Appendix contains a listing of total program costs, including maintenance, for each county.

Planned Improvements

Within the next 20 years, about two-thirds of the 91,000 miles of all county roads will require some form of improvement, ranging from simple gravel or crushed stone resurfacing, to construction of new heavy-duty roadway surfaces. Also, it is estimated that 53 percent of the 28,000 bridges on county roads will have to be replaced or rebuilt.

In this study, county engineers examined every mile of county road in their respective jurisdictions in accord with procedures established by the engineering staff of the Automotive Safety Foundation with the advice of the County Engineering Advisory Committee. Results of these operations

were reviewed by Foundation engineers to insure uniformity and competency of the analysis of the data, in the same manner as done for all other road and street systems.

Total capital investment needed for construction of roads and bridges between 1960 and 1980 on all county roads is shown in the table below:

CAPITAL INVESTMENT COST
FOR CONSTRUCTION
1960-1980

County Trunk System	$488,120,000
County Feeder System	463,140,000
Local Road System	428,240,000
Total	$1,379,500,000

The estimates provide for basic construction (including 3.5 percent for right of way on Trunk and Feeder Systems) and for reconstruction on roads built early in the period.

County Trunk Roads

Costs estimated for improvement of the 12,000-mile County Trunk Road System provide for construction, prior to 1980, of 11,000 miles of pavement and 1,900 bridges. Some 200 highway-railway grade crossing protection devices are needed.

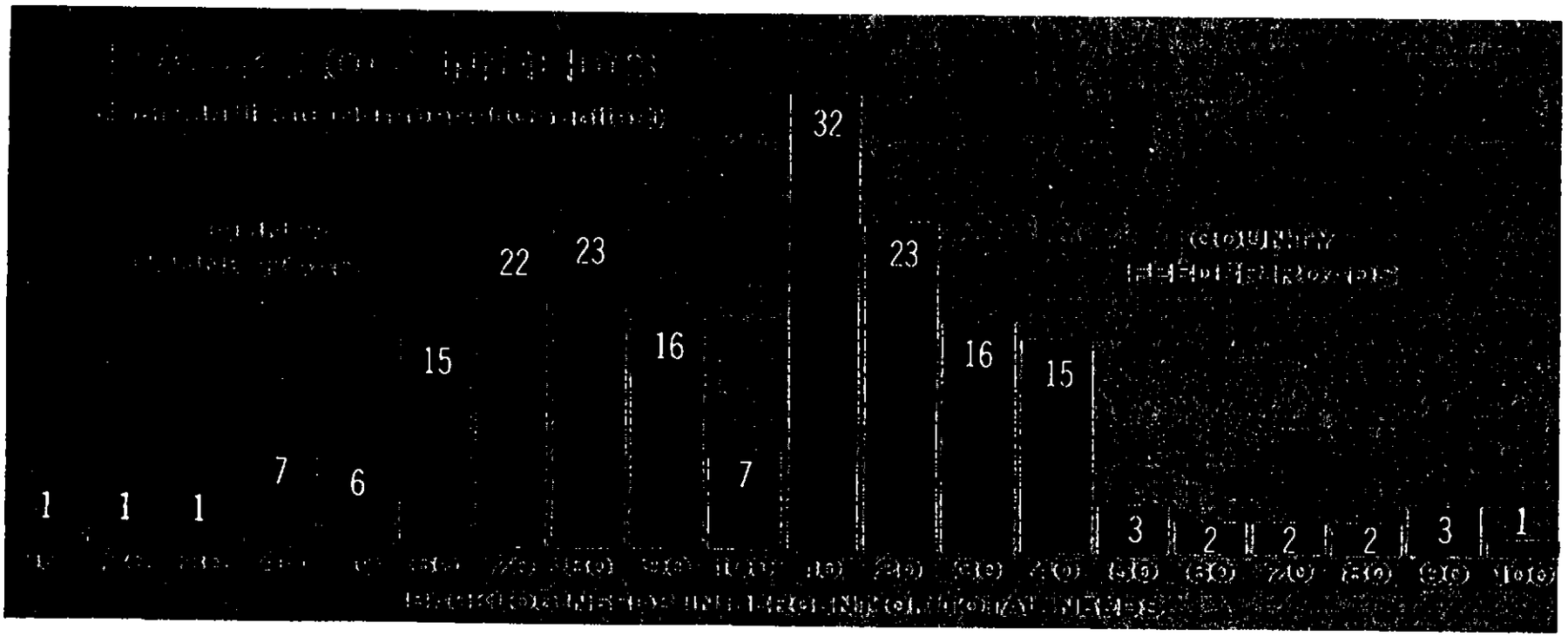
Upon completion of this program, all of the system would have a paved roadway adequate in all structural and geometric features for volumes of traffic in the range of 100 to 1,000 vehicles per day.

Improvements needed now—the "backlog"—involve 70 percent of the total capital investment cost of the 20-year program. It is impractical to undertake elimination of this backlog of needs all at once, but such work should have top priority of county expenditures for construction.

County Feeder Roads

Estimated expenditures for improvements prior to 1980 on the 20,000-mile County Feeder Road System, provide for the construction of nearly 400 miles of pavement, 8,500 miles of light dustless surface, and 3,900 bridges.

Upon completion of this program, the County Feeder Road System would contain 440 miles of paved roads for traffic volumes of 400 to 1,000 vehicles per day; 8,700 miles with lighter duty surfacing for 100 to 400 vehicles per day; and 10,800 miles of improved gravel or crushed stone



roadway, adequate for less than 100 vehicles per day.

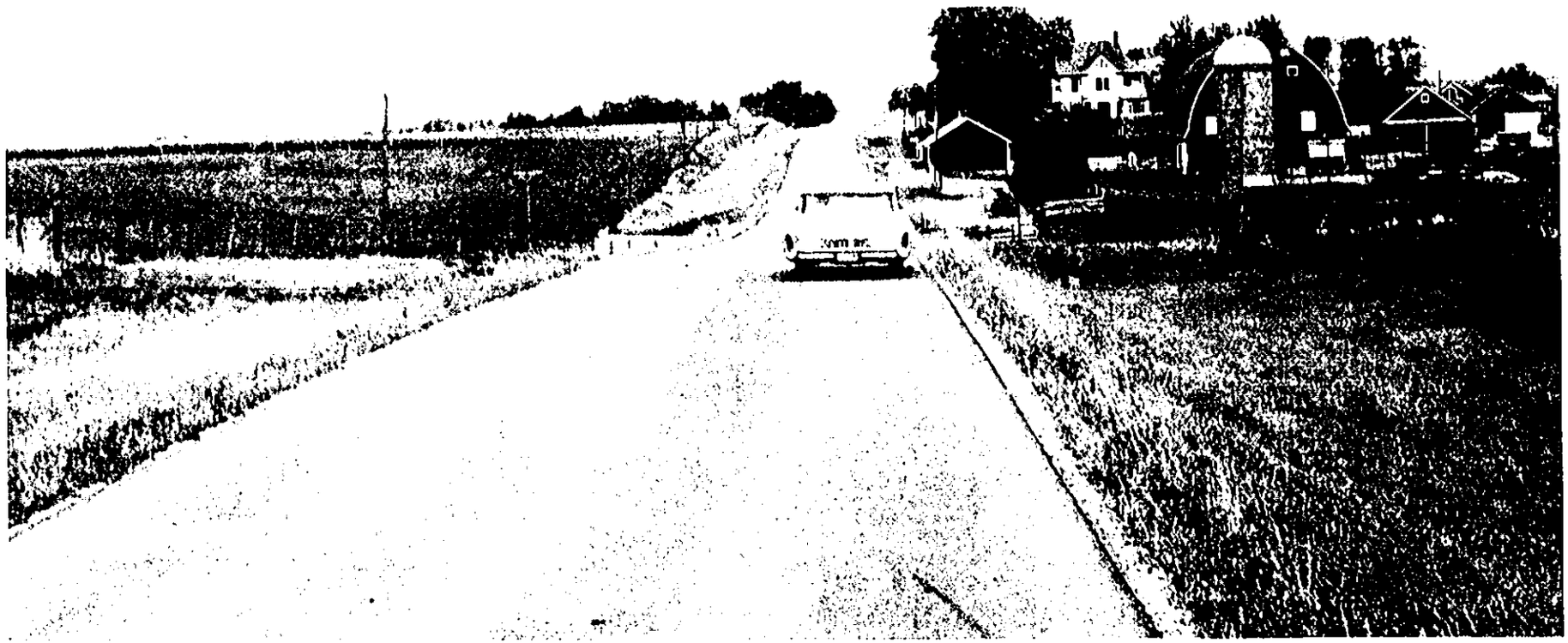
Improvements needed now represent 30 percent of the total capital investment cost of the 20-year program. This backlog of improvement needs could be completed at a somewhat slower rate of progress because of the lesser service rendered by the County Feeder Road System. It would be unwise to meet the needs on the Feeder System in advance of those on the trunks—the more important of the two portions of the Farm-to-Market Road System.

Local Roads

Appraisals of the 59,000 miles of Local Roads reveal that 36,700 miles, or 62 percent of the total mileage in this system, meet or exceed minimum conditions tolerable for the service now demanded of them, and that 22,300 miles, or 38 percent, fail to meet such conditions. The need for improvement of this latter group constitutes the backlog of work on this system. The urgency for elimination of this backlog is related almost entirely to the needs of individuals living along these roads. This differs from that on the Trunk and Feeder Systems which, in addition, serve considerable through traffic. These improvements, therefore, could be distributed over a longer period.

The 20-year program would require construction of about 2,500 miles of dustless surfacing and 32,000 miles of grading and gravel surfacing. Also, 9,145 new or rebuilt bridges and other structures will be required.

That Iowa counties recognize the need for well designed and constructed roads is illustrated by this County Trunk. During the next 20 years, however, large mileages of County Trunk and County Feeder Roads must be constructed or reconstructed.



Upon completion of the program, the Local Road System would contain 375 miles of pavement for moderately light traffic—mostly near cities, 2,365 miles of light dustless surfaces, and about 54,800 miles with gravel or similar surfaces adequate for traffic volumes up to 100 vehicles per day.

Maintenance of County Roads

Costs of maintenance vary with type of roadway surfacing, volume of traffic, variation in climatic conditions, type and condition of subgrade soil, and age of facilities. Total annual costs for a system of roads will vary also with change in proportions of the several roadway surface types in the system from year to year, and with local costs of materials and labor.

Furthermore, costs of maintenance for a given set of conditions now vary widely among the 99 counties of the state. This is due, in part, to lack of any generally accepted standards for maintenance. The National Association of County Engineers is engaged in the development of standards of maintenance for various roadway surfaces. For the purposes of this study, estimates of maintenance costs for different types of surfacing under various conditions of service were prepared, on the basis of experience in maintenance of county roads and judgment of standards of maintenance required for the conditions encountered on each system in each county of the state.

