

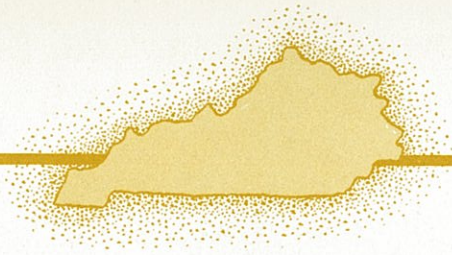
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*a  
summary  
report*



**A HIGHWAY PROGRAM FOR KENTUCKY**

Engineering  
Recommendations  
for Adequate Road  
and Street Systems



*A summary of highway engineering  
and fiscal studies prepared for ...*

**THE COMMONWEALTH OF KENTUCKY**

*Co-sponsors of the Study*

**Department of Highways**

**Legislative Research Commission**

**ADVISORY COMMITTEE FOR HIGHWAY DEVELOPMENT**

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# PREFACE

MOTOR VEHICLE transportation is woven firmly into the fabric of Kentucky economy and life. Over \$2.5 billion remain invested in roadways and vehicles, but demand has grown faster than highway improvement. Resulting inadequacies hamper not only free traffic movement but basic activities of business and people.

Two years ago the Commonwealth determined to face its highway problems and find solutions. The first need, it was decided, was a new, impartial and professional engineering analysis of the entire highway situation. In June, 1953, the Commissioner of Highways contracted with the Automotive Safety Foundation, Washington, D. C., a non-profit organization, to direct an engineering study of management and needs of the state's highways, roads and streets.

Arrangements also were made with the University of Kentucky Bureau of Business Research to study Kentucky's highway fiscal policy.

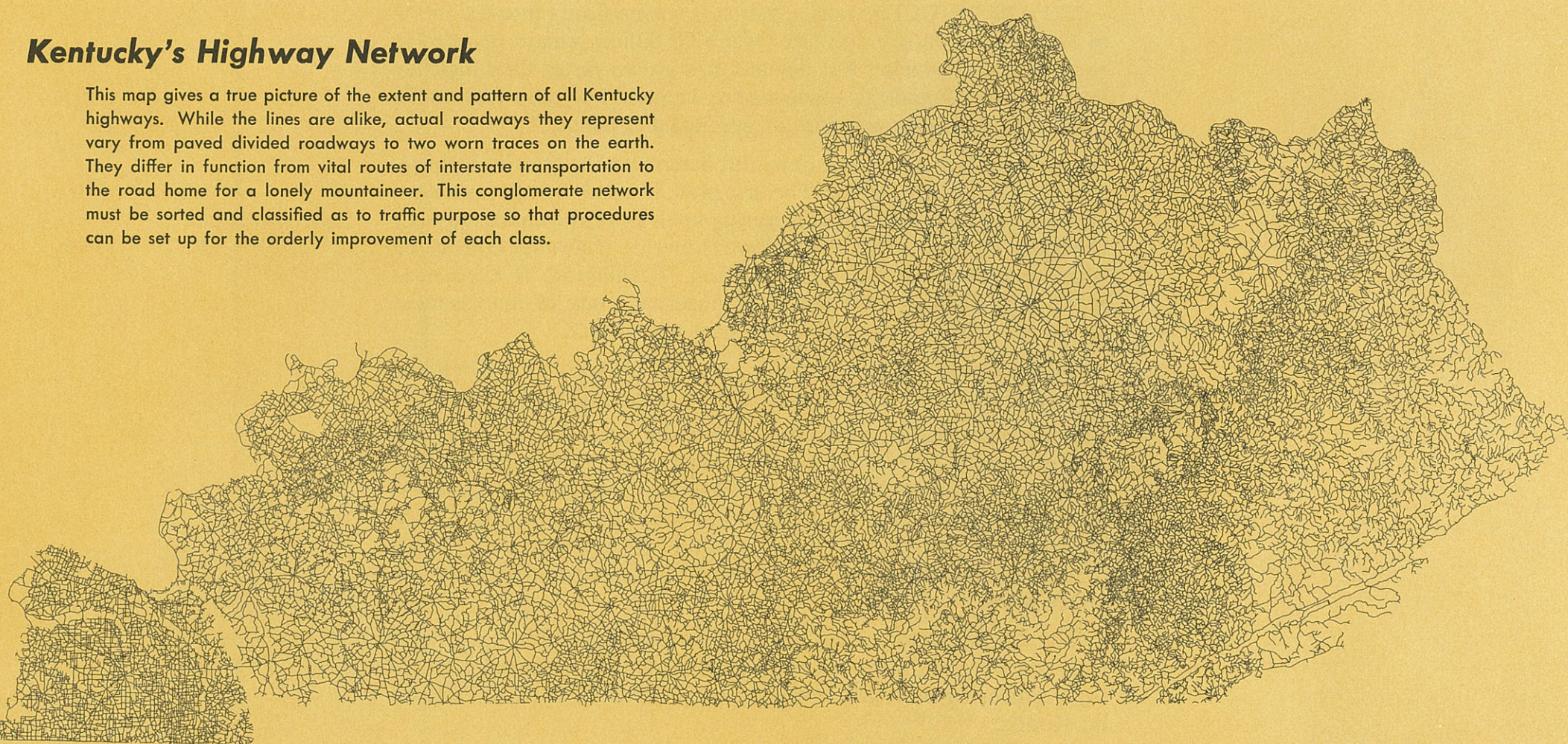
Those two studies proceeded under the co-sponsorship of the Commonwealth's Department of Highways and the Legislative Research Commission. An Advisory Committee for Highway Development was appointed by the Governor. Procedures and standards for measurement were planned in cooperation with engineers and officials of state, county and municipal highway organizations, who did much of the work.

The studies were conducted as a Federal-aid planning project with costs shared by the state and the Federal government. Helpful engineering assistance was given by the U. S. Bureau of Public Roads.

This summary presents the more important findings and recommendations of the full engineering report. The summary also includes certain information from the financial study, which was still in progress at the time of publication.

## ***Kentucky's Highway Network***

This map gives a true picture of the extent and pattern of all Kentucky highways. While the lines are alike, actual roadways they represent vary from paved divided roadways to two worn traces on the earth. They differ in function from vital routes of interstate transportation to the road home for a lonely mountaineer. This conglomerate network must be sorted and classified as to traffic purpose so that procedures can be set up for the orderly improvement of each class.



## A Summary Report of A Highway Program for Kentucky

TRANSPORTATION has always been a powerful factor in Kentucky's economic life. With the advent of the motor vehicle, methods of supply, production and distribution were quickly adapted to the use of the new type of service. Today operations in every field of enterprise are geared chiefly to highway transportation. Many suburban areas and 19 counties have no other means of travel or shipment.

Practically all of Kentucky's tobacco crop goes to the state's 32 markets by truck and so do most other farm and timber products. From nine of every 10 underground mines coal is shipped by highway. Most manufacturing plants use highways for moving materials, parts and products and 84 percent of all industrial workers travel to and from their jobs by motor car. In two of the most important industries — tobacco manufacture and distilling — raw materials are mostly received by truck while three-quarters of tobacco products and 40 percent of interstate shipments of whiskey are moved over highways.

Motor vehicles have made other far-reaching changes. In rural areas they have raised the standard of farm life: by widening access to market; by bringing rural mail delivery, the school bus and the consolidated school; and by banishing the isolation that had retarded many a back-country area. In cities, the motor vehicle has brought industrial and

residential development to the suburbs. Also grave problems of congestion and parking in the older downtown sections have been created by the increased numbers of customers driving in from widened trade areas.

In Kentucky there were 944,692 cars and trucks registered in the state in 1954, more than double the 1940 total. In 1954, those vehicles together with a considerable number from other states, rolled up over 8 billion vehicle miles of travel on Kentucky roads and streets, two and a quarter times that of 1940. Continuing industrial growth, increasing population and wealth is expected to boost vehicle ownership 52 percent and travel 72 percent by 1975.

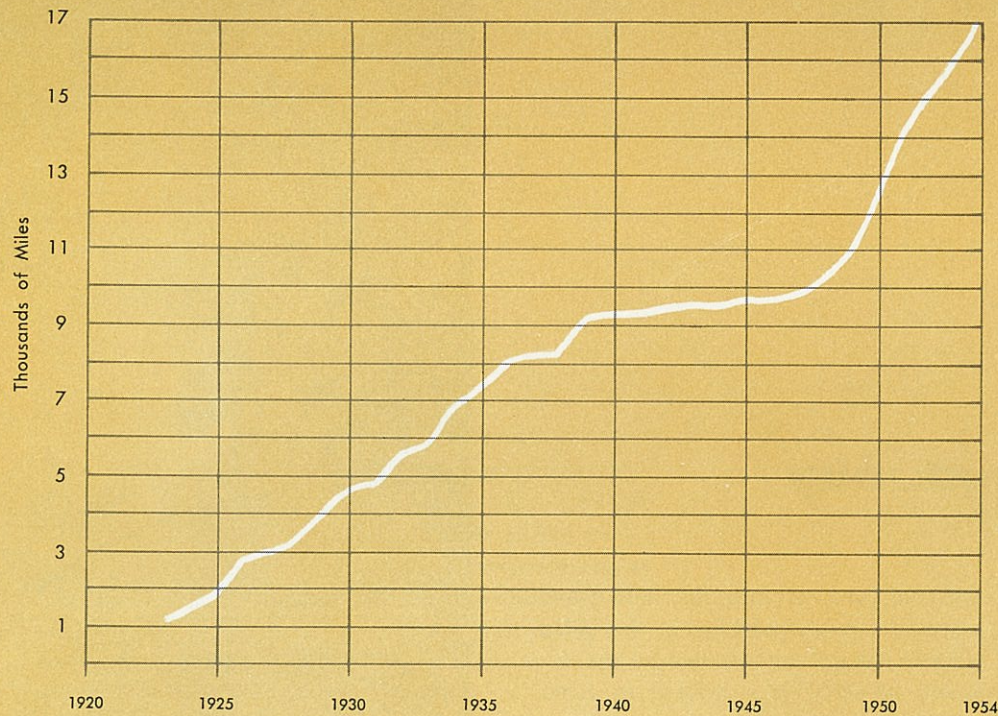
Such great expansion of highway use as Kentucky has experienced, and as is forecast for the future, demands parallel highway improvement. But for many years highway development has lagged.

