Session One—B

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HIGHWAY PLANNING CONCEPTS

W. F. BABCOCK, Presiding

Development of Highway Planning

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• PLANNING IN GENERAL receives little thanks; some even have described it to be a thankless job. It produces criticism and resentment among many who are directly affected. Yet it is undoubtedly one of the most important tasks of government.

Planning can mean different things to different people. To the maintenance engineer it has a connotation for the maintenance of highways in a safe operating condition. To the design engineer it means the selection of a specific alignment within a general location, fitting the highway facility on that alignment within the standards and specifications, and good engineering judgment and practice. To the personnel officer it means the staffing of the organization so that it will have the experience to perform creditably.

The highway user has perhaps a different concept of highway planning. The trucker is concerned with route selection that will permit movement of goods in the most economical operation. The mobile home can be hauled only where facilities are available for servicing, parking, and overnight storage. Thus planning has a slightly different connotation to each, and each must do some planning within his area of responsibility, business or interest.

Planning is sometimes referred to as a European concept, and a few may still find it difficult to accept in the conventional American tradition. It is contrary to the manner in which this country has developed and to the pioneering spirit. The exploitation of natural resources that was possible and profitable in the days when there was an unexplored frontier was not planned with a view of conservation. The factor, however, which made planning necessary in Europe long ago, is now making it more essential in the United States. That factor is population. The population growth problem may be unpleasant in terms of the price of solution whether it be dollars, inconvenience, or inertia. Population is not only increasing in absolute numbers but it is changing its place of residence and employment so that much of this growth is intensified in some areas more than others.

Planning in the present context is nothing new. There is evidence of it in the system of National Parks, the development of irrigation, Central Park in New York or the Mall in Washington, D. C., to cite a few instances—some highly successful—as time alone can tell. There are now more people with more cars and more time for recreation and with better highways. So the question logically may be asked, What is being planned today for the world of tomorrow and specifically what is the position of highway planning in this over-all situation?

DEFINITION

As a general thesis and within the concept of this conference planning is

a basic characteristic of executive action. Planning is an intellectual process involving creative thinking and an imaginative juggling of many complex variables. Conceptual thought is at the core of the mental abilities required for planning. Skill in planning is needed by all administrators or managers.

According to the dictionary, planning is a scheme or a method for doing, and to a highway administrator this should mean a scheme or a method for administering the highway system. Good highway planning is essential to the effective functioning of the several aspects of highway work and usage, but the term "highway planning" includes a much broader concept than that of the maintenance engineer or the design engineer, the personnel manager or the highway user.

In 1956, when R. B. Hindle of the Roads Department of the Province of Natal, South Africa, returned after a trip, he reported on his observations of highway practice in these United States. In this report he described highway planning as a continuous process aimed at maintaining, at all times, the best balanced state of highway transportation efficiency throughout the entire system.

In order that this highway transportation can be planned in balance with the economy of the area in which it is a part, social and economic considerations must be included as well as the physical. Planning also presumes that there be goals or objectives established and under the continuing process that they be modified from time to time as conditions change.

The one purpose of highways is to provide for the safe and convenient movement of persons and goods. It is not an exercise in drafting the layout for an interchange or the balancing of cut and fill or the determination of the optimum moisture content of a particular soil, although each has its place in the process of highway engineering.

THE PROBLEM

In the last days of horse-drawn highway transportation the highway administrator had problems of mud, ruts or dust, depending on the weather and the season. He was confronted with rough roads. As the capability of the internal combustion engine was more effectively adapted to the highway vehicle and as its efficiency improved, the problems increased in complexity with operational difficulties of sharp curves, excessively steep grades, limited and restricted sight distance, congestion and accidents. And always intermingled with these physical manifestations of problems has been the necessity of financing and administering the entire highway operation (Fig. 1).