Inadequate surfaces and less than year 'round, carefree travel still mark many miles of important county roads, particularly roads recommended to be classed as "Feeders" in this report.

Statewide annual average costs, estimated for proper maintenance by efficient crews, range from $337 per mile for local gravel roads to $661 for oiled earth roads. These costs include snow plowing, bridge maintenance, roadsides and roadway. In developing the individual county programs, shown in the Appendix, adjustments were made to reflect variations in costs of material and other factors among the 99 counties.

Benefits of Research

The State Highway Commission, in cooperation with the counties, is conducting research on county roads problems as authorized by law. Parts of this program are at a stage of completion that indicate contributions of great value and significance to the proposed 20-year road improvement programs described in this chapter.

Looking broadly at the county road situation, the great majority of county roads do not carry sufficient traffic to justify spending $25,000 to $30,000 per mile for pavement. Even with expected increases in traffic in the next 20 years, this cost can be justified on not more than 12,000 to 13,000 miles of county roads.

Nevertheless, the demand for additional dust-

The corn storage bins are indicative of the heavy loads of farm produce that must be carried to bring Iowa's huge farm production to market. The cost of having highways ready to serve at all times must be balanced against the high costs and wastes involved when roads break down and maintenance becomes expensive.

less surfacing is expected to grow. The need to conserve gravel and stone adds to the urgency of accelerating research, already under way, in the area of soil stabilization. What is needed is development of materials and techniques which can, at low cost, stabilize the natural soils of Iowa to provide support for a light-duty dustless surface.

Sufficiency Ratings

Determination of priority of highway improvements is, in any case, a complex problem. To provide assistance in this matter the Commission, at the request of the counties, has undertaken development of a sufficiency rating system for Farm-to-Market roads.

It appears that this research project may produce a reasonably reliable system for rating county roads on the basis of their adequacy for the service demanded, and for obtaining the rating of a given road on an objective and consistent basis. This would be an aid in selecting projects for improvements, when used in conjunction with other factors.

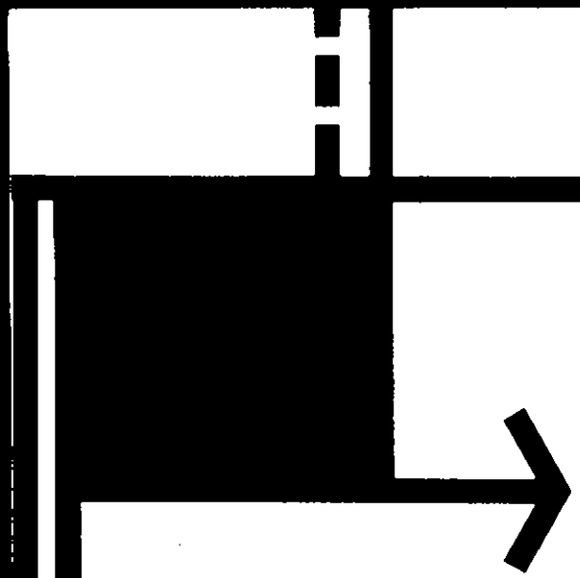
Planning and Management

The National Association of County Engineers, including many Iowa county engineers, is embarked on an extensive program to assist counties in improving their work. Research on a nationwide basis is under way, for example, in developing proper maintenance standards, in improving planning and programming of construction, and in other activities.

Iowa county engineers, working in cooperation with the State Highway Commission, should continue and expand their activities in this field. The benefits of more economical and better roads will far outweigh the effort that must be exerted.

Above: School buses recognize no class distinctions in roads — County Trunk, Feeder or Local Secondary, school buses must do their job when inadequate roads often are at their worst.

Below: Fifty-nine thousand miles strong, Local Roads are mostly adequate, but 22,300 miles do not now meet minimum requirements.



PROGRAM MANAGEMENT

In general, administration of roads and streets in Iowa is good. Certainly some wide variations exist—usually depending on scope of responsibilities and importance of the problems. Legislation, however, is basically sound—the most important changes needed being related to growing urban problems, to re-orientation of program emphasis both rural and urban, to improved law to encourage greater conformity with sound management principles in cities and counties, and to better inter-governmental relations.

Some recomendations on broad aspects of legislative and administrative needs have been made in previous chapters. Other important matters are discussed in this concluding chapter. All recommendations should be viewed in relation to the statewide scope of a continuing highway program, whose dimensions are summarized and evaluated here.

Program Summary

Drawing together all needs recorded in the preceding chapters for state, county and municipal roads and streets, the costs are:

Per Year	
$278,000,000	for a 20-year "catch-up" program
310,000,000	for a 15-year "catch-up" program
361,000,000	for a 10-year "catch-up" program

Each of the above alternatives includes all improvements and maintenance needed within the stated period to provide adequate roads and streets everywhere in Iowa, in keeping with traffic and service requirements, cost variations, and extent of present adequacy. The difference in annual totals is due mainly to the length of time within which it may be desired to "catch up" with the backlog of work needed now. Such backlogs vary widely among the different systems and areas of the state.

Three alternative programs are shown to assist in the development of an equitable and feasible fiscal plan, utilizing various sources of revenue. Legislative direction can be given to future programs by providing funds deemed appropriate to meet state responsibilities at various rates of progress for each system or jurisdiction. Major requirements for each of the alternate programs are shown in the table on page 66 . All costs are at 1959 price levels which, of course, may change in the future.

Acceleration of work on specific systems could, of course, be accomplished by arranging state or local financing, or both, to provide more funds per year early in a program—with reductions in later years as backlogs are overcome. It is estimated that approximately the same totals in 20 years would be required for basic improvements, replacement and maintenance, whether a 10, 15 or 20-year program were selected.

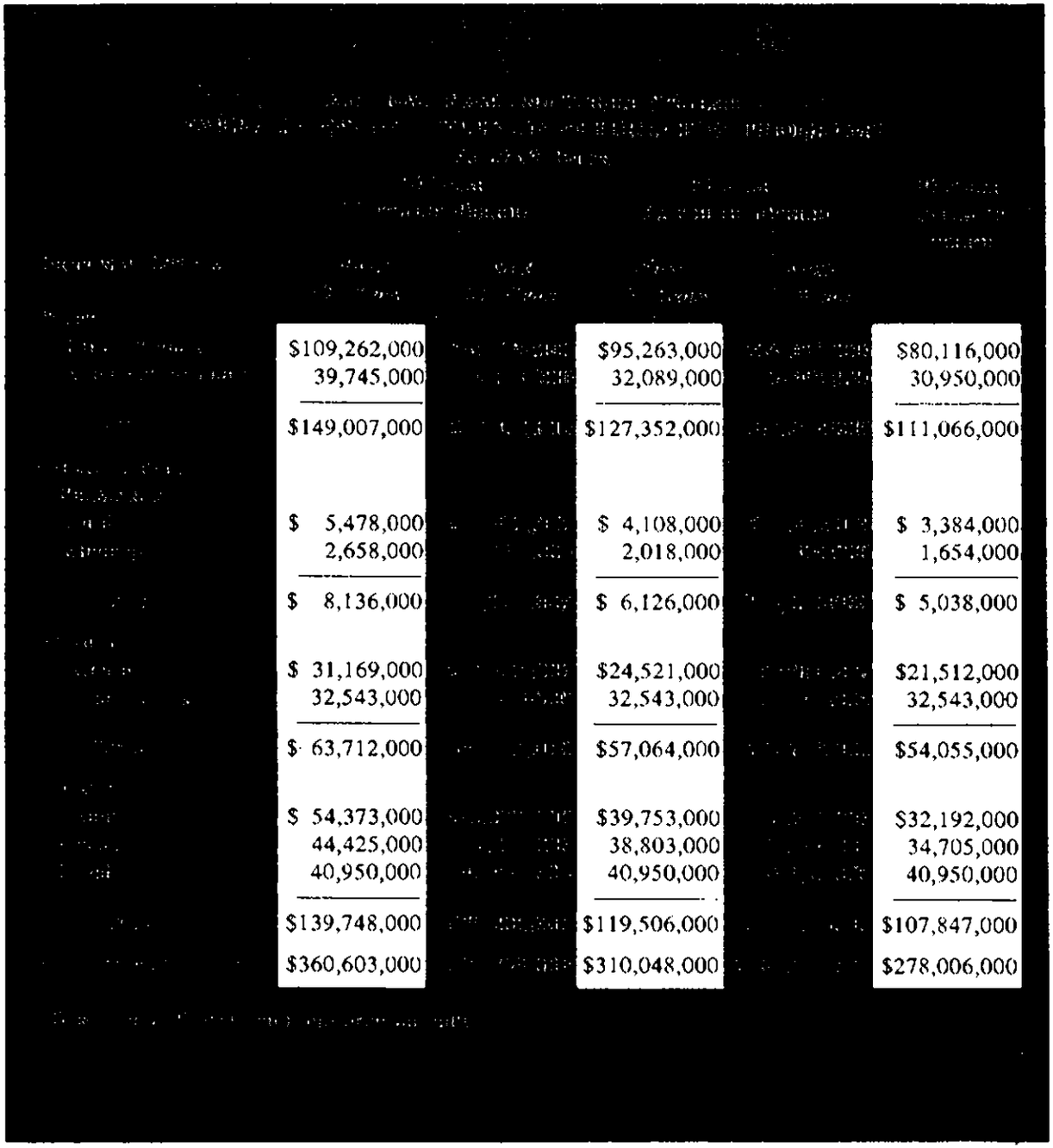
The fiscal study, being conducted for the Iowa Highway Study Committee by the Public Administration Service, reports the following approximate 1959 expenditures, from all sources of revenue, on roads and streets under the respective jurisdictions:

State—*Rural and Municipal*	$109,500,000
Municipal	32,500,000
County	88,000,000
Total	$230,000,000

However, it is anticipated that income at present tax rates will increase over the next 20 years, due to growth of population, vehicles and fuel consumption.