The Commonwealth's roadway network is not grouped into functionally workable systems. Many

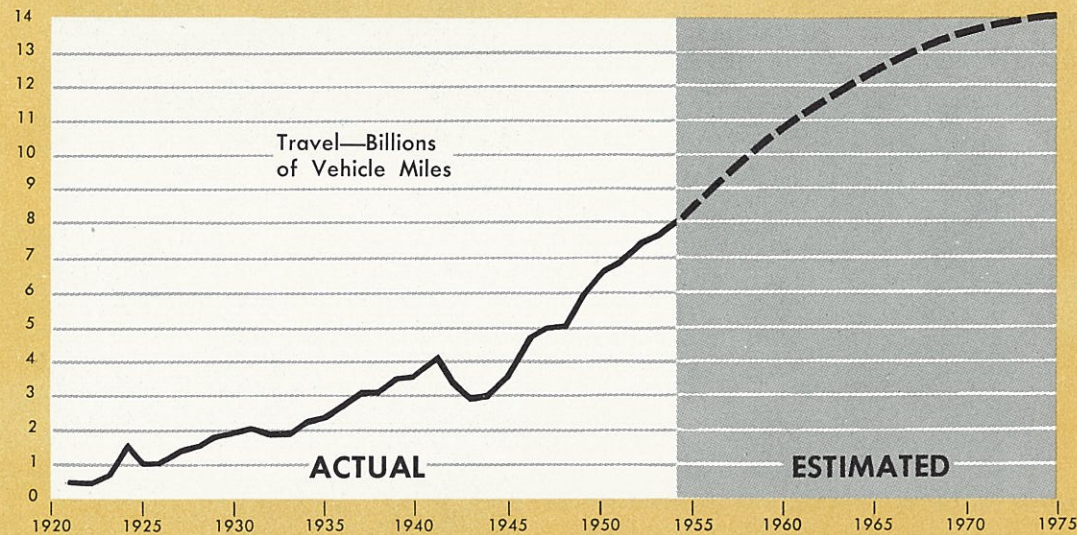
The verdant Bluegrass Country, with its white fenced horse farms and prosperous dairy industry, is favorite cruising and vacationing territory for tourists.



## State Mileage Doubled Since 1938



## Highway Traffic Soars



local agencies are weakly organized and financed and are shifting their road responsibilities to the Department of Highways. This has handicapped the more efficient state agency in improving Kentucky's principal transportation routes.

Kentucky's current highway problem is the inevitable result of those factors, and of increased price levels. Over half the state's roads and streets, including two-thirds of its main-traveled highways, are clearly inadequate for present traffic. Within 20 years practically the entire road and street mileage will require some sort of improvement. The transportation service on which Kentucky people and economy depend most intimately is seriously impaired. The cost just to correct existing facilities is estimated at about \$1.3 billion.

## NEED FOR HIGHWAY SYSTEMS

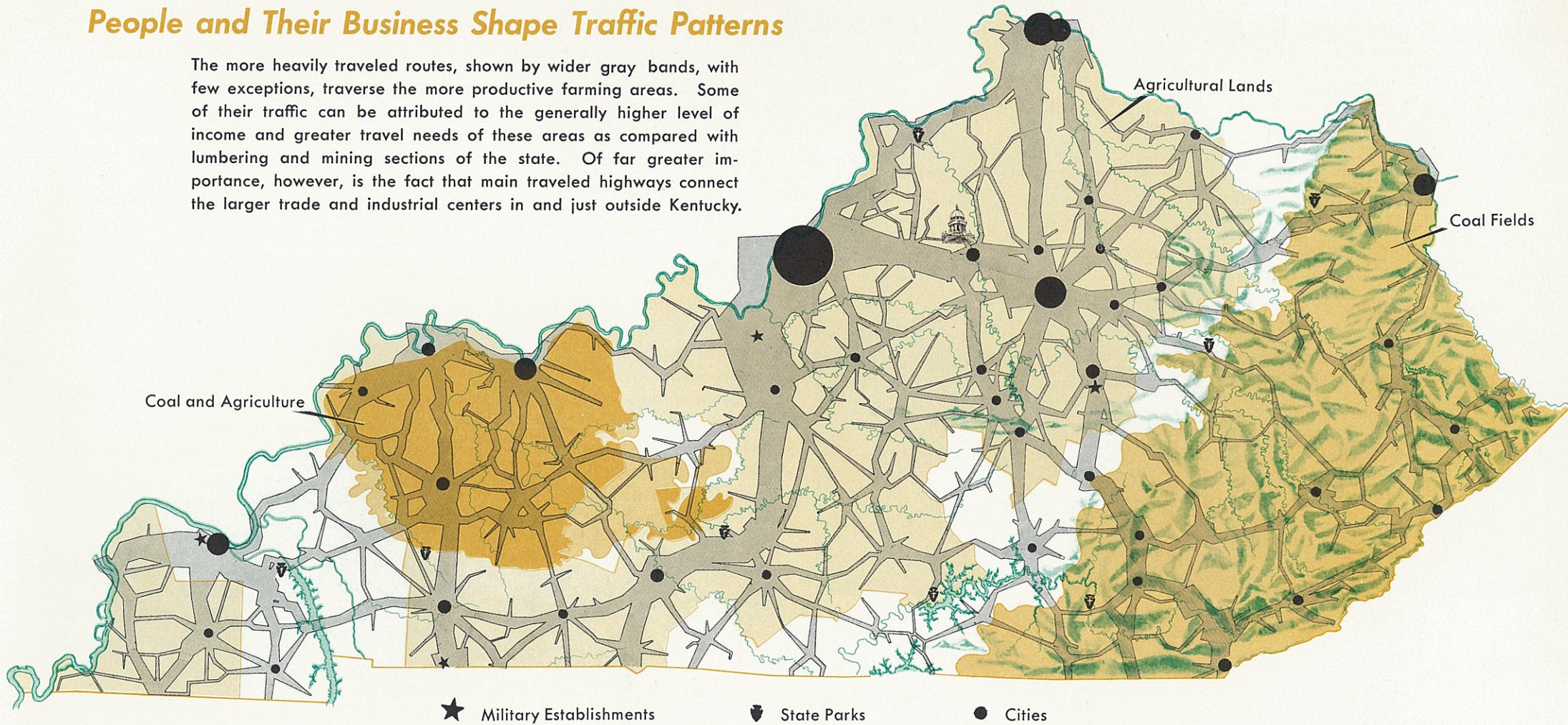
Highway travel is of three distinct kinds — statewide, community, and local. A basic need in Kentucky is that its 63,000 miles of roads and streets be classified and organized into corresponding systems so each may be managed and developed for the kind of traffic it must serve.

For 35 years, the Commonwealth has tried various ways of dividing road and street mileage and costs among state, county and city governments without arriving at a satisfactory solution. Since the establishment of a 4,000-mile state primary system in 1920, additional road and street mileages have been transferred from county and city to state jurisdiction. Transfers have been made without any consistent plan; in recent years have exceeded 1,000 miles annually. The Department of Highways is now responsible for a conglomerate collection of roads totaling more than four times the original length.

The state maintained 16,905 miles of rural highways and 716 miles of city streets early in 1955.

## People and Their Business Shape Traffic Patterns

The more heavily traveled routes, shown by wider gray bands, with few exceptions, traverse the more productive farming areas. Some of their traffic can be attributed to the generally higher level of income and greater travel needs of these areas as compared with lumbering and mining sections of the state. Of far greater importance, however, is the fact that main traveled highways connect the larger trade and industrial centers in and just outside Kentucky.



The extensive mileage spreads the Department's resources so thin that improvement has not kept pace with traffic needs.

There is no classification of the 42,557 miles of county roads. Consequently most counties lack selective road programs and the county fiscal courts are without adequate protection against various distracting pressures. Few counties are well equipped for road management. The steady shift-

ing of county road mileages to the state has so depleted many counties of principal local routes as to seriously lessen the importance of and pride in their own road functions.

Of the cities, only Louisville and Lexington have adopted and use arterial street plans. In most of the other 333 municipalities the only distinction is between streets maintained by the state and those which are not. Lack of selected arterial systems

hampers efficient street operations in most cities. Practically all cities are growing and need such plans to fit their expansion into a logical pattern. Moreover, most city street agencies also are subject to pressures which can best be resisted where systematic development channels limited funds into major projects, instead of spreading them haphazardly among the 3,401 miles of city streets with a variety of uses.

Differing functional services of rural roads — a few as major transportation routes, many as connecting arteries leading to those routes, and hundreds as access roads to widely spaced farms and homes — are reflected in wide differences in the amount of their usage, as shown by this tabulation:

Traffic	Miles of Rural Road
Over 700 vehicles per day	5,937
From 100 to 700 vehicles per day	13,244
Less than 100 vehicles per day	40,281

Rural routes carrying over 400 vehicles daily are shown by the gray bands in the map on page 5.

### Proposed Highway Systems

All agencies urgently need to have the extent of their responsibilities clearly defined and fixed. Equally, they need stable standards for determining the relative requirements and priorities of roadways. Those, together with sound financial plan-

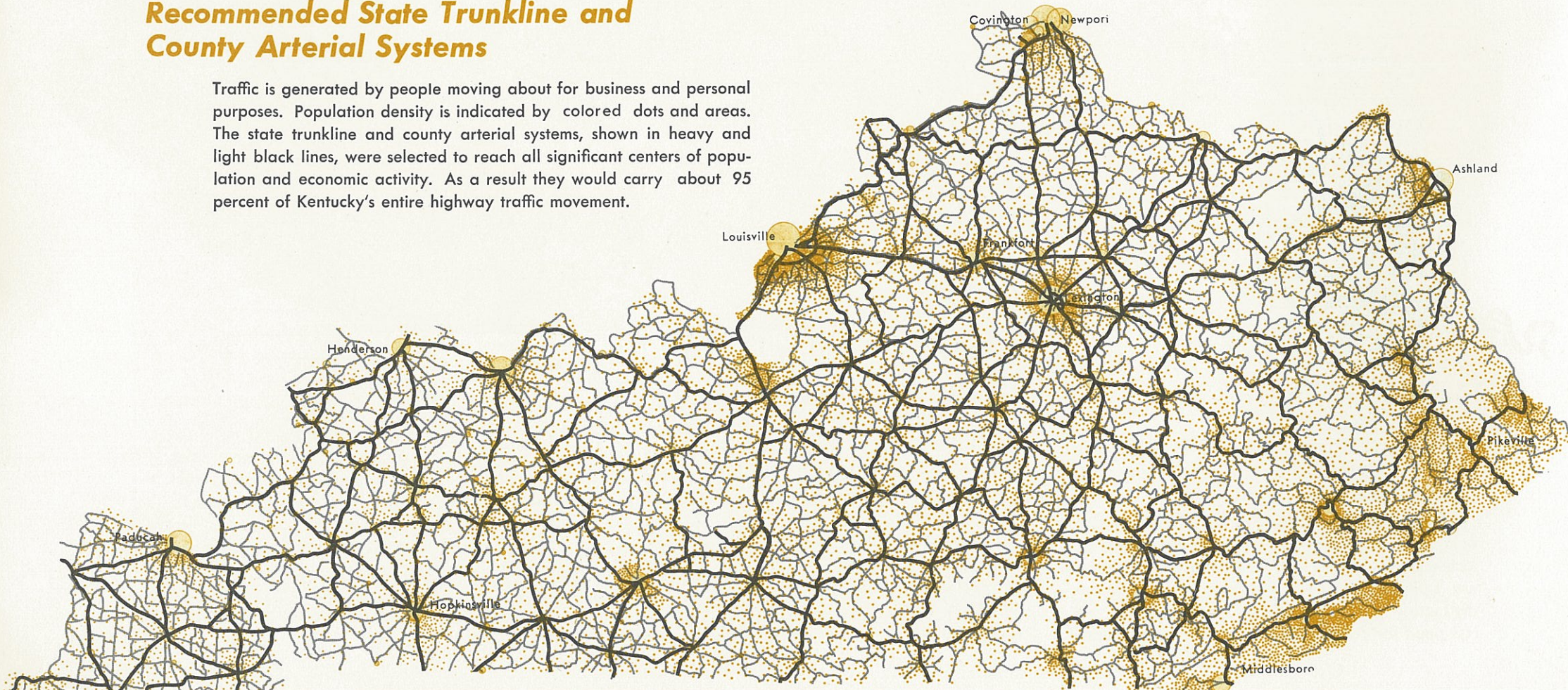
ning and management, are possible only when specific systems of roads are selected and all decisions geared to them.