Before 1930, improvement of the primary rural highways was the relatively uncomplicated objective of road improvement effort. Primary routes had been recognized and designated in accordance with law as State highway systems in the several States, and the more important of the routes of these systems, since 1921, had been incorporated in the Federal-aid highway system.

During the 1920's a steadily increasing expenditure by the States, with Federal aid, had gone into a pioneer improvement of these main rural highways. By 1930, the end of this initial program was in sight. Some degree of improvement had been extended to nearly the whole of the selected systems, and a situation had been created which called for a reconsideration of guiding policies.

The registration of motor vehicles had increased beyond all early expectation. The volume of traffic had grown at an even faster rate. Speed of travel had increased, and was continuing to mount. Already it was seen that much of the earlier improvement of the principal rural highways would soon be inadequate to the needs of the developed traffic, necessitating reconstruction and enlargement of the facility provided.

In the early 1930's, however, the highway departments began to find different and more complex problems. At this time the principal centers of population were connected with a system of highways—not always hard surfaced but generally considered to be of the all-weather type. The change was one in

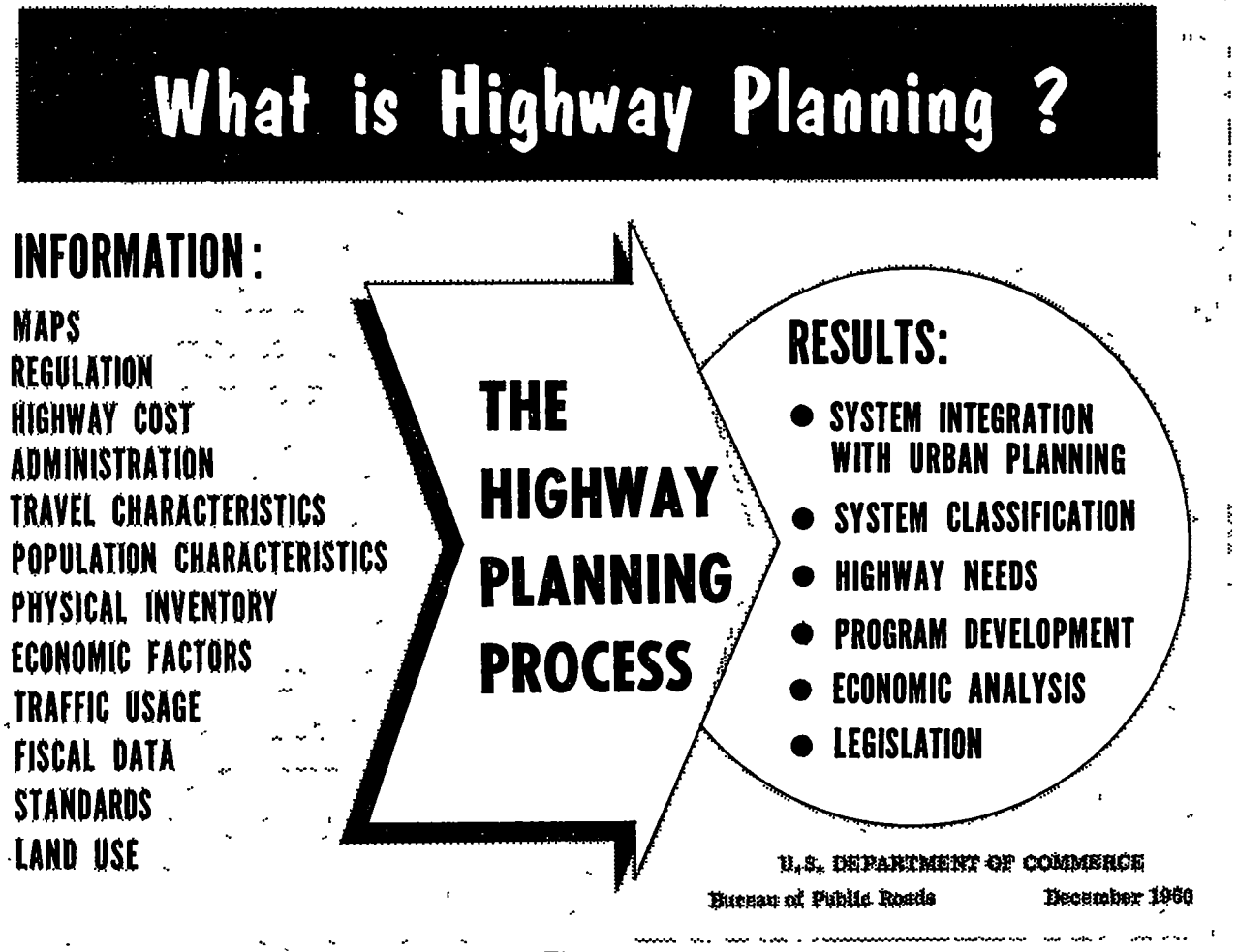
What is Highway Planning ?
INFORMATION:
MAPS
REGULATION
HIGHWAY COST
ADMINISTRATION
TRAVEL CHARACTERISTICS
POPULATION CHARACTERISTICS
PHYSICAL INVENTORY
ECONOMIC FACTORS
TRAFFIC USAGE
FISCAL DATA
STANDARDS
LAND USE
THE HIGHWAY PLANNING PROCESS
RESULTS:
SYSTEM INTEGRATION WITH URBAN PLANNING
SYSTEM CLASSIFICATION
HIGHWAY NEEDS
PROGRAM DEVELOPMENT
ECONOMIC ANALYSIS
LEGISLATION
U.S. DEPARTMENT OF COMMERCE
Bureau of Public Roads
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Figure 1.