Program Evaluation

Expenditures made from Federal aid, highway user taxes and local funds on all Iowa highways in 1959 were the equivalent of about two cents



	$109,262,000	$95,263,000	$80,116,000
	39,745,000	32,089,000	30,950,000
	$149,007,000	$127,352,000	$111,066,000
	$ 5,478,000	$ 4,108,000	$ 3,384,000
	2,658,000	2,018,000	1,654,000
	$ 8,136,000	$ 6,126,000	$ 5,038,000
	$ 31,169,000	$24,521,000	$21,512,000
	32,543,000	32,543,000	32,543,000
	$ 63,712,000	$57,064,000	$54,055,000
	$ 54,373,000	$39,753,000	$32,192,000
	44,425,000	38,803,000	34,705,000
	40,950,000	40,950,000	40,950,000
	$139,748,000	$119,506,000	$107,847,000
	$360,603,000	$310,048,000	$278,006,000

per vehicle mile of travel. Based on the average travel expected between 1960 and 1980, the estimated total program costs would equal about 1.7 cents per vehicle mile. That and similar relations for other common indices are shown below:

	1959 Expenditures	1960-1980 Annual Program Cost
Per Vehicle Mile	2 cents	1.7 cents
Per Registered Vehicle	$177	$178
Per Capita	$ 84	$ 95

Price Levels

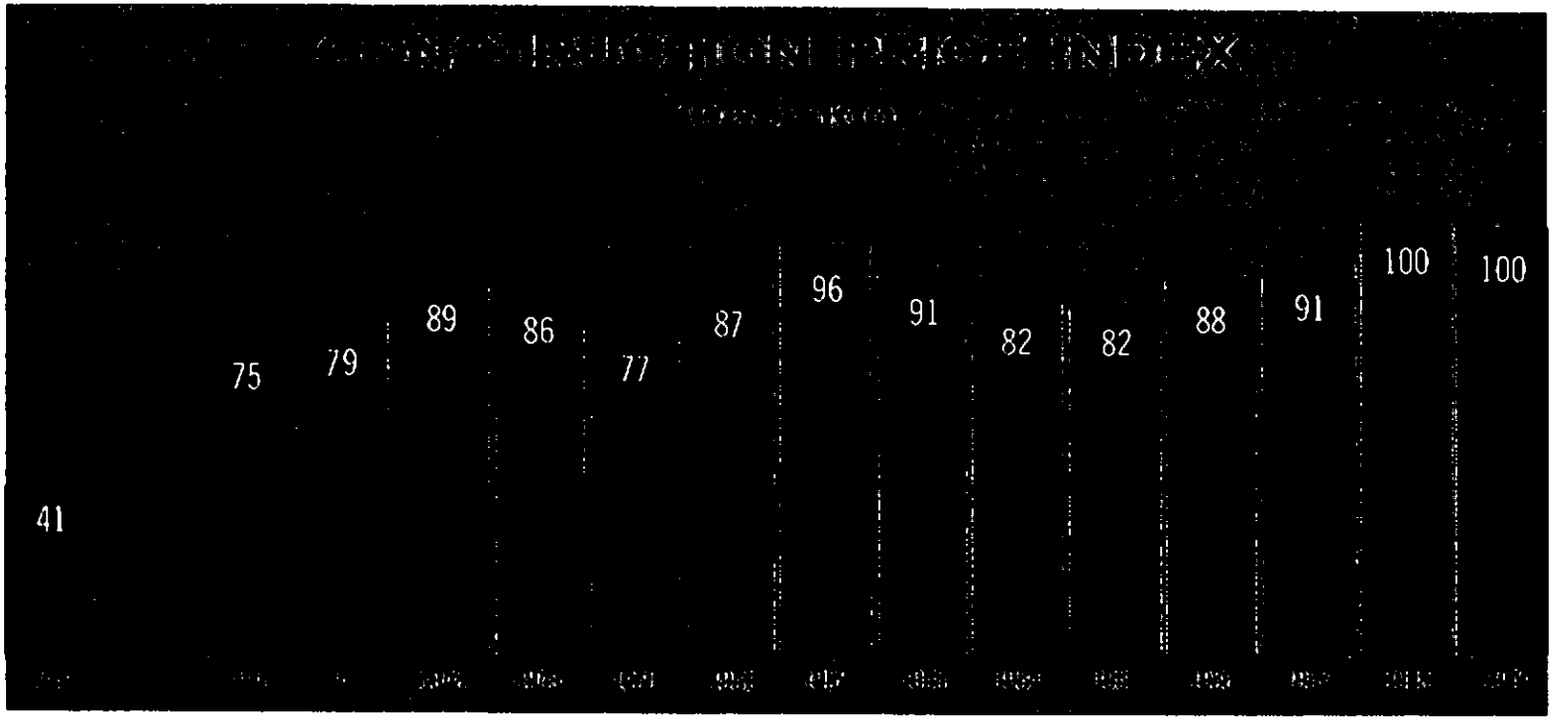
Complicating all forecasts, of course, is the unknown future of prices for labor, equipment and materials. The chart on page 67 shows how prices have fluctuated over the past 18 years.

Since 1941, the cost of doing the same amount of work has more than doubled—only half as much can be done now for every dollar spent. However, in the past two years unit prices have remained relatively constant. More efficient machinery and better job management have contributed greatly to that stability. Earth moving, for example, costs no more per yard today than it did in 1946, and considerably less than in 1922.

This study has made no attempt to predict future price levels, although improved standards of design and maintenance to meet future use have been anticipated. All estimates are based on 1959 prices.

Safety

Accidents and deaths on roads and streets in Iowa continue to be a major problem, despite the best efforts of engineers, police and other interested persons. In 1959, some 65,000 motor vehicle traffic accidents of all kinds, including 679 deaths, were recorded; these represented an economic loss of at least $100 million, according to recent research studies.



This study, in every phase, has considered feasible engineering means to cut the accident and death toll. Specifically, the following steps have been included to improve the situation:

1. A proposed rural and urban freeway system—the safest highway design
2. Improved design standards, on all roads and streets, encompassing the best known safety features economically feasible
3. Proposals for improvement of highways to those standards
4. Greater planned consistency of route development
5. Special studies of traffic operation needs for improved maintenance, signs, signals and other control devices
6. Management proposals that would aid in improving coordination and action on highway development for maximum safety.

Safety must go hand in hand with efficiency and economy of highway travel. All have been considered jointly in making the report of costs and recommendations of this study.

Management

The scope and size of continuing programs just summarized requires the most advanced management techniques and modernized laws that are possible.

The Laws Division of the Automotive Safety Foundation has reviewed existing law related to recommendations of this report. That analysis is available to assist technical personnel in preparing needed legislation.

Administrative recommendations also are made where important improvements are necessary. Generally, these could be accomplished without further legislation.

State Highway Commission

Responsibilities of the State Highway Commission have increased in scope and magnitude over the years, with consequent changes in organization and duties. From a purely advisory and educational body, it has evolved into one of the chief agencies of state government, having both direct control and broad coordinating activities in highway transportation affairs.

The state has produced some of the world's leading highway engineers, including Thomas H. MacDonald, head of the U. S. Bureau of Public Roads for nearly 40 years after beginning his career at Iowa State College and the State Highway Commission.

By general standards of competency and efficiency, the Commission and its staff measures up to the work assigned to it by the general assembly. The Commission is in the process of continual self-examination, aiming for further improvements. Looking to the future, many recommendations of this study call for further adjustments, both in responsibilities and in methods of discharging them—building on the good foundation already laid.

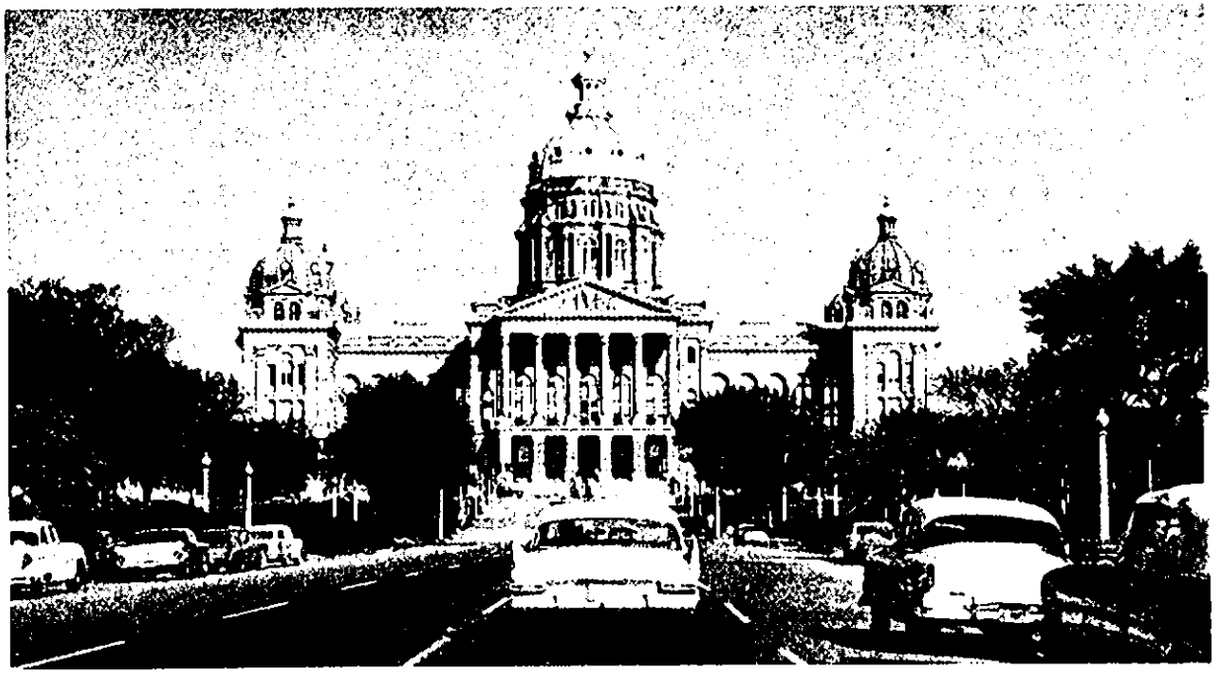
Top Management

State highway organizations throughout the nation are organized along one of two general top management plans. These are the highway commission form—used in 33 states—and the single-executive form.

Seventeen states have some variation of the single executive plan for management of their state highway business. This places in the hands of one individual full responsibility, with staff assistance, for creation of policy and for direction of state highway affairs. This plan generally affords minimum delay in reaching policy decisions, and maximum accountability for results.

Although details of the commission form of top state highway management vary widely, the objectives are served best when the number of commission members is small (not exceeding seven), and members are (1) appointed from the state at large (rather than districts), (2) appointed for staggered terms of office (to promote continuity of policy), and (3) can only be removed from office for cause. All of these conditions are found to apply to Iowa's State Highway Commission.

In many ways state government controls highway progress. Assignment and sharing of responsibilities are decisions which can come only from the legislative branch.



Recognized throughout the state, the generally high morale of employees of the Commission has grown and developed under the present form of top management. More specifically, there has been reasonable freedom from political influence and interference in personnel matters. Such environment is necessary to attract—and hold—capable employees. Facts show that the Commission has retained its employees, even without the benefits of civil service. The proportion of its employees that are professionals (mainly engineers) compares well with other leading state highway organizations, per million dollars worth of work.

One difficulty prevalent among commission forms is a tendency by a commission to make operating decisions that should be the responsibility of an executive officer. In Iowa, the Chief Engineer is, in effect, the chief executive for the part-time Commission. However, the law in Iowa, apparently stemming from early days when "The Commission" was practically the entire department, still fails to define properly the policy-making functions of the Commission, as distinct from administrative responsibilities.