Needed systems and standards correspond to the nature of travel — statewide, community and local. Thus three rural and three urban systems are proposed to provide for:

STATE-INTEREST TRAFFIC, which is the longer distance, higher speed travel generated by the inter-relations of eco-

## Recommended State Trunkline and County Arterial Systems

Traffic is generated by people moving about for business and personal purposes. Population density is indicated by colored dots and areas. The state trunkline and county arterial systems, shown in heavy and light black lines, were selected to reach all significant centers of population and economic activity. As a result they would carry about 95 percent of Kentucky's entire highway traffic movement.





nomic and individual interests in different parts of the state.

COMMUNITY-INTEREST TRAFFIC, consisting of the major movements largely confined within cities, counties and other community areas.

LOCAL-INTEREST TRAFFIC, which is the short-trip low speed travel that links individual homes, farms, shops, etc., with the operations and services of the community. Since this travel usually merges at some point with one of the other types, it is sometimes called feeder traffic.

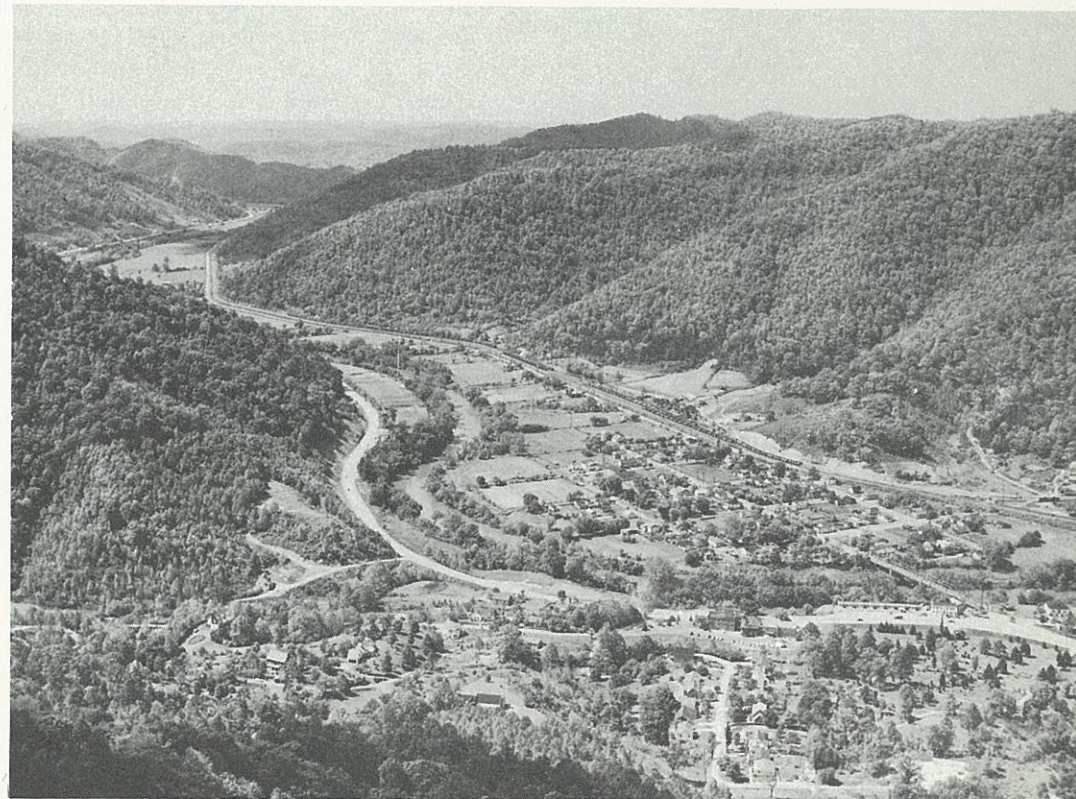
The recommended systems are defined by study of road and street traffic volume and character, by location of centers of activity, topography and other factors. Each system contains only the routes which provide predominantly similar service. The systems are mutually interlocking and connected to provide proper service to all areas.

### Recommendations

The General Assembly should create and empower the Department of Highways to designate these systems:

THE RURAL STATE TRUNKLINE SYSTEM should not exceed 5,300 miles of highway, and should consist initially of the 5,135 miles classified by the engineering study. Those classified routes provide, as directly as topography permits, for all significant movements of statewide and interstate travel, and serve all counties and all but 12 of the cities and towns with as much as 1,500 population. This system represents only nine percent of all rural mileage, but would carry three-fourths of all rural travel.

A section of Kentucky's highway network in rugged Bell County. U.S. 25 emerging from Pineville to follow the Cumberland River valley is the central artery of the whole area. In the towns, streets are connected with it and in the open country, county arterials and feeder roads take off to climb the hills to isolated settlements and homes.



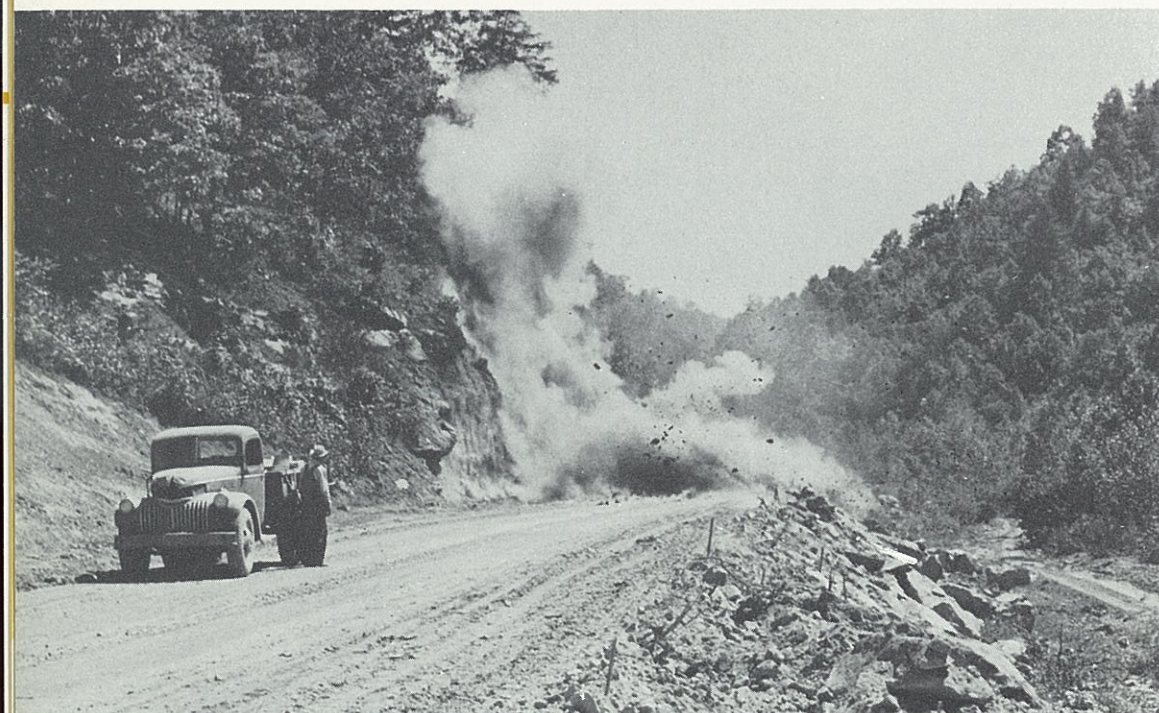
COUNTY ARTERIAL SYSTEMS should be established in all counties with not to exceed 14,500 miles of highways, consisting initially of the 13,628 miles classified by this study for community-interest travel service. These comprise about 23 percent of rural road mileage and would carry about 20 percent of rural travel.

*Together, the proposed rural State Trunkline and County Arterial routes total about 19,000 miles, and would serve practically every city and settlement. Such routes would be available*

*within a mile of nine out of 10 rural homes, and would carry 95 percent of all rural travel.*

COUNTY FEEDER SYSTEMS should be established to consist of the remaining 40,000 miles of rural roads not included in the State Trunkline and County Arterial Systems. Representing about two-thirds of the rural road mileage, these systems in the 120 counties would serve only about five percent of all rural traffic.

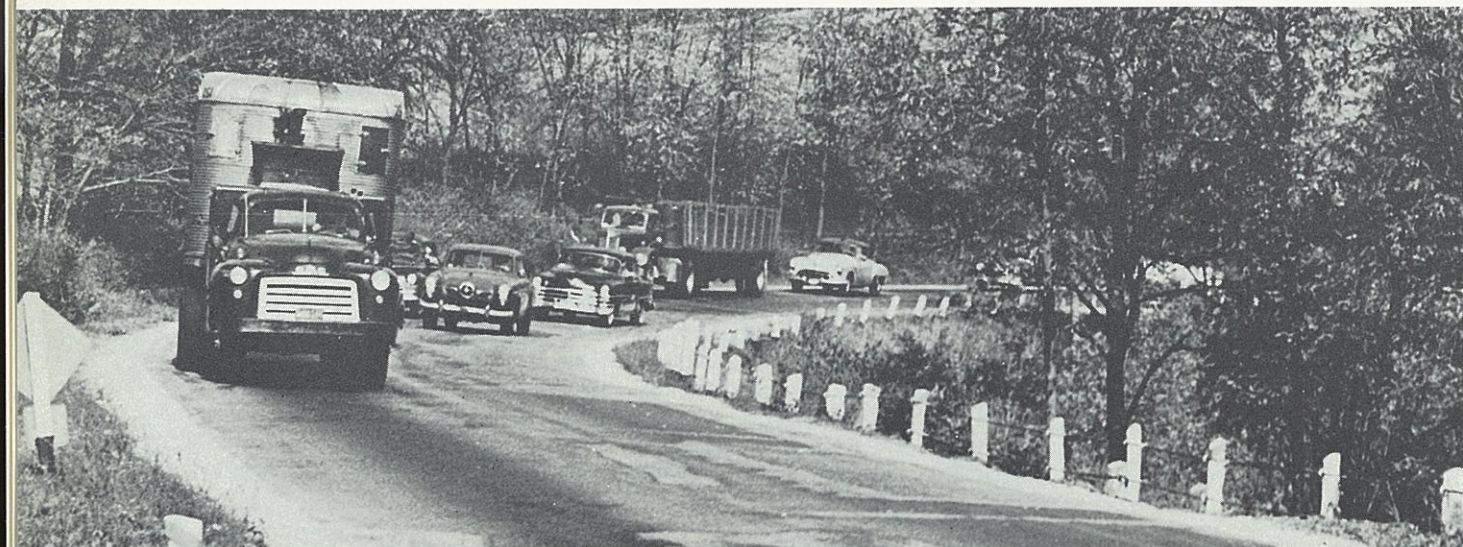
The General Assembly should also require the Department of Highways to



Heavy construction, such as this in Breathitt County, requires much advance planning, careful location and design and good supervision on the job. More district office responsibility is recommended.