the character of highway transportation. Automobile ownership increased. Traffic volumes, vehicle speeds, and the number of trucks and their weights and loads carried were far greater than could have been visualized by the engineers of the early roadbuilding years.

The studies and processes that are involved in solving these problems are highway planning. The results of such studies may take different forms but usually they find expression in a program involving location, acquisition of right-of-way, design, construction, and maintenance, with their financing and legislation. Underlying these program developments is a program of research and the management of the entire operation. The result is systems of adequate highway facilities.

THE HIGHWAY PLANNING PROCESS

The highway planning process (Fig. 2) takes any or all of such items as (1) maps that show topography, centers of population, industry, education, and religion—places that generate traffic; (2) an inventory of the physical extent of the highway facilities, mileage, surface type and condition, surface width, shoulder width, extent of grades, curvature and sight distance; (3) traffic usage in terms of volume, vehicle classification, and weights and loads; (4) travel characteristics of origin and destination, car occupancy, trip length and purpose, mode of travel, and trip frequency; (5) standards and regulations; (6) population characteristics; (7) highway costs and fiscal data; (8) land usage and economic factors; and (9) administration. After study, these produce a variety of results such as classification of highways for system administration, integration of highway systems with urban planning, development of highway improvement programs, economic analyses of route locations, studies of highway needs, and recommendations for legislation and regulation.

This highway planning process probably was not so clearly visioned in the minds of highway administrators when the work was first established as a separate function in the several States. The Federal-Aid Highway Act of 1954 provided that 1½ percent of the Federal-aid funds apportioned for any year to any State might be used for surveys, plans, engineering and economic investigations of projects for future construction. Starting in the autumn of 1935, the States began to take advantage of this provision in the Federal law, and began to conduct a comprehensive highway planning survey. By 1940 all of the States had begun to participate and all are continuing to do so.

In the initiation of this cooperative undertaking Public Roads proposed the studies, developed the procedures, rendered technical assistance, and consolidated data for use in the study of national problems. At the same time, and as part of the continuing nature of this program, the States have proposed additional studies where needed for State problems, set up work programs, made the field surveys and summarized and analyzed the results. The programs and reports have been subject to approval of the Bureau in the discharge of its responsibilities with respect to the expenditure of Federal funds.