The law still requires the Commission (meaning the five-member appointive body, generally laymen) to "devise and adopt standard plans . . . make surveys . . ." etc. Obviously, it is not the intention of the Commission to do such things, personally. But lacking any reasonably clear-cut distinction between policy and administration,

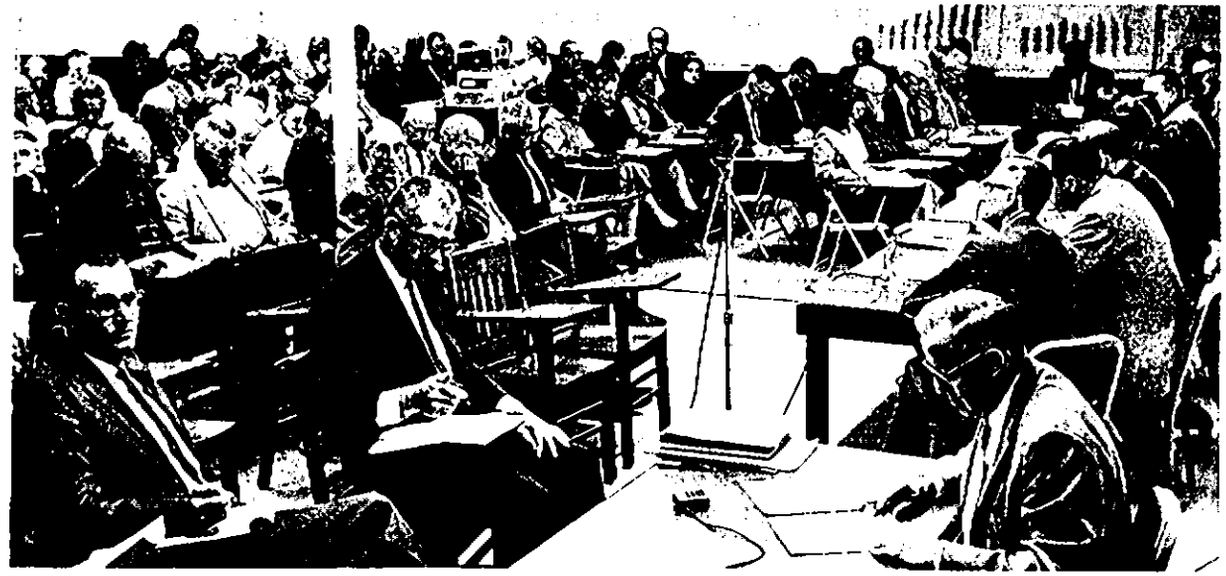
there is much room for sincere differences of opinion as to respective responsibilities. That the system works as well as it does reflects credit on both Commission members and employees, but it rests too much on individuals and their own philosophies and characteristics.

It is recommended, therefore, that legislation be enacted to define the proper role of the Iowa State Highway Commission as a policy-making body, and to constitute an Iowa State Highway Department, whose chief executive officer should be the Chief Engineer, responsible to the Commission for carrying out its approved policies, for operating the Department, and for recommending revised policy—all within the framework of a statement of legislative purpose defining the general powers and duties of the Department.

Organization of Department

Early in 1960 the Highway Commission approved a plan calling for reorganization of its functional structure, as shown in the chart on page 71 . Presently going into effect, this plan is based on studies by Commission employees, started four years ago. The plan is concerned primarily with improvements to its central headquarters organization, located in Ames. Referred to only in connection with other matters, organization of the Commission's field operations (districts, divisions, counties) is not fully spelled out.

Headquarters reorganization plans generally conform to accepted concepts of management. Functions have been re-grouped into business services, planning and engineering, each assigned to a responsible head, who reports to the Chief Engineer. Difficulties always encountered in such reorganization can be smoothed out ***through more continuous and formal study***



Here people are at work—above, planning and designing highway facilities — below, The Iowa State Highway Commission threshing out a highway location problem with the people directly concerned, the folks who live in the affected community.

One of the top problems of management is keeping abreast of traffic needs. Here an origin and destination study is being made to determine improvement needs.

of the mechanics of over-lapping functions, and more precise spelling out of limits of responsibility and the joint operations that have to be carried out.

District organization remains to be studied in a manner similar to that of the headquarters. As a general policy, however, it appears that the Commission has adopted a centralized organization, delegating only limited duties to the districts, and leaving some confusion concerning authority, responsibility, duties and supervision of both district engineers and assistant district engineers of construction, maintenance, et cetera.

The Commission should consider further decentralization, including design functions, and clarify responsibilities along staff and line principles.

For full effectiveness, each district engineer should be held accountable for all state highway activities within his district. For this to be meaningful, the district engineer should have full authority to direct all work—maintenance, construction, relations with cities and counties, et cetera—within, of course, the framework of policy established at Ames. His assistants—for construction, maintenance, secondary roads, materials—should advise and be responsible solely to him. To provide liaison to work out problems arising from the Commission's proposed responsibilities on the Primary Road System in municipalities, and to carry out new duties in connection with administering the proposed municipal state aid program discussed later, ***it is recommended that the Commission appoint one urban engineer as an assistant to each of the Commission's district engineers.***

The district engineer should report to and be accountable only to the Chief Engineer. Complementing this relationship, directors, department heads and other headquarters personnel constitute the Chief Engineer's general staff and should issue instructions, or take other management actions in the name of the Chief Engineer.

Planned Highway Programs

Chapter III includes a brief discussion of project selection for highway construction programs. Such decisions are among the most important that management must make. To return greatest benefits, a great deal of study must be applied to increasingly complex situations.

Examination of advance programming procedures now in use indicates basically sound techniques, with good control and reasonably effective methods of utilizing funds efficiently. Improvements are being made in advance scheduling of preliminary engineering and right of way procurement, in order to provide adequate lead time to carry out such work.

Improvement programs for the proposed Primary System, as shown in this report, will demand better advance planning, along with advance scheduling. The engineering forces are aware of this need and are already taking steps in that direction.

Development of the Interstate System is having considerable effect on plans for other routes. So too, the proposed Iowa freeways will require thorough location and planning studies. Urban problems will demand increasing attention. Area, regional and cross-state route studies are imperative to define the design standards that should be applied to each route location. Economic, traffic, land planning and other research must be undertaken on a broader scale to produce the

best highway corridor plans in both rural and urban areas.

Such studies should be scheduled well in advance of need, and should become the basic guide for work priority and design. The long-range study of needs, summarized in this report, provides a good beginning point.

Right of Way

This study estimates a need, at 1959 prices, for about $270,000,000 worth of right of way over the next 20 years for the proposed rural and urban Primary Road System. This large sum emphasizes need for certain improvements in land acquisition and management legislation.

It is recommended that the general assembly authorize advance purchase of right of way some years ahead of actual construction, and establish a revolving fund to finance such purchases. The fund would be reimbursed when construction contracts are awarded. In California, for example, such a plan has effected savings estimated at five dollars for each dollar invested in the fund, by permitting acquisition of needed property before it becomes highly developed.

Iowa statutes now authorize sale or rental of unused right of way for cash, but do not provide for any other disposition. ***It is recommended that the State Highway Commission also be given legal authority to exchange property for right of way purposes.*** It is believed that considerable savings would result.

Present law provides for just compensation to land owners in either purchase or condemnation proceedings under the general law of eminent domain. Immediate possession, pending final settlement, is authorized for certain public purposes. ***It is recommended that highways be included, to permit immediate possession,*** thus avoiding possible long delays in construction.

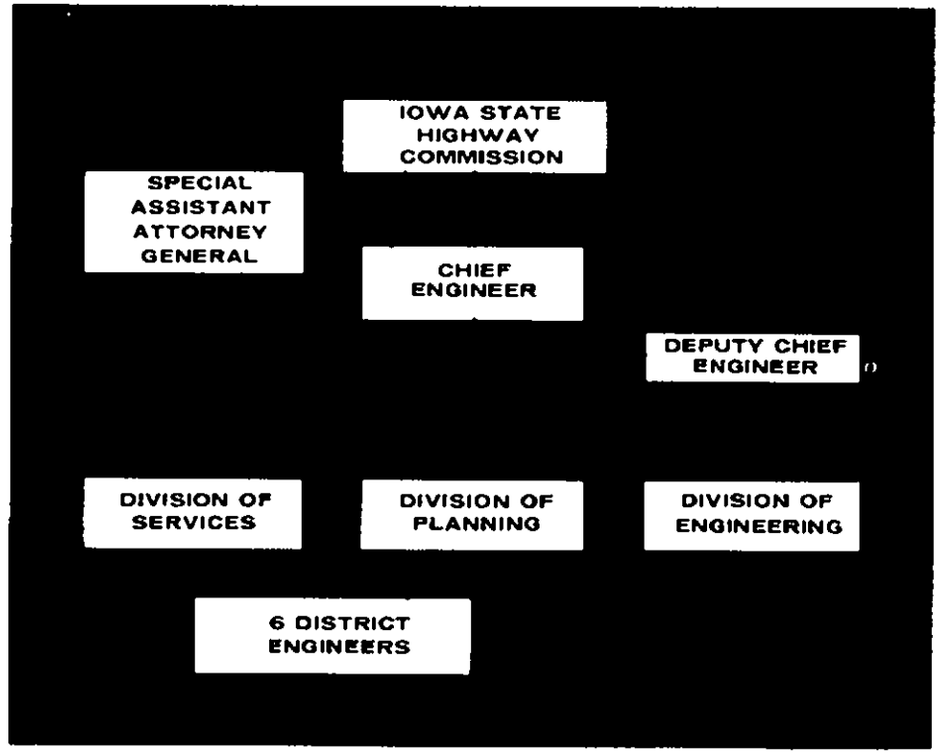
Inter-governmental Relations

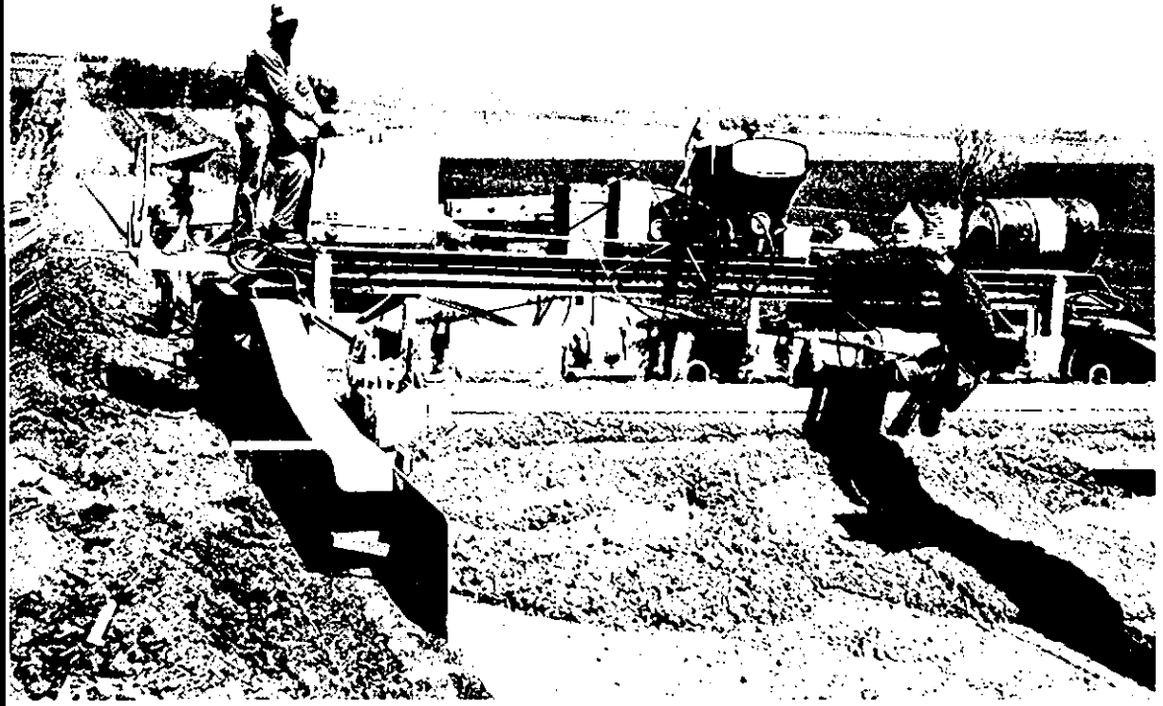
Development and maintenance of highway transportation facilities requires a high degree of coordination among all agencies of government. Each has its primary obligation for the road or street systems under its jurisdiction, but each must recognize its relation to others.