Expanding travel by both private and commercial vehicles on many main traveled routes creates demands for modern facilities which have not yet been fulfilled. On this major highway

between Cincinnati and Lexington the curving alignment, short sight distances and narrow surface cause serious delays and hazards.



select not over 375 miles of urban STATE TRUNKLINES in cities, these to consist initially of the 356 miles of streets so classified by this study.

The Department should also aid larger cities in selecting ARTERIAL STREET SYSTEMS totaling not more than 725 miles, consisting at first of the 706 miles of streets so classified in this study. Together with selected state trunkline streets, these constitute 31 percent of urban street mileage.

The remaining approximately 2,300 miles of streets should comprise the CITY FEEDER SYSTEMS.

The extent and composition of each system should remain substantially unchanged with only such additions, deletions or transfers as are justified by engineering analyses of traffic and other classification factors.

## HIGHWAY MANAGEMENT

The Commonwealth has long been plagued by questions of how highway responsibilities should be distributed among the governmental agencies and of how those agencies should be organized to administer highway duties effectively. Now more than ever before, competent management is essential for the expanded programs this report proposes.

Through custom and long experience, Kentucky's three established classes of highway agencies — the state, the 120 counties and the 335 cities — are the natural managers of the Commonwealth's highway systems. They are the agencies to which the responsibilities must be assigned for the systems as classified and recommended.

Efficiency varies among the units of government. Differences are attributable to: character of the

system; engineering talent available; adequacy of financial support; degree of public interest in highways; and effects of political decisions on highway policy. To assure adequate performance of the duties involved, administrative inadequacies in all agencies should be corrected as an essential part of the state's highway improvement program of the future.

In the assignment of management responsibilities, it must be recognized that success is dependent on firm establishment of fiscal plans suitable for each road and street system. Amounts should be

based on the needs of the respective systems as determined by engineering study. Means by which needed funds can be raised and how they should be distributed are to be covered in the separate fiscal study.

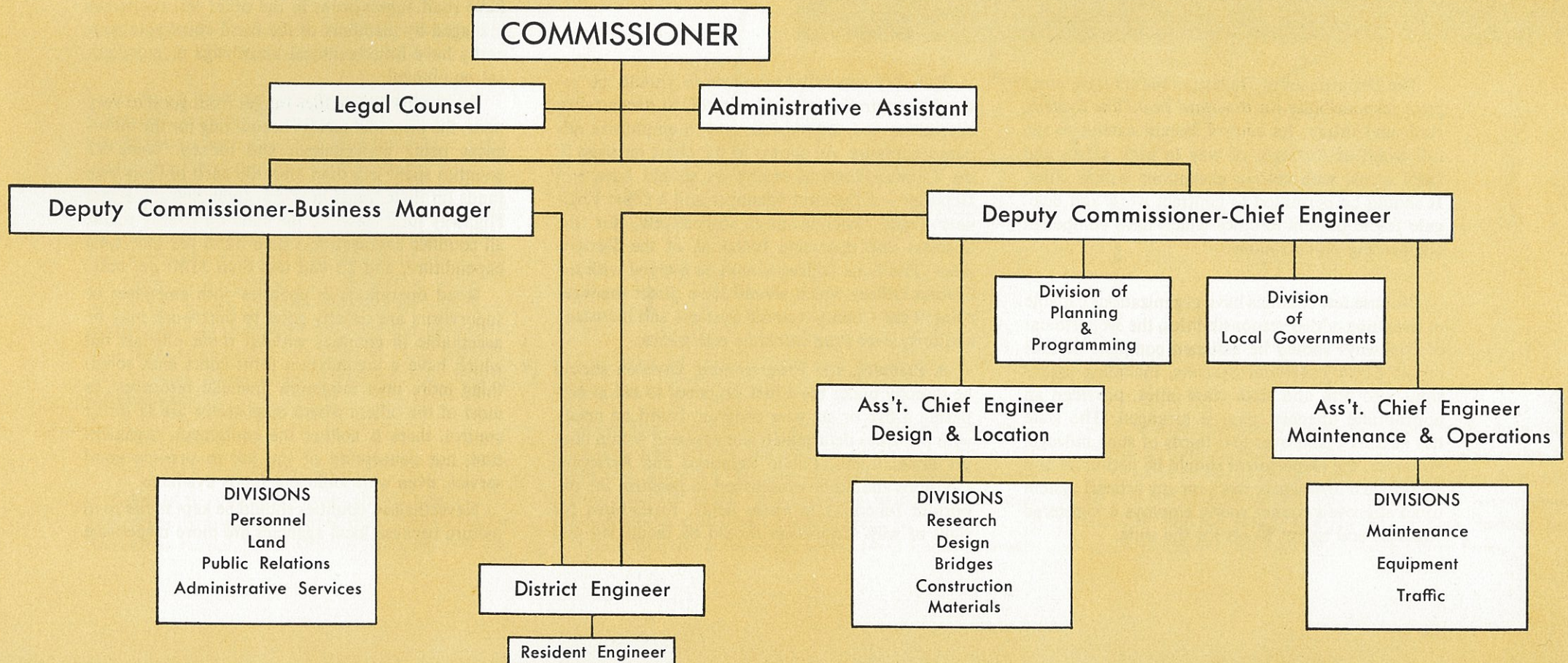
### Department of Highways

The Department of Highways now administers the state-maintained highways and city streets, and in addition does much of the actual field work involved in state aid to county roads. It is under the

Commissioner of Highways who is appointed by the Governor and who is assisted by two Deputies and the State Highway Engineer. The latter has direct charge of the Department's 11 headquarters divisions, six Zone Offices, and 11 District Offices.

The Department is the largest highway engineering organization in the Commonwealth. It is not an ideally efficient agency, but it has administered the development and operation of the expanding state-maintained system in a generally satisfactory manner.

## Proposed Organization • Kentucky Department of Highways





Counties can reasonably improve and maintain local roads, as indicated by this example in Franklin County. Counties should retain responsibilities for their own feeder systems, but need to improve their management.

The Department of Highways should have complete responsibility for the *State Trunkline System*, rural and urban. Its control should extend to the full width of the right of way in both urban and rural areas, with certain exceptions within cities. It should be permitted to contract work and delegate traffic powers to cities which have competent engineering organizations.

Because few counties have organizations capable of assuming added responsibilities, the Department of Highways should be assigned complete control of the *County Arterial Systems*, including extensions into fifth and sixth class cities, provided an appropriate financial plan is arranged. The state has already taken over two-thirds of such mileage. However, the Department should be permitted and encouraged to delegate work on any arterial system to an approved county which employs a registered engineer and agrees to act for the state.

The *Department's organization* should be revised to centralize over-all control, to decentralize operations and supervision, and to emphasize advance planning. As shown in the chart on page 9, the Commissioner of Highways should have two Deputies — a Business Manager and a Chief Engineer — with responsibility, respectively, for the business and operating functions of the Department. The Zone Offices should be merged with the District Offices which should have direct management of the County Arterial Systems and increased authority over state trunkline operations.

A Planning and Programming Division should be directly under the Chief Engineer to aid in preparing a five or six-year program based on needs, with priorities determined and assigned within budget limits. Land, Public Relations and Personnel Divisions should be established to perform the important functions in those fields. Procedures for right of way acquisition should be facilitated and

a revolving fund set up for the advance purchase of land.

A civil service system and a retirement plan are strongly recommended to remedy existing difficulties in procuring and retaining competent engineering and other personnel.

### County Road Agencies

County roads are under County Fiscal Courts which in 107 counties consist of the County Judge and from three to eight Magistrates elected from districts, and in 13 counties of a County Judge and three Commissioners elected from the county at large. The magistrate courts divide road funds and responsibilities among members' districts; the commission courts administer roads on a countywide basis. Ten counties have road engineers and 15 have road supervisors; in the other 95, roads are managed by members of the fiscal court who generally have little technical knowledge or mechanical equipment.

Road work in counties ranges from good to very poor, the principal factors accounting for the differences being management and money. Some 73 counties spent less than \$40,000 each of their own funds on their roads in 1953. Including the Rural Highway fund spent by the state on county roads, all counties averaged less than \$256 per mile total expenditure, and 23 had less than \$150 per mile.

Road operations in counties with engineers or supervisors are usually good to fair; work may be acceptable in counties without those officials but which have a commission form court with something more than minimum financial resources. In most of the others where magistrates are in direct control, there is neither the equipment, organization, nor conception of the job to provide good service, even were sufficient funds available.

Nevertheless, counties should be kept in the road picture because local agencies are more responsive

to and better informed about local needs, and because further increase in state responsibility, beyond the increased amounts recommended in this report, would present unwieldy minor administrative and financial problems which would disperse the productive effort of state engineers too widely.

It is recommended, therefore, that County Fiscal Courts should have basic financial and administrative responsibility for the *County Feeder Systems*. Present maintenance by the Department of Highways and financing from the Rural Highway fund should end, eliminating present confusing and inefficient dual responsibilities by both county and state on the same roads.

Counties should have commission-type government or establish a three-member Road Board. Those with inadequate resources should combine to form Road Districts. Each county or district should employ a qualified road engineer or superintendent with full management authority.

Although the state's first financial responsibility is to roads and streets which it directly manages, should the General Assembly decide the state has a continuing interest in the county feeder roads, it could provide cash grants in aid to be paid directly to the counties. These would be in lieu of the direct expenditures by the state under the Rural Highway Act. Amounts should be in proportions which the General Assembly may determine properly reflect the degree of state interest. In that case, funds should be audited by the state and controlled in a manner insuring protection of state interest. The separate fiscal study should provide helpful information.

### Municipalities

Cities of the first four classes should retain basic responsibility for and control over their *Arterial Street and Feeder Street Systems*, because they are

## SUGGESTED INTERSTATE FREEWAY SYSTEM AND OTHER NEEDS IN LOUISVILLE



Direct fast service to and from downtown and other important areas of the city and all connecting rural routes would be provided by the proposed 35-mile freeway system, shown in black. It is proposed as part of the Interstate System and its urban connections.