The problems of the administrators in the several States vary to some degree and extent because of differences in natural attributes of climate and topography, differences in the economy and social characteristics of the population and differences in laws and regulations under which the individual highway departments must operate. Fundamentally, however, certain basic elements of work are common in all States and it is around this common interest that a fairly uniform pattern of methods and techniques could be developed and were applied. Within the cooperative framework of the Federal-aid concept it was possible for the individual States to utilize the information for studying its problems and recommending solutions and for the Federal Government to utilize the same information for studying its problems and recommending action without duplicating data collection and assembly processes. In this manner decisions of local

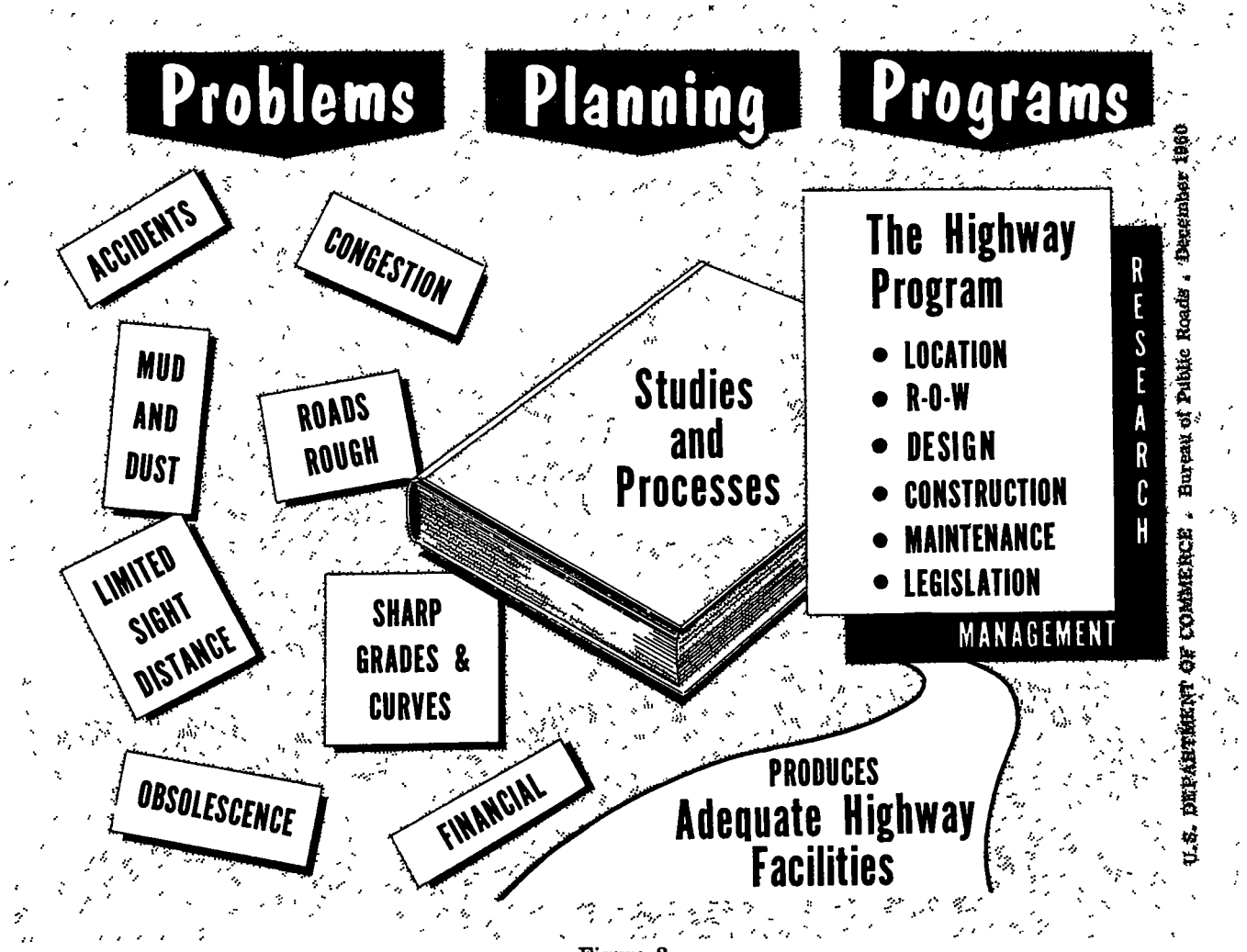
Problems
Planning
Programs
ACCIDENTS
CONGESTION
MUD AND DUST
ROADS ROUGH
LIMITED SIGHT DISTANCE
SHARP GRADES & CURVES
OBSOLESCENCE
FINANCIAL
Studies and Processes
The Highway Program
• LOCATION
• R-O-W
• DESIGN
• CONSTRUCTION
• MAINTENANCE
• LEGISLATION
RESEARCH
MANAGEMENT
PRODUCES
Adequate Highway Facilities
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Figure 2.