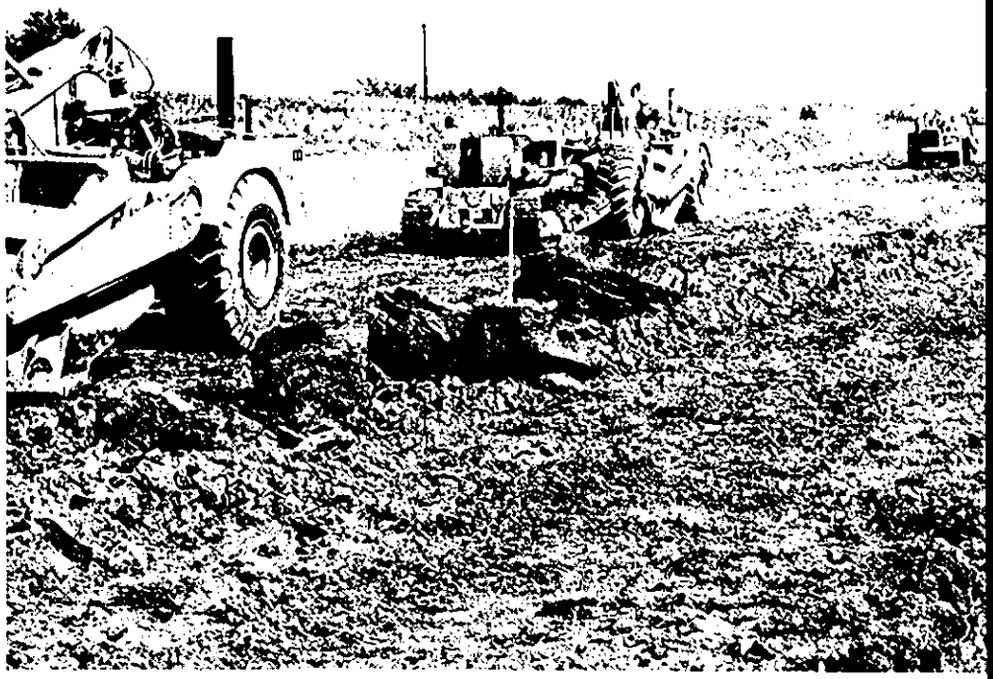
Iowa highway law indicates that the general assembly has designated the State Highway Commission as its agent to effect coordination by supervision of certain road matters being conducted by local units of government. For example, approval of secondary road systems, review of proposed county road improvement programs and action on other matters show how an agency of state government can assist and guide county governments in the conduct ot their affairs, without replacing county government. This has proved to be sound procedure.

For cities and towns, there is little similar state interest indicated in the law, or in practice. However, the magnitude of street needs in municipalities, the importance of sound development of adequate street transportation for all Iowa people, and the responsibilities of state government to all citizens call for specific state action.

Improvements in inter-governmental activities of the State Highway Commission are recommended in relation to general management problems of municipalities and counties, described in the balance of this report.







Construction of highway facilities occurs only after a vast amount of work has done—planning, location, financing arrangements, design of structures, lettin contracts and inspection.

Municipalities

The great number of municipalities, with 51 over 5,000 population and 891 below that number, creates such diverse management problems that adequate improvement will remain difficult as long as complete local autonomy is maintained. While in total, street needs in smaller places are substantial, individually many are so small that they cannot afford adequate engineering and fiscal supervision. Recommendations differ in some respects for larger cities (over 5,000 people) from those made for improved management in smaller municipalities.

In general, ***it is recommended that the general assembly expand activities of the State Highway Commission by providing for cooperative relations with all municipalities on street affairs,*** similar to those now established or proposed for county roads, but excluding direct control of funds and letting of contracts—except on Primary Roads.

First step ***recommended is general assembly action to require the establishment of an Arterial Street Fund in all municipalities.*** Such state aid as may be deemed appropriate, plus all other funds appropriated by local governments, for the purposes of improvement, maintenance and administration of Arterial Streets should be allocated to the fund.

Larger cities should be required to prepare five-year advance construction programs, kept up to date annually. Smaller cities should prepare at least a one-year advance program. ***Annual budgets and project-by-project construction programs should be submitted to the State Highway Commission for approval at least three months in advance of the fiscal year.*** Approval should be based on necessity of the work, adequacy to correct deficiencies and coordination with state and county programs.

All municipalities should account annually for all Arterial Street funds and any other funds involving state aid for streets, reporting to the State Highway Commission on forms prescribed by it. Reports should show all funds received and purposes for which they are expended.

It is recommended that annually 1.5 percent of the funds accruing to the proposed Arterial Street Fund be set aside solely for the purpose of gathering essential data and for research on city street problems and preparation of sound street plans.

Such funds should be administered by the State Highway Commission in cooperation with the cities, in a manner similar to that provided by law for the "Secondary Road Research Fund." In this connection, the Iowa Highway Research Board should be expanded to include some city representation and should undertake appropriate urban research projects.

To qualify for Arterial Street Fund state aid, ***it is recommended that all municipalities be required to furnish the State Highway Commission satisfactory evidence of adequate engineering services.*** Criteria for adequacy should be established by the Commission, varying with the size and complexity of problems. Larger cities should be required to provide competent, continuous engineering supervision. Special problems of smaller communities are discussed in subsequent paragraphs.

Each municipality should also be required to designate one responsible official who can represent the city when dealing with state or county officials on street matters.

Traffic Engineering

The Commission has legal authority and sufficient staff to carry on an adequate traffic operations program on rural highways—provided budgeted amounts are used for that purpose. However, the situation on State Primaries in municipalities is, by contrast, in need of considerable improvement.

Iowa law requires adoption of a uniform system of traffic control devices, signs and marking on any public road or street. The number of nonconforming installations is greater by far in Iowa municipalities than on rural Primary Roads. The problem on municipal primaries can be corrected most rapidly by giving the Commission full responsibility, as recommended in Chapter II.

To achieve conformity on other city streets, and recognizing that most cities and towns sorely need advice and assistance with traffic engineering problems, ***it is recommended that the general assembly authorize and direct the Commission to provide technical advice to municipalities under 50,000 population on traffic engineering and related problems, at their request and at cost.*** Larger cities should employ traffic engineers on a full-time basis.

Smaller Municipalities

Only about ten percent of the 891 municipalities under 5,000 population regularly employ engineers or consultants for street work. Most towns are too small for efficient maintenance or construction activity. Certainly some practical means should be found to improve street planning and operations in these communities.

Two alternatives are suggested, the choice depending on whether practical fiscal and other inter-governmental arrangements can be worked out.

From the viewpoint of efficiency alone, the counties are generally equipped and managed to handle engineering, construction and maintenance. Many counties now provide all or part of such service to smaller places, despite the fact that street engineering involves complications not generally found on rural roads. Therefore, one

Above: The wear and tear of traffic and of weather requires constant attention—a stitch in time saves nine many times over in the case of highways.

Below: The best laid plans go awry when floods, excessive freezing and thawing, or other unexpected events occur. This washout, costly to repair, shut off travel north of Vinton last April.

alternative would be to require all counties to assume full responsibility for the extensions of all Secondary Roads to appropriate connections inside all municipalities of less than 5,000 people.

There are problems that would have to be resolved under such a proposal. For example, operations on the remaining local streets would be even less likely to have competent supervision—the principal problem having been removed from municipal jurisdiction. Priority of improvements and maintenance would be less subject to municipal control. State aid and other fiscal arrangements would be more complex, since much street work involves several sources of revenue. Considering such problems, this report ***recommends legislation to encourage and authorize municipalities of less than 5,000 people to contract with adjoining larger cities, or with counties in which they are located to provide street construction or maintenance, or both, at cost—to be paid by the smaller municipality.***

In either alternative, consulting engineer services could be utilized, as is often done now.

Counties

On the whole, Iowa's county road business is well-managed, as a result of forward-looking legislation and generally competent personnel. Within the framework of law, however, there are substantial differences from county to county in the role of the boards of supervisors in county road matters.

Review of board functions in counties where road progress has been good indicates that the board establishes general policy—on personnel matters, record keeping, road maintenance, property and equipment, et cetera—and holds the county engineer responsibile for execution of necessary work within the framework of the law and board policy.