Yellow lines show important arterial and trunkline streets,

with principal proposed street extensions and connections shown in dashed lines. Freeway design is also needed on U. S. 31W to the southwest, and along the Ohio River east of the North-South Expressway. Many other improvement projects needed which are not shown here, include new grade separations to further expedite traffic flows.

better able to finance and manage their own affairs, and since the state would have full responsibility for trunkline routes in cities. Cities of the fifth and sixth classes should, however, continue to have complete responsibility for their own feeder streets.

State law should require all cities of over 2,500 population to prepare arterial street plans and long range programs based on engineering analyses of traffic and parking needs, now lacking in most cities. Such planning should be done in cooperation with the Department of Highways.

Should the General Assembly recognize that the general usage of Arterial Streets creates a state interest in them, state aid could be granted on condition that plans be approved and expenditures audited by the state.

## NEEDS AND PROGRAMS

A major objective of the Kentucky highway needs study was determination of what is required to bring each of the Commonwealth's recommended road and street systems up to standards adequate for efficient transportation service.

In appraising the state's roadways, care was taken to make sure that measures of adequacy were fitted to Kentucky conditions. Two sets of criteria were used — design standards which establish desirable levels of design for the future development of each highway system and "tolerable conditions" which set the minimum levels of condition and fitness acceptable for present traffic service.

The backlogs of existing deficiencies on each system were determined by comparing roads and streets, section by section as they existed on June 30, 1954, with design standards recommended by the American Association of State Highway Officials, as modified to fit Kentucky conditions. All this work was done in consultation with engineers of the state, county and city agencies. Deficiencies accruing in the next 20 years were determined with reference to estimates of traffic growth and the service life of existing facilities. However, no roadway now delivering tolerable service was judged deficient.

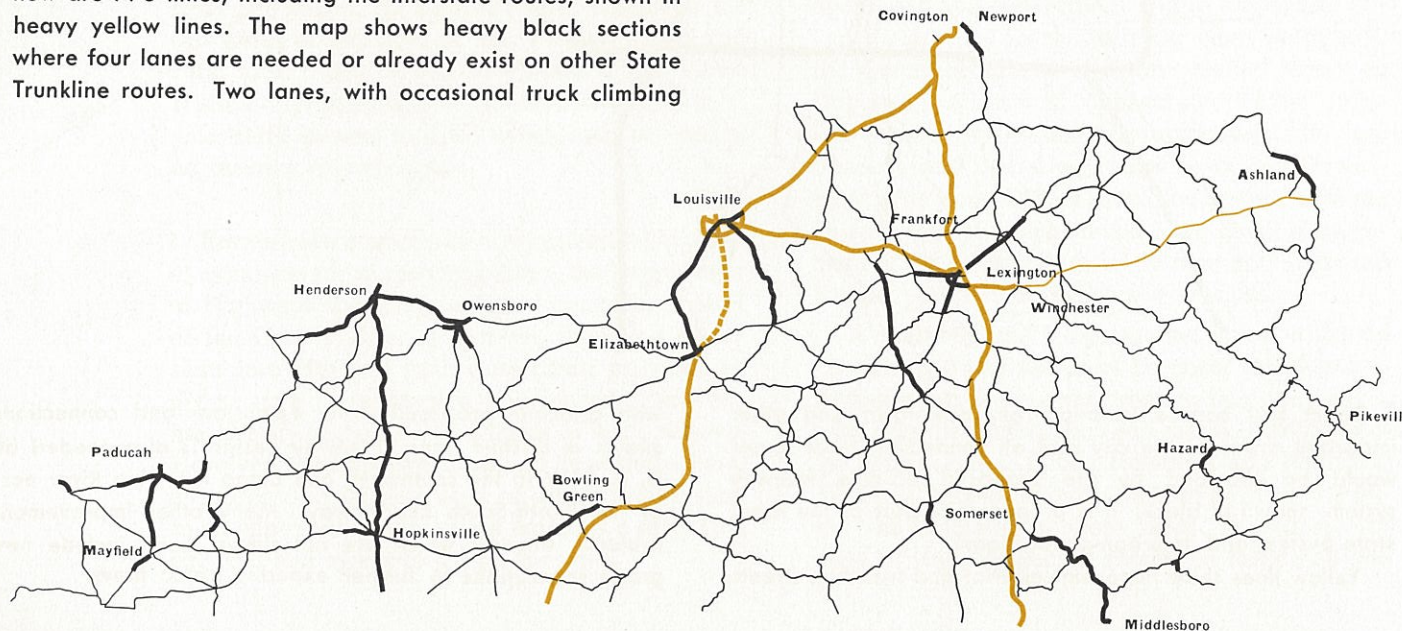
Cost of improvements necessary to remedy existing and accruing deficiencies were computed from unit prices actually paid for such work in Kentucky in 1953-54. The totals of work and costs are large and correction will take some years — how many must depend on fiscal policy and resources.

Since standards for highways and structures must be based on a firm knowledge of the loads to be carried, regulations in Kentucky and elsewhere for the size and weight of vehicles were analyzed. It is recommended that the design standards adopted for this study and the limits of vehicle size and weight recommended by the American Association of State Highway Officials be adopted and used by Commonwealth highway agencies. The latter proposal would increase weight limits now too restrictive, although the Commissioner of Highways should continue to specially restrict loads on certain routes.

## NEARLY 1,000 MILES OF DIVIDED HIGHWAYS NEEDED

Traffic congestion, resulting in slow and unsafe driving conditions, requires development of 964 miles of new rural four-lane divided highways in the next 20 years. Needed now are 773 miles, including the Interstate routes, shown in heavy yellow lines. The map shows heavy black sections where four lanes are needed or already exist on other State Trunkline routes. Two lanes, with occasional truck climbing

lanes, should be sufficient on the balance of the system, shown by thin black lines and a thin yellow line for the two-lane section of the Interstate System.



### State Trunklines

Kentucky routes in the National System of Interstate Highways, shown in the accompanying map, form a 619-mile core of the recommended State Trunkline System.

It has long been recognized nationally that the Interstate System should be developed to high

standards for lasting service. Freeway design is required to provide the requisite capacity, speed and safety, and to avoid early obsolescence. Experience shows that elimination of interference from the roadside and at intersections doubles the maximum traffic capacity of ordinary highways, provides for higher safe speeds, saves an average of 10 lives and many accidents annually for each 100 miles in service, and greatly increases the life of the facility.

The Automobile Manufacturers Association has estimated that modernization of the nationwide Interstate System to freeway standards would save \$2.1 billion annually to drivers in operating, accident and time costs. On this basis, yearly savings on the Interstate highways in Kentucky alone would amount to about \$26 million.

In recognition of such facts, Federal policy requires freeway or expressway design on all Interstate System projects involving Federal-aid funds.

Study of present and future traffic and existing conditions on Kentucky's Interstate routes confirms the wisdom of this policy.

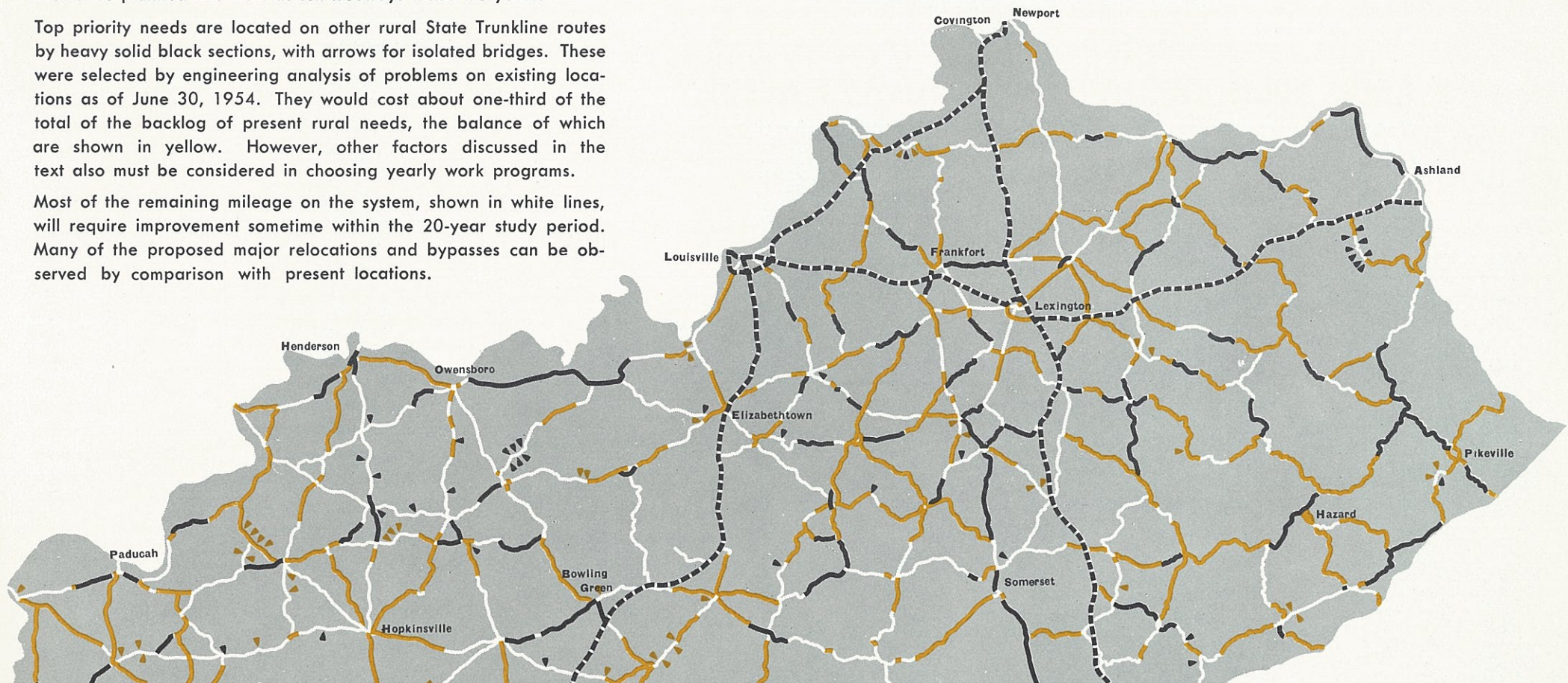
In view of their unique importance to Commonwealth traffic and in keeping with national policy, Kentucky's Interstate routes are planned on new locations bypassing all cities except Louisville and Covington, shortening their present mileage and permitting development to the required full freeway design prescribed for this system on both rural and urban sections.