and Federal authorities are based on the same data.

Highway planning studies, although organized and conducted differently in some particulars in the several States, have, on the whole, followed a uniform pattern which is briefly described in the following paragraphs.

This is fundamentally the same functional type of work as would be found in a planning operation in business or industry—an inventory of the physical plant, an inventory of its usage or production record, and an audit of the fiscal situation, income, and expenditures.

Highway Facility Inventory

Initially, a complete inventory was made of all rural roads which were publicly traveled to determine in detail the extent and dimensions of the road facilities. Observers drove over every mile and recorded the width, type, and condition of roadway surfaces; the type, dimensions, and condition of structures; the location of dwellings and other cultural features which are sources of traffic; and the physical characteristics of railroad grade crossings. On the important routes they measured the location and degree of curvature of sharp curves, the location and rate of steep grades, and the location and nature of restrictions to road visibility which might present a traffic hazard.

The inventory data were summarized in tables, and in addition a series of county maps were prepared in accordance with standards which show all public roads and their surface type in relation to the adjacent dwellings and other improvements. Several series of maps have been prepared showing school bus routes, postal routes, and regularly scheduled truck and bus routes. State maps were also prepared showing the principal highways but not the cultural features. The maps constitute, in themselves, an extremely valuable tool for the use of the State highway organizations in their regular work, and in addition they supply information which is valuable to other State agencies, to Federal agencies, and to private agencies, business, industry, and individuals. They are generally sold by the States at a price approximating their reproduction cost, and the demand for them has been large and continuous.

Traffic Usage Inventory

An inventory of traffic usage was made to determine how the several highway systems are being used, the total travel, and separately for predominant vehicle types and loads carried—vehicles, loads, weights, and dimensions.

It is impractical to observe traffic usage on all road sections. With a knowledge of sampling techniques of standard statistical procedures, however, it is possible to make estimates within reasonable limits that can be predetermined according to the accuracy required for the problem.

A continuing function of these studies obtains additional information each year so that trends in these characteristics are known. Traffic trends have been determined by the operation of continuous-count machines at selected points and extensive traffic counts have been made periodically by these sampling procedures. State traffic flow maps have been prepared and generally revised annually, and county traffic maps at less frequent intervals—graphical representations of the usage of the several highway systems.

Trucks were weighed and measured at a large number of locations representative of the more important highways. The information obtained included the type and some measure of the capacity of the vehicle; the total weight and the load on each axle; the width, height, and length; the axle spacing; the commodity carried and, when possible, the weight of the carried load; the origin and destination of the vehicle; and other pertinent facts. The weight information has been kept current by trends established through annual weighings at selected points during comparable periods. In addition, most States have occasionally made more extensive weight surveys to deter-

mine variations in different hours and in different seasons, and on different classes of roads.