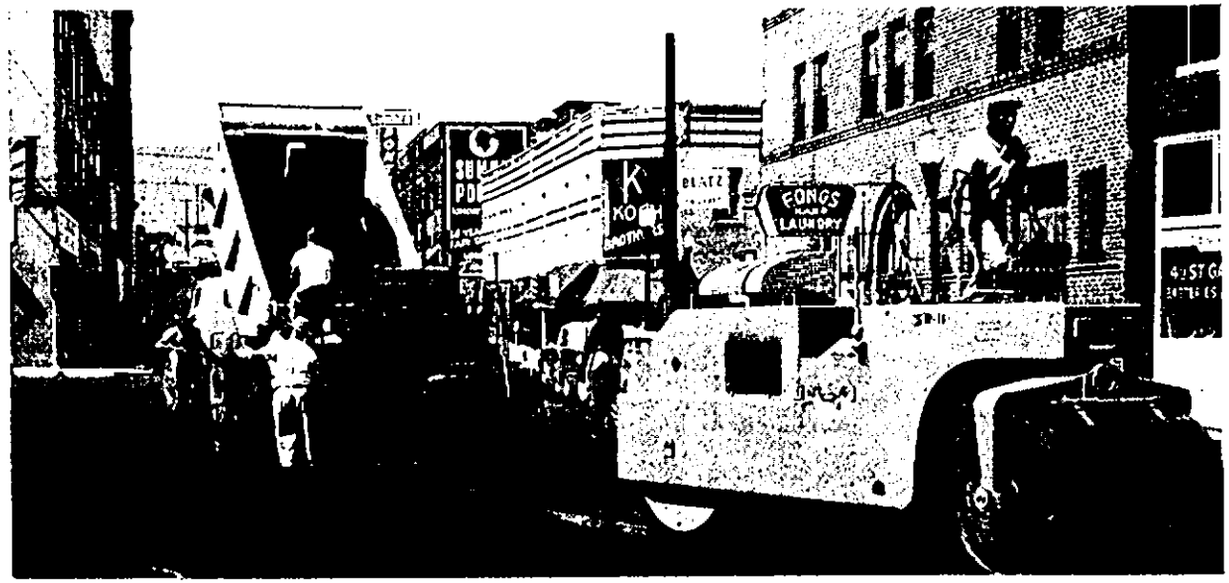
In a few counties, board members have themselves taken over personal direction of some county road activities, such as road maintenance. Apparently this is done as a result of their interpretation of the law giving "jurisdiction and control" over the Secondary Road System to the board, and the law charging "the board of supervisors and the engineer with the duty" of repair and dragging the Secondary Road System. Obviously not able to hold the county engineer directly responsible for either failure or inefficiency in such cases, as also required by law, places both the boards and the engineers in untenable positions.

Accordingly, ***it is recommended that the law be rewritten to clearly establish legislative intent with regard to the policy-making role of boards of supervisors in county road affairs, and the direct executive authority of the county engineers. State aid funds should be withheld until flagrant violations are discontinued.*** Reference to publications of the National Association of County Engineers will provide information useful in defining the role of the board and establishing more effective relationships with county engineers.

County Engineer

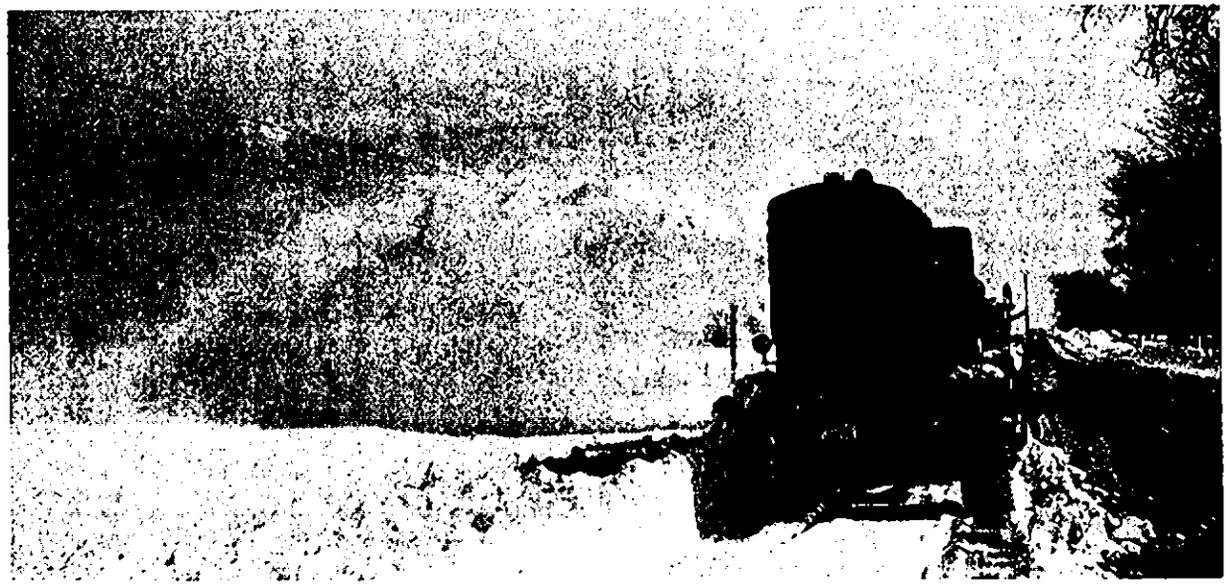
In order for a board to attract capable and qualified men for the post of county engineer, the position must be reasonably attractive from the viewpoint of salary, responsibility, authority and tenure of office.

In principle, Iowa law seeks to establish a three-year term of office for the county engineer. However, since his tenure . . . "may be terminated at any time by the board," the office has no real tenure. Of long-range benefit to the counties, ***it is recommended that the county engineer's term of office be five years, and that he not be removed except for cause.*** He should serve a one-year probationary period, during which period the board could remove him at any time.



Above: In cities maintenance, reconstruction and construction work requires good planning by those responsible to reduce interference with traffic, particularly on city arterials or extensions of State Primaries.

Below: All over Iowa a good job is done of removing snow promptly during and after storms on State Primaries, many county roads and city streets.



Procedures for later removal for cause, including a public hearing, should be established.

County engineers should be employed only from among those approved by the State Highway Commission as having satisfactory qualifications—to be established by agreement with the County Engineers Association. Interchangeable employment should be promoted between state and county, without loss of benefits.

Cost Accounting

To be able to compare relative costs of road construction and maintenance by county forces requires a full and accurate accounting for all costs incurred over a period of several years. It is currently impossible to evaluate relative merits of contract versus force account work in Iowa counties.

Cost of work let to contract is clearly and fully shown on contract documents. However, current record-keeping required by law, does not provide for other cost accounting procedures. Repair, maintenance and operating costs of road machinery, as well as its depreciation, and engineering, supervision and overhead costs are substantial, and often overlooked in superficial cost comparisons.

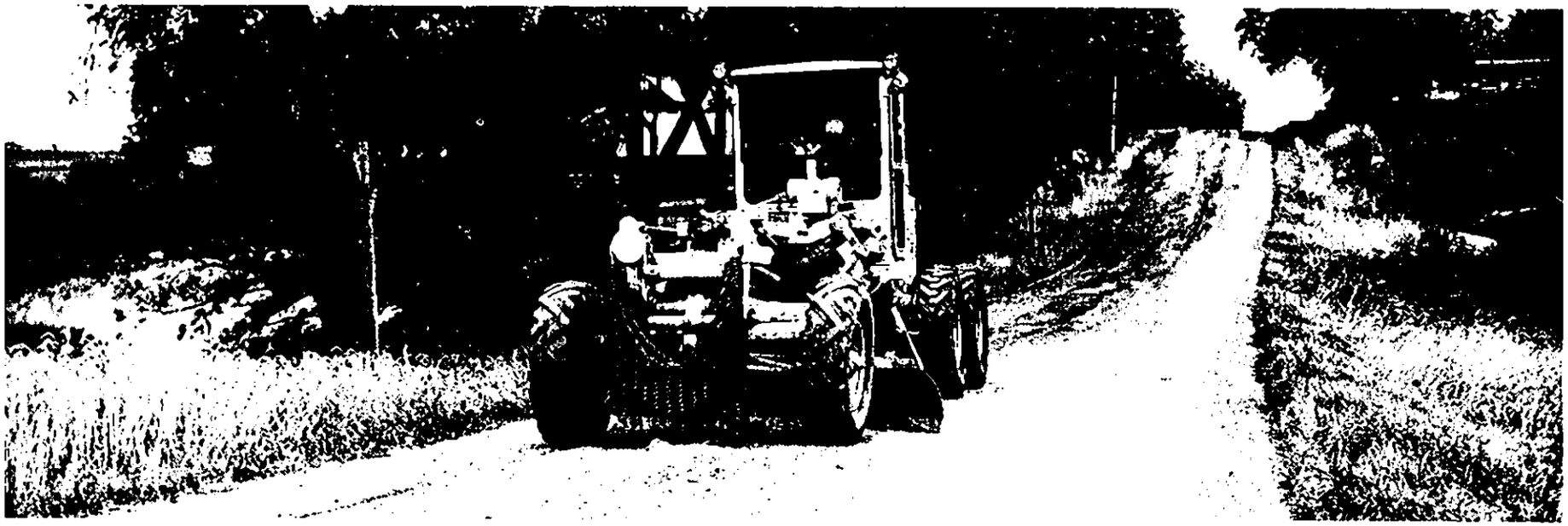
Accordingly, ***it is recommended that the Commission revise regulations concerning a separate tool and equipment account to establish a revolving equipment account in each county, perpetuated by realistic rental rates, with appropriate charges to construction projects, if any, and maintenance sections on each system.***

Moreover, present accounting requirements do not separate construction and maintenance costs by road systems, except for contract work paid from the Farm-to-Market Fund. ***It is recommended that all counties be required to provide such data in a form prescribed by the State Highway Commission. The counties, in cooperation with the Highway Commission, should adopt a uniform record-keeping system,*** such as that being developed by the National Association of County Engineers.

Advance Programs

The preparation of a yearly road improvement program is now required on the Farm-to-Market System. This is commendable. However, road programs on all systems for several years in advance are necessary for the organization and undertaking of specific projects. Advance programs also help to evaluate the yearly program.

Good maintenance is all important to lesser used roads as it is to major arteries. On Local Secondaries the principal problem is maintenance rather than construction.

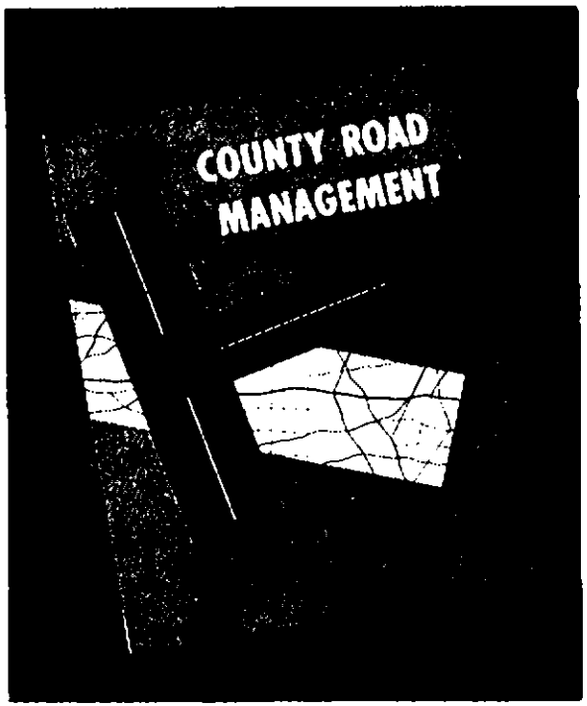


It is recommended that counties be required to develop a five-year advance construction program for each proposed system, submit it for approval by the State Highway Commission, and up-date it annually.

Maintenance Standards

Data secured in this study of highway needs indicate an extremely wide variation among the counties in concepts of maintenance operations. More uniform adequate procedures for all counties should be the goal.