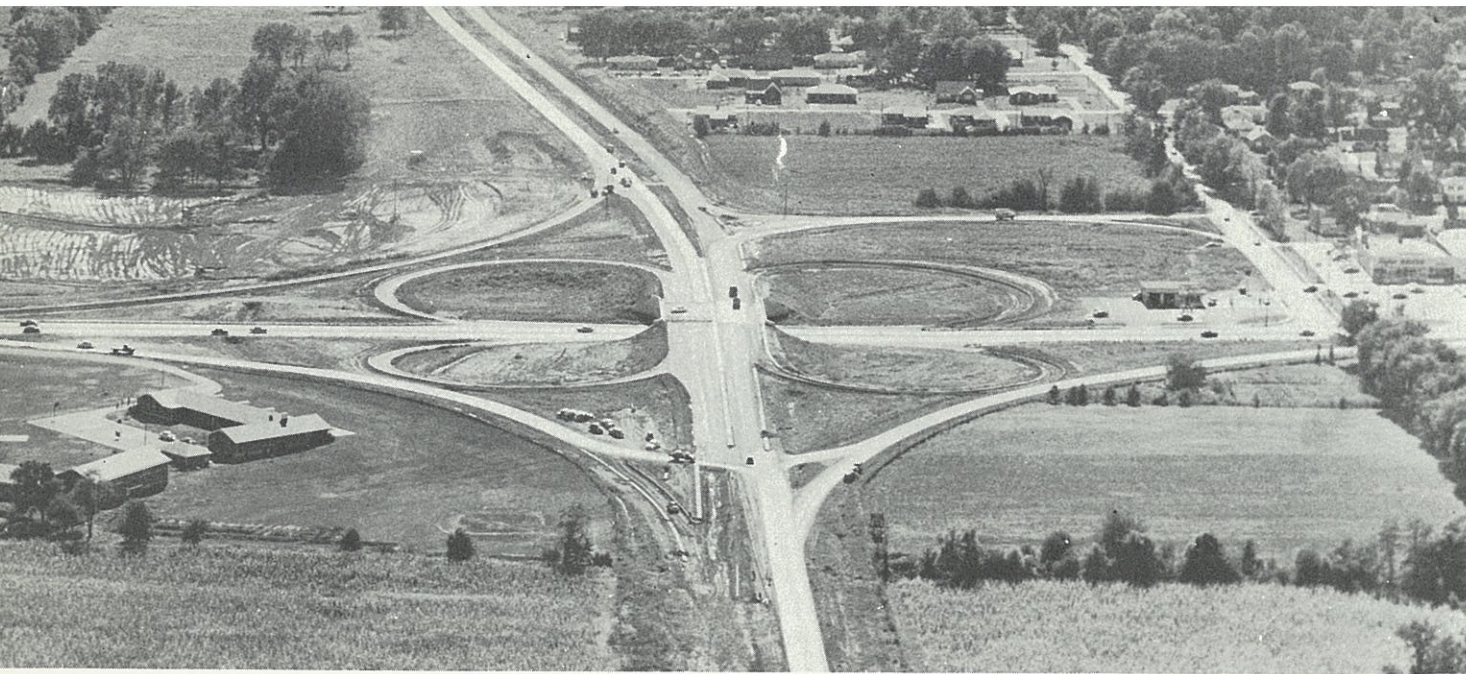
## High Priority Needs On Interstate System and Other State Trunklines

Interstate routes, with general location shown in dashed black lines, should be planned and built as full freeways within 10 years.

Top priority needs are located on other rural State Trunkline routes by heavy solid black sections, with arrows for isolated bridges. These were selected by engineering analysis of problems on existing locations as of June 30, 1954. They would cost about one-third of the total of the backlog of present rural needs, the balance of which are shown in yellow. However, other factors discussed in the text also must be considered in choosing yearly work programs.

Most of the remaining mileage on the system, shown in white lines, will require improvement sometime within the 20-year study period. Many of the proposed major relocations and bypasses can be observed by comparison with present locations.





On 619 miles of rural and urban Interstate routes, construction like this on the Watterson Expressway near Louisville is needed

to give faster movement free from stop lights, cross roads, and dangers of unlimited access.



Interstate traffic follows the route of U.S. 60 through Olive Hill on this heavily congested business street. This is a reason why it is proposed that the entire Interstate System be relocated to bypass all cities except Louisville and Covington and that urban freeways be provided in those centers.

Plans provide for construction of 439 miles of four-lane and 102 miles of two-lane highway in rural areas and 38 miles in the two cities, all to freeway standards. This construction would cost \$368 million, including \$93 million for work in the two cities. The proposed system includes the 40-mile Kentucky Turnpike, but costs of that toll road are not included.

Construction of the Interstate System should be completed in 10 years and the costs could be extended over such period as may be dictated by congressional action on Federal aid for construction and by Commonwealth policy. The service of the system as planned and recommended would be so centrally important to major movements of both rural and urban traffic along its route, that plans for other roadways and streets are predicated on its completion.

Sixty percent of the 4,939 miles of other State Trunkline highways and streets, and 47 percent of the structures are now inadequate for their traffic load. The accompanying chart shows the nature of the defects. The estimated cost of construction required by existing needs alone is \$399 million and another \$294 million will be required during the next 20 years to take care of accruing needs as roads wear out and traffic mounts.

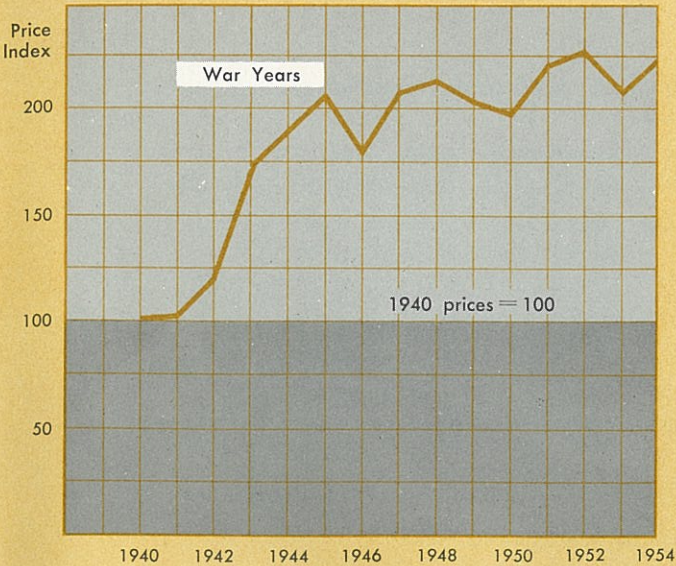
The map on page 12 shows where nearly 1,000 miles of divided four-lane rural highways are needed in the next 20 years. Only about 70 miles now exist.

Other State Trunkline work includes construction of 366 miles of new roads, including a number of city bypasses, and 1,116 bridges. City costs alone total \$57 million, exclusive of the Interstate System.

The backlog of work is so large that special studies were made to suggest top priority rural road and bridge projects to aid advance planning, so vital to future efficiency and economy. Results are shown in the map on the preceding page.



### Highway Prices More Than Double Since 1940



### County Arterial Systems

On the County Arterial Systems, 6,913 miles or 48 percent of the entire 14,320 miles of road and 2,019 of the 3,535 bridges are deficient. Of the currently deficient road mileage, 84 percent has bad alignment, 77 percent has too narrow surface, 54 percent is in poor structural condition and 21 percent has inadequate type surface. Most of the mileage lacks adequate shoulder width. It is estimated that it will cost \$232 million to take care of existing needs alone.

### County Feeder Systems

On the County Feeder Systems more than half of the roads, 20,540 miles, and 6,151 bridges are now deficient. Inadequate shoulders and drainage and poor structural condition are the principal road defects, while bridges are most often too narrow or too weak, or both.

Needed construction to remedy present defects would cost \$264 million, or about \$12,800 per mile, including bridges.

### City Street Systems

Only about 21 percent of the 708 miles of arterial streets are now deficient, but in the next decade the deficient mileage will almost double as traffic increases beyond street capacities. Over a 20-year period, 532 miles will need resurfacing or

reconstruction; and nine miles of new streets and 82 bridges and grade separations should be built.

Estimated total costs for construction are: now, \$29.9 million; in 20 years, \$102.5 million. Louisville accounts for a quarter of the arterial street needs. Another third of the total is needed in the 14 other cities of more than 10,000 population.

On the basis of an inventory of all 2,390 miles of city feeder streets, annual costs for development and maintenance were computed. These amount to \$7.9 million per year.

## Rural Trunkline Problems

HAVE DANGEROUSLY SHARP CURVES

85%

SURFACES TOO NARROW

68%

SHOULDERS TOO NARROW

50%

HAVE STEEP GRADES

43%

NO PASSING

36%

CONGESTED

17%

Percent of Currently Intolerable Mileage

## CONCLUSION

For the first time, a complete picture of long-range construction and maintenance needs in the entire Commonwealth has been put together.

The accompanying table shows estimated costs of alternative programs for meeting the needs on each principal system in 10, 15 and 20-year program periods, whichever may prove to be more practical after further study of fiscal problems. Shorter programs would speed up improvement, although at higher annual costs in early years. Over a long period, costs would be about the same, but improvements would be deferred longer.

Each program includes the estimated catch-up cost of remedying the existing backlog, together with the estimated cost of correcting accruing deficiencies and of maintenance and administration during each program period. Costs in any future year will vary from the estimated average annual totals shown herein, as construction prices may diverge from the 1953-54 price base.

The 20-year construction needs for all systems total about \$2.1 billion. About 17 percent is for needs within incorporated places. In that same period, expenditures proposed on systems recommended for full responsibility of the Department of Highways would average \$97.9 million per year, or about 68 percent of all road and street costs.

Over-all, 20-year needs on all systems total \$144 million annually, compared to an estimated income from present sources of \$118 million. The needs are the equivalent of about 12 cents per day per person, or about 1.2 cents per vehicle mile of travel.

This report has presented a reasonable and conservative statement of what is required to catch up and then to keep up with highway needs. The pro-

gram requires a long-range continuing effort on the part of all highway agencies. Highway systems are never "completed," but investments can be made to last longer and therefore to cost less per year

through better advance planning and adequate basic designs.

The total financial requirements must be considered in the light of the separate fiscal study. The

### Summary of Average Annual Program Costs

#### Kentucky Highway Systems

System	Mileage	Backlog Catch-up Period		
		10 years	15 years	20 years
<i>Interstate</i>				
Rural	581	\$ 31,481,000	\$ 21,627,000	\$ 16,726,000
Urban	38	10,354,000	6,967,000	5,292,000
<i>Sub-total</i>	<i>*619</i>	<i>\$ 41,835,000</i>	<i>\$ 28,594,000</i>	<i>\$ 22,018,000</i>
<i>Other State Trunklines</i>				
Rural	4,621	\$ 58,455,000	\$ 45,412,000	\$ 40,147,000
Urban	318	5,258,000	4,576,000	3,919,000
<i>Sub-total</i>	<i>4,939</i>	<i>\$ 63,713,000</i>	<i>\$ 49,988,000</i>	<i>\$ 44,066,000</i>
County Arterials	14,320	43,805,000	35,254,000	31,795,000
<i>Sub-total, Proposed State Responsibility</i>	<i>*19,878</i>	<i>\$149,353,000</i>	<i>\$113,836,000</i>	<i>\$ 97,879,000</i>
Municipal Arterials	708	\$ 9,676,000	\$ 7,875,000	\$ 6,637,000
Municipal Feeders	2,390			7,953,000
County Feeders	37,263			31,746,000
All Systems, Annual Total	60,239			\$144,215,000

\* Includes toll road and urban extension, for which no costs are shown.