Financial and Motor-Vehicle-Use Studies

A complete highway planning survey program includes a group of financial studies to determine the relation of street and highway finances to the finances of all other governmental operations within each State, to determine the ability of the State to finance the necessary highway maintenance, replacements, and improvements, and to indicate an equitable base for the assessment of highway-user taxes.

One of the studies in this group was the road-use survey in which a representative sample of motor-vehicle owners were interviewed to determine their annual travel and the class of roads and streets used for that travel. The data obtained made it possible to determine the proportional amount of travel on each of the road systems of the State, originating in the respective governmental jurisdictions. This information, correlated with that obtained in the other studies, indicated the relation between the contributions to highways and the benefits obtained from their use. Most of the States made this study in the early period of the planning surveys and 23 of them have repeated it recently under somewhat modified procedures, known as the motor-vehicle-use study.

A fiscal study comprised an analysis of the financial reports of the State and its various political subdivisions. This analysis indicated the source of all revenues and classified expenditures as to whether they were made for highways (or streets), education, public welfare and services, or for general government. The highway finance data are being kept current from year to year.

Another study of this group, called the road-cost (or road-life) study, involves studies and research on highway investment, service lives and depreciation of various road types on the State highway system. Over the past 15 or 20 years, a group of States have built up a continuing record of the mileages constructed and retired. A number of States have also recorded their construction cost and analyzed salvage values, thus permitting determinations to be made of the highway investment in terms of grading, surfacing, and structures.

With the information thus obtained it is possible for highway departments to estimate the rate at which highways wear out and the cost of making needed replacements. Such information is extremely useful in scheduling long-range highway construction programs and in determining the rate at which highway needs will be met under various highway financing alternatives.

EVALUATION

General

Broadly speaking, the fundamental purpose of the highway planning survey activity is to place highway financing on a sound continuing basis under which the cost of supporting the systems might be distributed as equitably as possible among the users and other beneficiaries and to provide facts on which the administrative and engineering officials might plan, construct, and operate the highway systems efficiently and in the best public interest. It is very doubtful that any State highway department or the Bureau of Public Roads would feel that the millennium has arrived. Each decade brings technological developments that modify and change the usage of highway transportation. In many localities the United States has not yet caught up with the "lost-ground" demand for highways that may be traced as far back as the depression of the 1930's and World War II. Then there are the demands caused by needs of replacement and of expansion and of the increased quality of service. The ingenuity of individuals living in an atmosphere of freedom finds new uses for old areas and old facilities. So it is difficult to find a permanent satisfaction for any program accomplishment. There are a few generalities that are evident, and then there are some

specific areas in which it is possible to demonstrate the accomplishment of planning in relation to highway administration.

Highway planning is now an operating function in all highway departments with adequate funds available for normal programs and in some States with enough additional funds so that some research work is also included in the program. It is handicapped as are all highway functions by staffs of insufficient size and, in some areas of work, with lack of trained personnel.

Although highway planning in some aspects was done in the several highway departments and in the Bureau of Public Roads prior to the passage of the Hayden-Cartwright Act in 1934, it was lacking in comprehensive scope in any State, and there was no reasonably accurate way of creating a regional or national study for guiding or recommending administrative decisions.

Following the passage of the act in 1934, most of the States took advantage of the provisions of the act and initiated programs to conduct highway planning surveys. By 1940, all States had begun to participate and all are continuing to do so.

The Bureau of Public Roads has assembled the data collected by the several States and analyzed them to develop information of nationwide significance. It has frequently incorporated in these analyses information and data assembled by other governmental agencies to obtain as complete and comprehensive an analysis as possible so that highway transportation may be properly positioned in relation to other forms of transportation and the economy of the nation as a whole.