The State Highway Commission should, with the advice and assistance of the Iowa County Engineers Association, establish maintenance standards for county roads. This should be a continuing activity, including a research program.



General

Truck sizes and weights permitted in Iowa generally conform to current recommendations of the American Association of State Highway Officials, except for maximum length of tractor-trailer combinations which are limited to 50 feet, compared to a recommnded 60 feet and corresponding adjustment in allowable gross weight.

A special committee of AASHO, on which Iowa is represented, is now considering revisions in recommended policy concerning truck sizes and weights. It would be desirable for Iowa to conform in all major respects to AASHO policy. Consideration might be given now to increasing the length limit of vehicles, but ***it is especially recommended that review of the new policy be made, when it is available, and that appropriate action be taken by the general assembly at that time.***

Both counties and cities are handicapped by lack of authority to deal adequately with growing suburbs of cities and towns. ***Legislation is needed to strengthen county planning laws, giving official power to control new road and street development, including establishment of minimum design standards and uniform platting requirements. Cities and counties should be authorized to work out joint arrangements in those matters that affect both agencies of government.***

Finally, the basic data of this study should be revised periodically, kept up to date, and used for future development planning, management analysis and fiscal review, with ***reports to the general assembly on progress and problems.***

APPENDIX

ALL MUNICIPAL STREETS
(including State Primary Road extensions)
AVERAGE ANNUAL PROGRAM COSTS

CITY OR POPULATION GROUP	10-YEAR CATCH-UP PERIOD		15-YEAR CATCH-UP PERIOD		20-YEAR CATCH-UP PERIOD
	First 10 Years	*Next 10 Years*	*First 15 Years*	*Next 5 Years*	
Des Moines	$ 20,059,000	$12,388,000	$16,828,000	$13,996,000	$16,235,000
Sioux City	6,611,000	4,455,000	5,678,000	5,093,000	5,562,000
Davenport	7,060,000	4,185,000	5,848,000	4,944,000	5,553,000
Cedar Rapids	8,432,000	5,375,000	7,132,000	6,294,000	6,848,000
Waterloo	7,166,000	4,590,000	6,059,000	5,404,000	5,827,000
Dubuque	2,050,000	1,001,000	1,696,000	1,016,000	1,498,000
Council Bluffs	3,772,000	2,257,000	3,142,000	2,660,000	2,996,000
20,000-40,000	8,826,000	5,394,000	7,578,000	5,664,000	7,073,000
10,000-20,000	5,677,000	3,335,000	4,845,000	3,496,000	4,467,000
5,000-10,000	9,591,000	6,096,000	8,347,000	6,258,000	7,817,000
2,500-5,000	5,880,000	4,131,000	5,293,000	4,145,000	5,024,000
1,000-2,500	7,608,000	5,647,000	6,952,000	5,644,000	6,670,000
Under 1,000	10,725,000	7,987,000	9,755,000	8,003,000	9,435,000
TOTAL	$103,457,000	$66,841,000	$89,153,000	$72,617,000	$85,005,000

MUNICIPAL STATE PRIMARY ROAD EXTENSIONS

AVERAGE ANNUAL PROGRAM COSTS

CITY OR POPULATION GROUP	10-YEAR CATCH-UP PERIOD		15-YEAR CATCH-UP PERIOD		20-YEAR CATCH-UP PERIOD
	First 10 Years	*Next 10 Years*	*First 15 Years*	*Next 5 Years*	
Des Moines	$ 7,942,000	$ 5,170,000	$ 6,500,000	$ 6,660,000	$ 6,676,000
Sioux City	3,203,000	2,032,000	2,628,000	2,652,000	2,677,000
Davenport	3,999,000	2,348,000	3,228,000	3,005,000	3,134,000
Cedar Rapids	4,235,000	2,888,000	3,532,000	3,774,000	3,555,000
Waterloo	3,705,000	2,576,000	3,063,000	3,364,000	3,088,000
Dubuque	479,000	77,000	348,000	86,000	274,000
Council Bluffs	2,123,000	1,194,000	1,685,000	1,574,000	1,643,000
20,000-40,000	2,510,000	995,000	1,959,000	1,200,000	1,756,000
10,000-20,000	1,807,000	686,000	1,393,000	833,000	1,225,000
5,000-10,000	2,819,000	1,125,000	2,226,000	1,277,000	1,981,000
2,500-5,000	1,482,000	404,000	1,133,000	416,000	968,000
1,000-2,500	2,353,000	875,000	1,882,000	862,000	1,673,000
Under 1,000	3,088,000	1,306,000	2,512,000	1,290,000	2,300,000
TOTAL	$39,745,000	$21,676,000	$32,089,000	$26,993,000	$30,950,000

MUNICIPAL STREETS

(excluding State Primary Road extensions)

AVERAGE ANNUAL PROGRAM COSTS

CITY OR POPULATION GROUP	ARTERIAL STREETS					ACCESS STREETS *
	10-YEAR CATCH-UP PERIOD		15-YEAR CATCH-UP PERIOD		20-YEAR CATCH-UP PERIOD	20-YEAR CATCH-UP PERIOD
	First 10 Years	*Next 10 Years*	*First 15 Years*	*Next 5 Years*		
Des Moines	$ 8,659,000	$ 3,760,000	$ 6,870,000	$ 3,878,000	$ 6,101,000	$ 3,458,000
Sioux City	1,669,000	684,000	1,311,000	702,000	1,146,000	1,739,000
Davenport	1,694,000	470,000	1,253,000	572,000	1,052,000	1,367,000
Cedar Rapids	2,566,000	856,000	1,969,000	889,000	1,662,000	1,631,000
Waterloo	1,990,000	543,000	1,525,000	569,000	1,268,000	1,471,000
Dubuque	901,000	254,000	678,000	260,000	554,000	670,000
Council Bluffs	778,000	192,000	586,000	215,000	482,000	871,000
20,000-40,000	3,058,000	1,141,000	2,361,000	1,206,000	2,059,000	3,258,000
10,000-20,000	1,938,000	717,000	1,520,000	731,000	1,310,000	1,932,000
5,000-10,000	3,351,000	1,550,000	2,700,000	1,560,000	2,415,000	3,421,000
2,500-5,000	1,289,000	618,000	1,051,000	620,000	947,000	3,109,000
1,000-2,500	933,000	450,000	748,000	460,000	675,000	4,322,000
Under 1,000	2,343,000	1,387,000	1,949,000	1,419,000	1,841,000	5,294,000
TOTAL	$31,169,000	$12,622,000	$24,521,000	$13,081,000	$21,512,000	$32,543,000

** Program costs for Access Streets computed for a 20-year catch-up period only.*

COUNTY TRUNK ROAD SYSTEM

AVERAGE ANNUAL PROGRAM COSTS

County	10-YEAR CATCH-UP PERIOD		15-YEAR CATCH-UP PERIOD		20-YEAR CATCH-UP PERIOD
	First 10 Years	*Next 10 Years*	*First 15 Years*	*Next 5 Years*	
Adair	$ 635,000	$ 128,000	$ 465,000	$ 110,000	$ 373,000
Adams	854,000	77,000	590,000	74,000	458,000
Allamakee	697,000	133,000	498,000	133,000	395,000
Appanoose	456,000	65,000	322,000	64,000	255,000
Audubon	653,000	147,000	482,000	127,000	388,000
Benton	772,000	116,000	545,000	115,000	433,000
Black Hawk	556,000	140,000	412,000	132,000	336,000
Boone	438,000	109,000	322,000	106,000	264,000
Bremer	417,000	70,000	297,000	69,000	238,000
Buchanan	727,000	131,000	522,000	122,000	417,000
Buena Vista	481,000	114,000	354,000	109,000	290,000
Butler	596,000	126,000	433,000	122,000	351,000
Calhoun	398,000	169,000	289,000	255,000	280,000
Carroll	633,000	111,000	451,000	109,000	362,000
Cass	537,000	111,000	383,000	114,000	309,000
Cedar	577,000	138,000	413,000	142,000	344,000
Cerro Gordo	519,000	217,000	449,000	112,000	361,000
Cherokee	518,000	121,000	383,000	108,000	311,000
Chickasaw	348,000	66,000	250,000	65,000	201,000
Clarke	517,000	153,000	378,000	173,000	321,000
Clay	362,000	90,000	267,000	88,000	220,000
Clayton	999,000	116,000	697,000	114,000	548,000
Clinton	621,000	173,000	475,000	143,000	384,000
Crawford	930,000	127,000	660,000	117,000	520,000
Dallas	366,000	84,000	266,000	83,000	218,000
Davis	603,000	122,000	430,000	121,000	346,000
Decatur	630,000	123,000	455,000	115,000	364,000
Delaware	447,000	93,000	320,000	98,000	260,000
Des Moines	442,000	116,000	333,000	107,000	270,000
Dickinson	315,000	55,000	225,000	54,000	181,000
Dubuque	536,000	171,000	386,000	110,000	313,000
Emmet	298,000	89,000	226,000	81,000	187,000
Fayette	673,000	194,000	517,000	156,000	421,000
Floyd	227,000	73,000	171,000	71,000	145,000
Franklin	628,000	111,000	449,000	109,000	360,000
Fremont	399,000	75,000	288,000	69,000	230,000
Greene	395,000	187,000	355,000	91,000	288,000
Grundy	494,000	107,000	354,000	119,000	293,000
Guthrie	553,000	82,000	390,000	81,000	309,000
Hamilton	321,000	155,000	273,000	120,000	227,000
Hancock	340,000	75,000	249,000	76,000	203,000
Hardin	421,000	108,000	307,000	119,000	256,000
Harrison	669,000	151,000	483,000	152,000	393,000
Henry	393,000	74,000	281,000	73,000	226,000
Howard	454,000	83,000	324,000	82,000	260,000
Humboldt	218,000	103,000	187,000	71,000	156,000
Ida	518,000	98,000	375,000	91,000	302,000
Iowa	722,000	157,000	537,000	125,000	430,000
Jackson	462,000	85,000	329,000	89,000	266,000
Jasper	672,000	139,000	485,000	135,000	389,000