Annual average total cost per capita, estimated for the period, is another guide to consideration of program feasibility. Such costs for a 20-year program show:

*Annual Cost Per Capita*

Kentucky	\$ 45
Michigan	44
Minnesota	46
Mississippi	28
Ohio	33
*West Virginia	46

*\*Excludes feeder streets*

Today, Kentucky is spending on highways, roads and streets the equivalent of about 1.1 cent per vehicle mile of travel,

about 12 percent of the total average cost of owning and operating the average motor vehicle. With the expected increase of about 72 percent in travel by 1975, average traffic during the next 20 years would be 36 percent above the 1954 level and costs to develop and maintain all systems properly would amount to about 1.2 cents per vehicle mile. That value compares favorably with other states:

Kentucky	1.2 cents
Michigan	0.97 cents
Minnesota	1.02 cents
Mississippi	1.18 cents
Ohio	1.04 cents
*West Virginia	1.46 cents

*\*Excludes feeder streets*

features and recommendations of both reports are geared together. The long range financing possibilities are based on the costs estimated in this study; the costs are based on the proposed classification of systems; improvement needs are keyed to proposed developments on other systems, such as construction of the Interstate System; all phases presume efficient management developed in general along lines recommended herein.

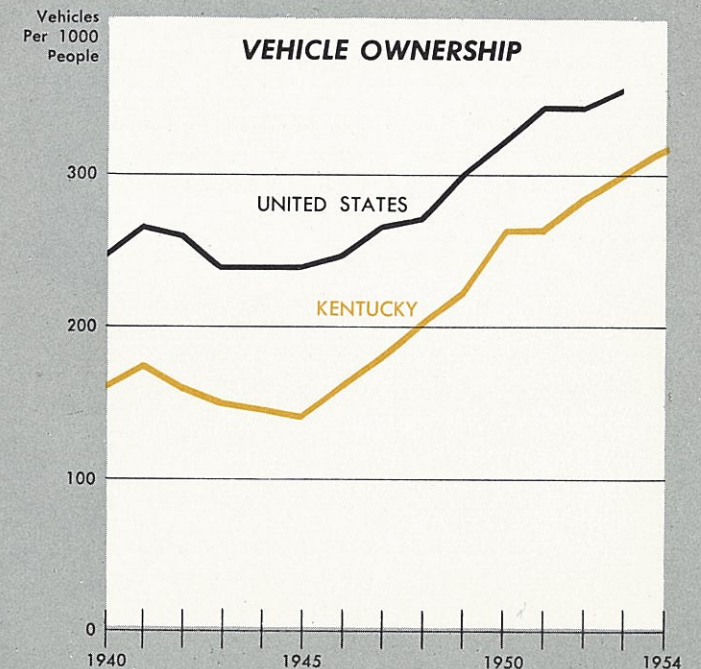
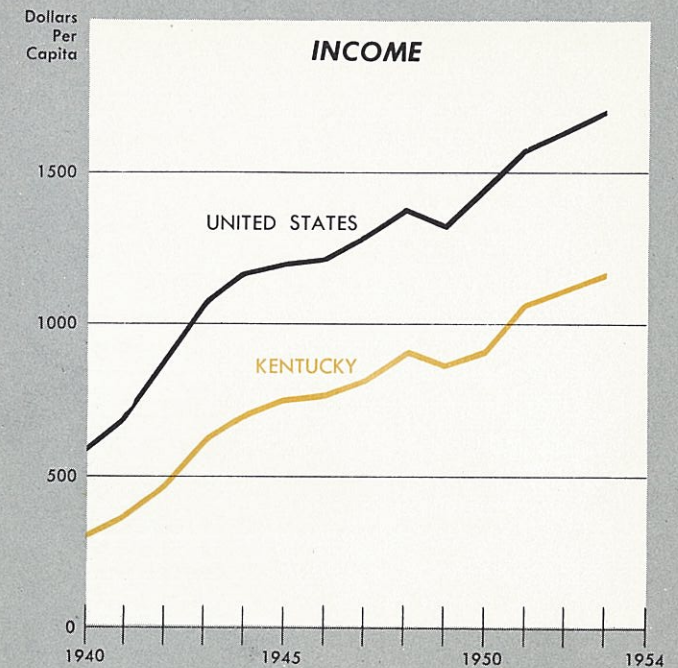
Should one element be adopted without the others, careful analysis should be made of the effect upon the whole structure. One of the basic difficulties now is an unbalanced operation, proceeding without full realization of its far-reaching effects. For example, the report emphasizes the importance of county and city governments in road and street operations and financing: if their role is diminished

rather than enhanced, a greater burden is thrown upon the state.

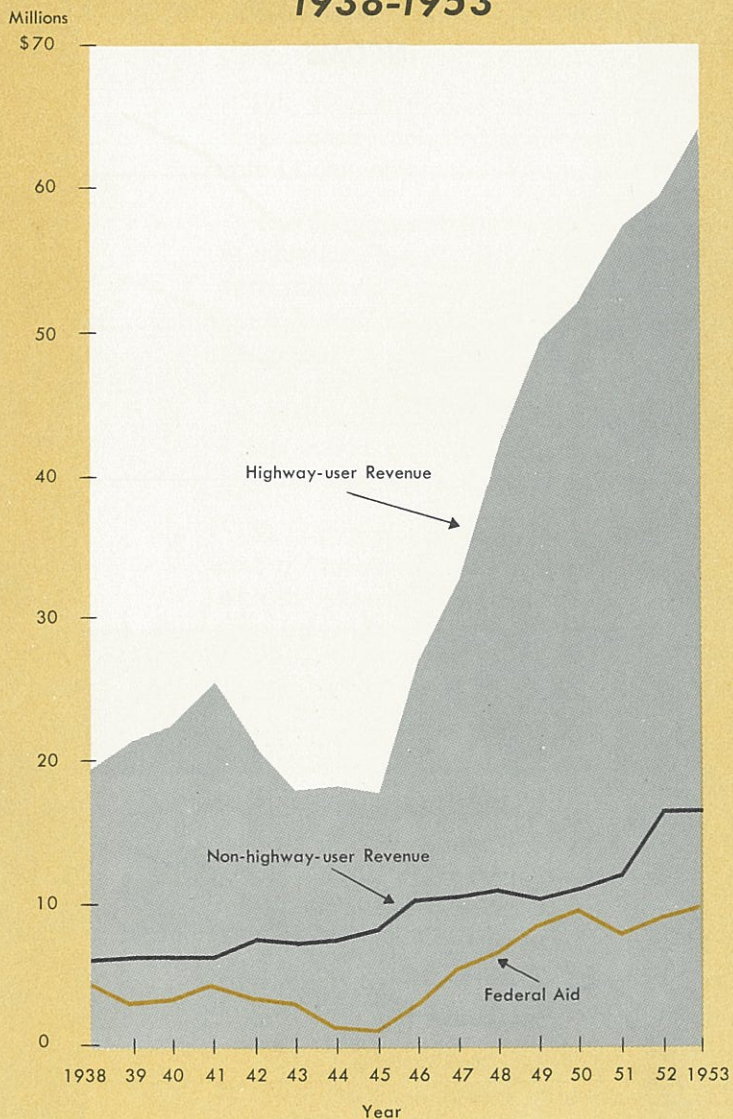
Continued change is characteristic of a dynamic economy and highway affairs must keep pace. Continued planning and restudy of all pertinent matters by all highway agencies is essential to properly inform and advise legislators and the public on needed changes of the future. This report furnishes a sound basis for appropriate action which should lead to beneficial results.

In 1940, there were only 162 motor vehicles for every 1,000 men, women and children in Kentucky. Today the ratio has nearly doubled—more closely approaching the increasing national figure. In the same period, individual income in Kentucky grew nearly four times—a rise more rapid than for the U. S. as a whole.

## Rising Income Helps Double Vehicle Ownership



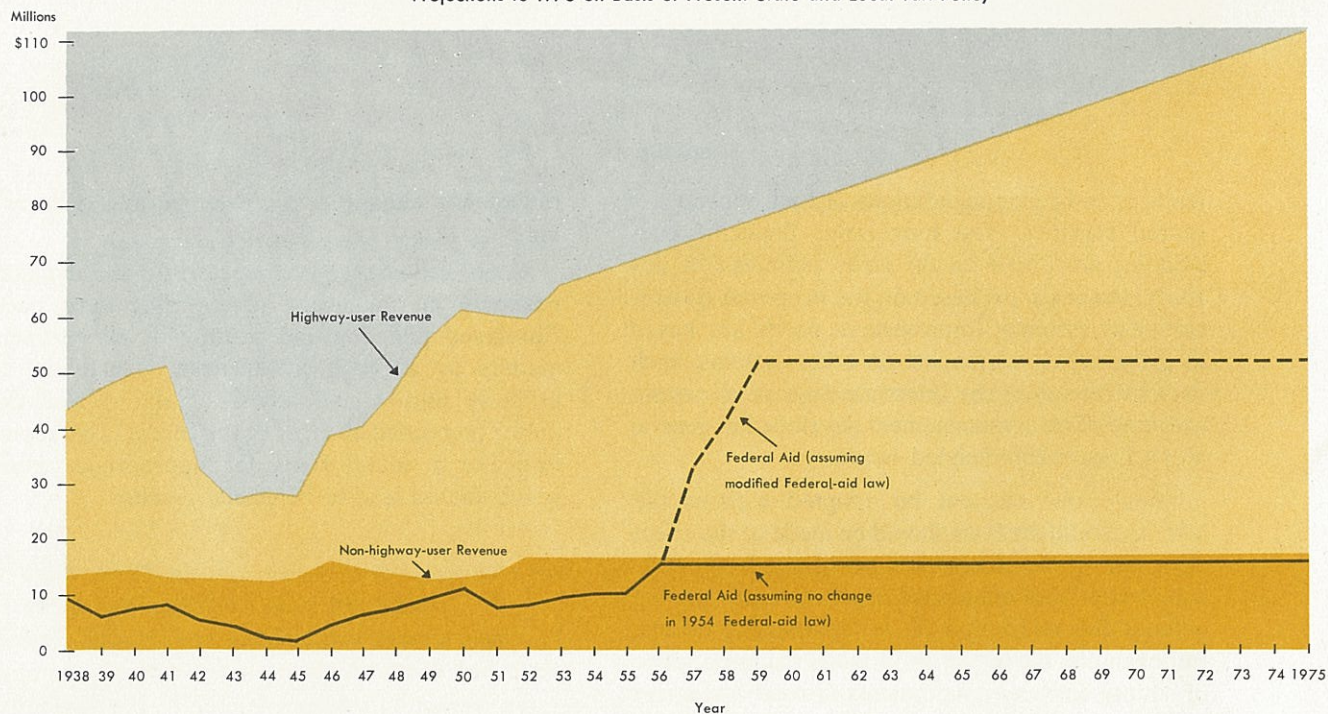
# State and Local Highway Revenues and Federal Aid 1938-1953



This chart shows the same data as the first chart converted to 1953 purchasing power, and projections to 1975 based on present tax laws.