AVERAGE ANNUAL PROGRAM COSTS —*Continued*

County	10-YEAR CATCH-UP PERIOD		15-YEAR CATCH-UP PERIOD		20-YEAR CATCH-UP PERIOD
	First 10 Years	*Next 10 Years*	*First 15 Years*	*Next 5 Years*	
Jefferson	435,000	81,000	311,000	80,000	251,000
Johnson	623,000	122,000	446,000	122,000	360,000
Jones	545,000	113,000	391,000	114,000	317,000
Keokuk	636,000	159,000	478,000	139,000	390,000
Kossuth	582,000	145,000	429,000	142,000	353,000
Lee	402,000	84,000	291,000	82,000	234,000
Linn	973,000	327,000	787,000	208,000	633,000
Louisa	146,000	32,000	106,000	36,000	87,000
Lucas	545,000	117,000	392,000	116,000	318,000
Lyon	461,000	129,000	346,000	118,000	285,000
Madison	537,000	137,000	391,000	145,000	325,000
Mahaska	755,000	106,000	531,000	106,000	420,000
Marion	510,000	105,000	369,000	101,000	298,000
Marshall	487,000	139,000	363,000	150,000	302,000
Mills	625,000	102,000	441,000	109,000	353,000
Mitchell	302,000	100,000	228,000	101,000	194,000
Monona	872,000	138,000	612,000	124,000	476,000
Monroe	473,000	108,000	342,000	105,000	276,000
Montgomery	727,000	152,000	520,000	172,000	428,000
Muscatine	372,000	129,000	282,000	135,000	238,000
O'Brien	408,000	207,000	346,000	180,000	304,000
Osceola	398,000	75,000	286,000	74,000	231,000
Page	469,000	80,000	333,000	79,000	267,000
Palo Alto	514,000	80,000	366,000	80,000	293,000
Plymouth	1,091,000	242,000	813,000	199,000	654,000
Pocahontas	306,000	131,000	229,000	172,000	215,000
Polk	1,141,000	214,000	840,000	151,000	660,000
Pottawattamie	1,552,000	340,000	1,118,000	326,000	902,000
Poweshiek	417,000	106,000	303,000	106,000	248,000
Ringgold	484,000	120,000	367,000	90,000	294,000
Sac	468,000	110,000	346,000	100,000	281,000
Scott	536,000	125,000	387,000	132,000	320,000
Shelby	677,000	152,000	499,000	120,000	395,000
Sioux	480,000	140,000	366,000	123,000	301,000
Story	480,000	132,000	353,000	136,000	291,000
Tama	479,000	129,000	352,000	132,000	291,000
Taylor	714,000	109,000	504,000	108,000	401,000
Union	637,000	88,000	449,000	81,000	353,000
Van Buren	420,000	72,000	299,000	71,000	239,000
Wapello	550,000	99,000	394,000	98,000	313,000
Warren	843,000	123,000	600,000	109,000	475,000
Washington	413,000	90,000	300,000	89,000	244,000
Wayne	562,000	102,000	401,000	100,000	321,000
Webster	508,000	121,000	370,000	131,000	306,000
Winnebago	361,000	70,000	259,000	69,000	209,000
Winneshiek	625,000	130,000	459,000	114,000	367,000
Woodbury	721,000	133,000	521,000	109,000	411,000
Worth	304,000	67,000	223,000	62,000	181,000
Wright	370,000	115,000	282,000	112,000	235,000
TOTAL	$54,373,000	$12,025,000	$39,753,000	$11,279,000	$32,192,000

COUNTY FEEDER AND COUNTY LOCAL ROAD SYSTEMS

AVERAGE ANNUAL PROGRAM COSTS

County	County Feeder Road System					County Local* Road System
	10-YEAR CATCH-UP PERIOD		15-YEAR CATCH-UP PERIOD		20-YEAR CATCH-UP PERIOD	20-YEAR CATCH-UP PERIOD
	First 10 Years	*Next 10 Years*	*First 15 Years*	*Next 5 Years*		
Adair	$ 152,000	$ 188,000	$ 185,000	$ 127,000	$ 169,000	$ 304,000
Adams	228,000	156,000	212,000	279,000	192,000	409,000
Allamakee	466,000	293,000	430,000	230,000	379,000	463,000
Appanoose	324,000	232,000	311,000	173,000	277,000	425,000
Audubon	484,000	137,000	377,000	107,000	308,000	225,000
Benton	260,000	541,000	238,000	885,000	403,000	470,000
Black Hawk	312,000	142,000	240,000	136,000	204,000	493,000
Boone	428,000	117,000	252,000	123,000	268,000	241,000
Bremer	393,000	168,000	333,000	121,000	278,000	335,000
Buchanan	526,000	245,000	359,000	254,000	380,000	228,000
Buena Vista	426,000	272,000	424,000	117,000	344,000	455,000
Butler	498,000	178,000	260,000	168,000	335,000	477,000
Calhoun	390,000	341,000	395,000	275,000	363,000	455,000
Carroll	349,000	203,000	291,000	229,000	275,000	401,000
Cass	626,000	346,000	567,000	235,000	481,000	475,000
Cedar	739,000	162,000	553,000	125,000	442,000	420,000
Cerro Gordo	277,000	579,000	481,000	356,000	435,000	344,000
Cherokee	200,000	133,000	175,000	139,000	166,000	379,000
Chickasaw	565,000	113,000	415,000	103,000	335,000	443,000
Clarke	294,000	102,000	236,000	80,000	196,000	366,000
Clay	386,000	289,000	396,000	156,000	335,000	370,000
Clayton	383,000	412,000	450,000	243,000	396,000	420,000
Clinton	570,000	305,000	484,000	268,000	422,000	530,000
Crawford	1,332,000	478,000	1,005,000	429,000	828,000	478,000
Dallas	317,000	145,000	265,000	122,000	229,000	249,000
Davis	514,000	221,000	419,000	202,000	364,000	453,000
Decatur	244,000	122,000	193,000	149,000	182,000	413,000
Delaware	463,000	125,000	356,000	99,000	289,000	554,000
Des Moines	442,000	118,000	337,000	95,000	274,000	327,000
Dickinson	474,000	158,000	385,000	103,000	312,000	385,000
Dubuque	170,000	158,000	151,000	202,000	165,000	201,000
Emmet	296,000	153,000	264,000	103,000	222,000	316,000
Fayette	393,000	465,000	411,000	480,000	426,000	411,000
Floyd	290,000	360,000	388,000	144,000	325,000	240,000
Franklin	582,000	113,000	422,000	112,000	342,000	371,000
Fremont	452,000	258,000	437,000	110,000	353,000	269,000
Greene	237,000	390,000	308,000	330,000	312,000	269,000
Grundy	388,000	448,000	479,000	220,000	400,000	326,000
Guthrie	225,000	358,000	262,000	383,000	292,000	506,000
Hamilton	227,000	258,000	205,000	339,000	242,000	303,000
Hancock	566,000	142,000	420,000	139,000	347,000	520,000
Hardin	359,000	440,000	415,000	355,000	399,000	282,000
Harrison	669,000	272,000	552,000	217,000	466,000	477,000
Henry	383,000	129,000	289,000	126,000	243,000	331,000
Howard	319,000	82,000	239,000	82,000	199,000	221,000
Humboldt	288,000	146,000	253,000	107,000	215,000	181,000
Ida	365,000	103,000	278,000	96,000	231,000	305,000
Iowa	630,000	248,000	513,000	208,000	433,000	463,000
Jackson	530,000	417,000	544,000	256,000	468,000	566,000
Jasper	830,000	285,000	665,000	218,000	548,000	647,000

COUNTY FEEDER AND COUNTY LOCAL ROAD SYSTEMS—*Continued*

AVERAGE ANNUAL PROGRAM COSTS

County	County Feeder Road System					County Local* Road System
	10-YEAR CATCH-UP PERIOD		15-YEAR CATCH-UP PERIOD		20-YEAR CATCH-UP PERIOD	20-YEAR CATCH-UP PERIOD
	First 10 Years	*Next 10 Years*	*First 15 Years*	*Next 5 Years*		
Jefferson	199,000	235,000	230,000	177,000	216,000	471,000
Johnson	416,000	446,000	480,000	293,000	420,000	375,000
Jones	325,000	530,000	399,000	514,000	427,000	559,000
Keokuk	586,000	204,000	477,000	140,000	390,000	509,000
Kossuth	1,199,000	364,000	896,000	354,000	743,000	1,106,000
Lee	433,000	328,000	394,000	319,000	369,000	354,000
Linn	738,000	336,000	562,000	340,000	484,000	646,000
Louisa	392,000	80,000	285,000	78,000	231,000	149,000
Lucas	368,000	262,000	355,000	183,000	309,000	477,000
Lyon	326,000	203,000	297,000	167,000	264,000	674,000
Madison	264,000	418,000	360,000	283,000	340,000	288,000
Mahaska	649,000	137,000	475,000	136,000	388,000	388,000
Marion	545,000	368,000	510,000	291,000	453,000	520,000
Marshall	307,000	202,000	270,000	207,000	253,000	608,000
Mills	546,000	158,000	431,000	108,000	348,000	324,000
Mitchell	236,000	301,000	267,000	274,000	269,000	224,000
Monona	653,000	195,000	475,000	203,000	389,000	428,000
Monroe	251,000	174,000	239,000	134,000	212,000	323,000
Montgomery	334,000	226,000	312,000	180,000	277,000	253,000
Muscatine	454,000	238,000	372,000	227,000	328,000	262,000
O'Brien	332,000	268,000	304,000	285,000	299,000	375,000
Osceola	241,000	176,000	209,000	188,000	200,000	248,000
Page	619,000	192,000	477,000	182,000	401,000	470,000
Palo Alto	284,000	368,000	306,000	388,000	327,000	342,000
Plymouth	608,000	648,000	640,000	590,000	621,000	445,000
Pocahontas	514,000	226,000	430,000	188,000	369,000	415,000
Polk	345,000	183,000	272,000	177,000	237,000	487,000
Pottawattamie	934,000	309,000	708,000	346,000	614,000	556,000
Poweshiek	176,000	137,000	164,000	131,000	155,000	406,000
Ringgold	436,000	209,000	352,000	204,000	308,000	448,000
Sac	769,000	170,000	573,000	151,000	465,000	455,000
Scott	356,000	310,000	322,000	360,000	330,000	337,000
Shelby	895,000	293,000	699,000	242,000	576,000	659,000
Sioux	723,000	398,000	669,000	233,000	557,000	812,000
Story	450,000	253,000	381,000	232,000	337,000	323,000
Tama	418,000	245,000	378,000	191,000	330,000	530,000
Taylor	243,000	153,000	294,000	110,000	247,000	403,000
Union	571,000	210,000	440,000	179,000	363,000	418,000
Van Buren	393,000	122,000	299,000	128,000	256,000	357,000
Wapello	341,000	372,000	313,000	420,000	342,000	241,000
Warren	713,000	300,000	614,000	175,000	501,000	459,000
Washington	324,000	239,000	305,000	201,000	278,000	479,000
Wayne	261,000	574,000	281,000	824,000	419,000	442,000
Webster	584,000	233,000	469,000	217,000	404,000	416,000
Winnebago	288,000	297,000	314,000	227,000	292,000	349,000
Winneshick	814,000	334,000	630,000	306,000	530,000	743,000
Woodbury	835,000	555,000	804,000	366,000	692,000	626,000
Worth	178,000	216,000	183,000	237,000	197,000	224,000
Wright	298,000	592,000	368,000	703,000	459,000	355,000
TOTAL	$44,425,000	$26,233,000	$38,803,000	$23,144,000	$34,705,000	$40,950,000

* *Based on a 20-year catch-up program only*