This chart shows, from 1938 through 1953, the dollar yield of the state's revenue sources by principal classes. The amounts of money in millions of dollars which the United States Government has made available for all Kentucky highways for the period are depicted near the bottom of the chart. Amounts raised by local property taxes and payroll and other license taxes, except those imposed on motor vehicle users as such, are shown in the middle curve. Those amounts exceed Federal aid. As indicated by the top curve, highway-user revenues have provided the bulk of the money available for road and street purposes, especially since World War II. Those revenues include state and local licenses on motor vehicles as well as motor transportation and motor-fuel taxes along with several minor classes of revenues from highway users.

## Total Highway Revenues in 1953 Dollars Projections to 1975 on Basis of Present State and Local Tax Policy



# The Over-all Problem of Financing A Kentucky Highway Program

by the  
Bureau of Business Research, University of Kentucky

AFTER the Automotive Safety Foundation began its intensive survey of highway needs in Kentucky, the University of Kentucky undertook a study of state and local road and street finances. The research includes a comprehensive analysis of state, county and city road and street financial practices and possibilities.

The final report will include:

- (a) a statement of the problem in the light of expenditure practices and of the required expenditures for the programs defined by Automotive Safety Foundation
- (b) an analysis of historical and present financing methods
- (c) a consideration of the methods by which expenses of the programs may be spread equitably among various beneficiaries of highway services
- (d) a series of alternative plans for financing the support of needed state and local highways
- (e) a sketch of highway finance administration in the state, the counties, and the cities and a survey of possible improvements designed to make each dollar provide maximum highway service.

This preliminary statement contains historical data and projections that clarify the nature and

magnitude of the financial issues which Kentucky must confront if it is to deal with its road and street problems as defined by the engineering study. The over-all Kentucky highway finance problem is shown in the accompanying charts.

There are two especially significant facts depicted in the top chart on page 18. (1) Both highway-user taxes and Federal aid slumped emphatically during World War II. (2) Highway-user taxes show a much sharper recovery since 1945 than do either non-user revenues or Federal aid.

The other chart on page 18 shows that, after reducing all road dollars to the same purchasing power, there is very little advance at the end of 1953 over the level of money available at the 1941 prewar peak.

Although the revenue projections to 1975 assume a continuation of present state and local revenue legislation, they rest on assumed revisions in weight and dimension legislation which the Kentucky Advisory Committee on Highway Development and the American Association of State Highway Officials have recommended. The chart projects Federal aid to Kentucky on the assumption that the step-up in such assistance provided in 1954 legislation will be continued but not further increased. It shows, alternatively, what the figures would be according to one interpretation of the Washington debates of 1955.

The first chart on page 20 not only takes account of changes in the value of money but also gives

consideration to one measure of the need for road service. Viewed in terms of the purchasing power per vehicle available for road and street purposes, there has been a decided reduction since before World War II.

According to the chart, it is clear that one should expect a continuing decline in revenues per vehicle over the long term if there is no change in revenue legislation.

In the other chart on page 20, the prospective state and local highway revenue total for 1955-1975, not including road or bridge tolls, is compared with the expenditures, exclusive of those on toll facilities, required to carry out the programs recommended by the Automotive Safety Foundation if the expenditures are presumed to be stepped up by the same amount each year. It should be emphasized that this expenditure pattern is merely one way of securing a comparison with revenues; it is certainly not recommended. But the *average* is consistent with the engineering recommendations.

The chart shows, with presently authorized Federal aid and with the existing tax system, that there is a prospective revenue shortage which averages about \$26.4 million per year for the 20-year period. On the other hand, if Federal aid for all systems assisted is stepped up according to the pattern suggested by proposed national legislation, there will be no over-all, 20-year revenue shortage, assuming Kentucky can manage to match all the aid according to the anticipated Federal statute.

The projected expenditure data are higher by an annual average of \$5.4 million than the figures shown by the Automotive Safety Foundation. This addition represents the projected average annual highway fund expenditures which are incurred by state agencies other than the Department of Highways, and which the Foundation excludes from "highway program expenditures." This adjustment is essential to the comparison of revenues and ex-

penditures, as highway money is used for these expenses.

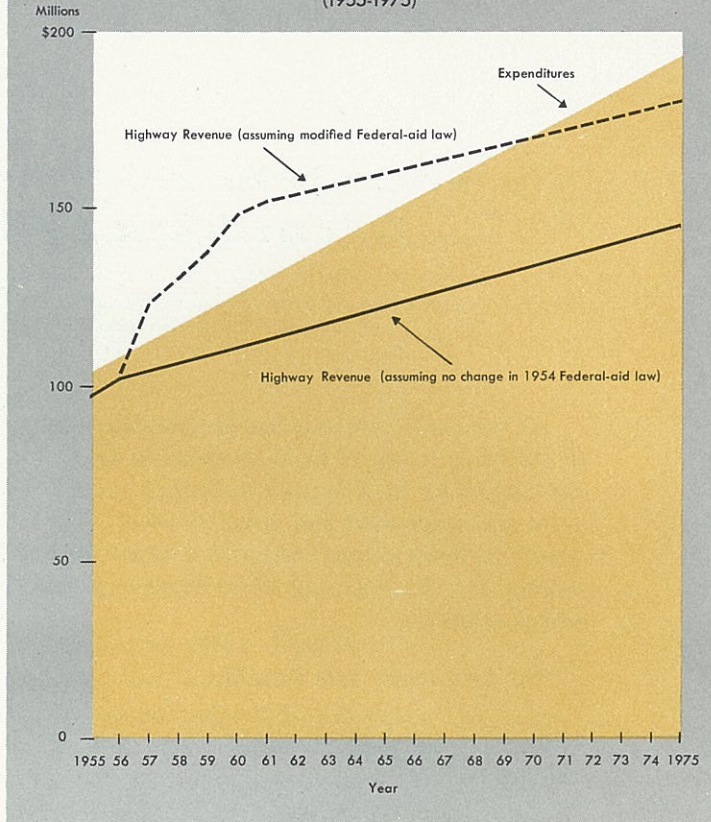
It may be concluded from the charts that: (1) If allowance is made for changes in the purchasing power of the highway dollar, recent revenues for road and street purposes are little above the level existing before World War II. (2) If allowance is made for changes in the number of motor vehicles which Kentucky highways must serve, there is an actual decline from the period before World War II in the amount of Kentucky revenue per motor vehicle registered. (3) Assuming no changes in the existing tax system and in presently authorized Federal aid: (a) Kentucky revenue per vehicle will apparently continue to decline over the long range, and (b) there will be a shortage of revenue averaging about \$26.4 million a year to carry out the highway programs over the next 20 years. (4) If Federal aid is increased and continued as suggested by Washington debates last summer and if no

change is made in existing state and local revenue legislation, there would probably be sufficient aggregate revenues to carry out the recommended programs over a 20-year period if price levels go no higher. In the absence of a credit arrangement, however, there might well be difficulties in matching Federal aid and in making the monies available by systems.

Finally, because of the large backlog of work needed on all systems, and because of the urgency of work and benefits to all highway users on the principal systems – especially State Trunkline routes – there is need to accelerate construction now. That suggests consideration of borrowing some of the funds, in anticipation of the greater income which is expected in the future. Indeed, without the early benefits of improved roads, it might not be possible to realize the continued growth of motor vehicle ownership and use on which the income estimates are based.

## Highway Expenditures Compared with Revenues

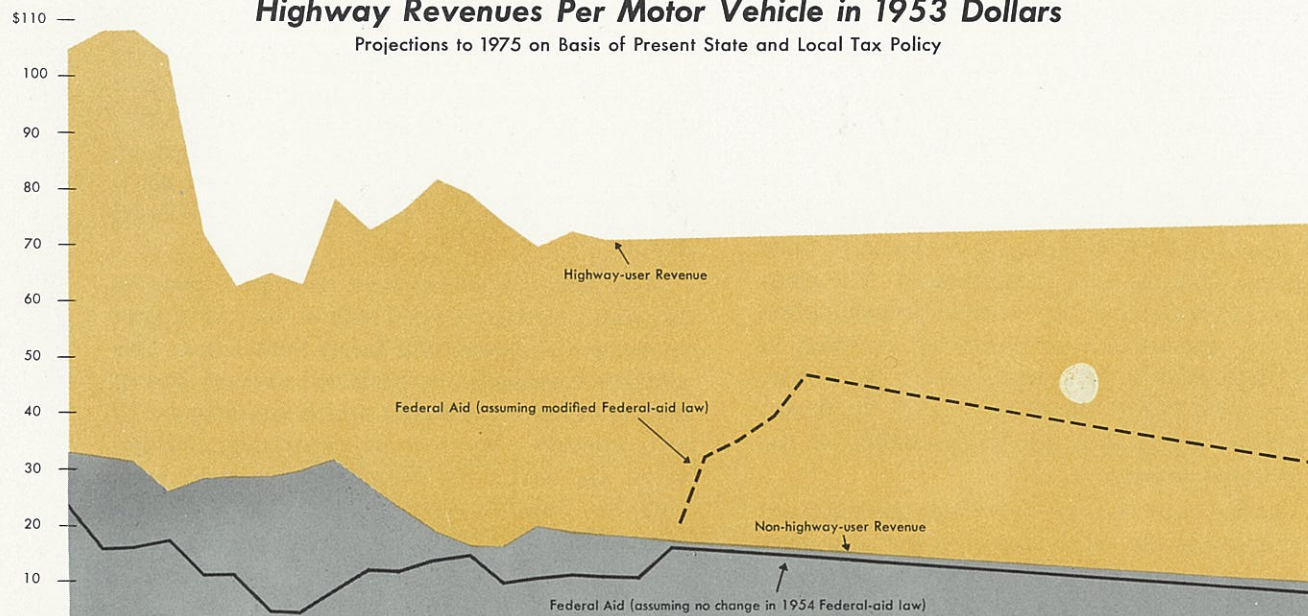
Assuming a Straight-line Increase and Estimated Revenues in 1953 Dollars (1955-1975)



The revenue and expenditure pattern shown in this chart is for comparative purposes only. The prospective state and local highway revenue is compared with expenditures required to carry out the needed programs.

## Highway Revenues Per Motor Vehicle in 1953 Dollars

Projections to 1975 on Basis of Present State and Local Tax Policy



The amount of highway money in 1953 dollars available per licensed vehicle actually declined sharply to 1953, as compared with the situation before World War II. There was a decline in each class of receipts: Federal aid, non-highway-user revenue, and highway-user revenues. Federal aid per vehicle, with no change in the law, would reach a peak in 1956 when the changes under the 1954 legislation become fully operative and then would taper off because the number of motor vehicles will continue to increase. The situation as to non-user revenues is the same except that there is no prospect of any further increase in the number of dollars per registered vehicle. The user tax revenue per vehicle may