Prior to World War II, the States began using the results of these highway planning survey operations, as soon as the information could be analyzed, in the setting up of construction programs, determining priorities, designing individual projects, and in many other ways. The results have been used in reports to legislatures on many subjects such as route locations and developments, the need for funds, the allocation of funds to systems, the extent of the systems, size and weight limitation of vehicles, and road-user fees—especially license fees for trucks of different sizes. These results—and it takes time for survey operations to show results—are the manifestations of highway planning.

Since World War II, traffic volume trends, data on vehicle-miles of travel, ton-mileages hauled by trucks and frequency of gross weights and axle loads of various magnitudes have been computed and published regularly. One of the important trends pointed out in these publications was the alarming increase in frequency of heavy axle loads that took place between 1936 and 1948. Partly as a result of these findings, stricter enforcement and other measures taken by the States and truck operators have resulted in reducing the frequency of heavy axle loads considerably below the 1948 peak.

The third decade of highway planning is well under way. Looking back, the first half of the first decade was spent largely in the assembly of basic facts and laying the groundwork for keeping them up to date. World War II virtually put a stop to efforts to plan ahead, but it did serve to focus attention on the importance of what had already been accomplished. Many will recall the important uses made of traffic and other data already available or quickly supplied by the highway planning divisions during that period. They demonstrated the essentiality of highway projects so that the slim supplies of critical material that could be spared were made available to the highway departments. They aided in the routing of military convoys and war material shipments. They supported the need of gasoline and rubber to keep highway transportation alive. The war forced highway planning, like other highway functions, into a hand-to-mouth basis. But the war also brought to the attention of highway administrators the idea that facts that would convince rationing officials could be equally useful in developing the continuing peacetime programs.

In recent years the program of highway planning employs some 4,745 persons in the 50 States, District of Colum-

bia, and Puerto Rico, together with about 140 in Public Roads. These numbers do not include those persons working under consultant contracts either with 1½ percent Federal-aid funds or Federal administrative funds, nor some of the larger transportation studies.

This program for both highway planning and research during the past five years has averaged $51.6 million a year, including both Federal-aid and State matching funds.

It is more significant, however, to realize the uses that have been and are being made of this information and the reliance that is being placed on the highway planning work at both the State and the Federal levels.

A review of highway planning in terms of significance to the total planning program indicates that the work can be generally grouped as follows:

1. Program authorization and expenditures;
2. Current planning and operations;
3. Advance planning;
4. Urban planning; and
5. National planning.

Program Authorization

An analysis of the highway planning programs since they were first started in 1935, under the Hayden-Cartwright Act, could well be grouped into three time periods recognizing the differences in programs that were developed according to legislative changes: the first from 1935 to 1945 and the passage of the Federal-Aid Act of 1944, when funds were first made available for highway work in urban areas; the second from 1945 to 1956, when funds for the construction of the Interstate System were first authorized; and the third, for the period subsequent to 1956. Table 1 shows the apportionments for each year since 1936, together with the total amount of the highway planning and research programs and Federal and State shares. In the years prior to 1945, the actual amounts of Federal and State participation have not been totaled by years, since the method of fiscal control is difficult to assign to any 1-yr period. In total, however, for the 10-yr period, highway planning surveys and highway research programs approximate $52.8 million, or $5.3 million a year with about equal amounts of Federal-aid and State funds with all apportioned funds programmed.

In the 1946-56 period, a total of $79.0 million of Federal-aid funds were apportioned, an average of $7.2 million a

TABLE 1

ONE AND ONE-HALF PERCENT FEDERAL-AID HIGHWAY FUNDS APPORTIONED, PROGRAMMED, AND RELEASED TO CONSTRUCTION, BY YEARS

(Millions of Dollars)

Year	Apportionments	Work Programs			Released to Construction
		Federal	State	Total	
1936	3 0				
1937	1 8				
1938	3.0				
1939	2 9				
1940	2.0				
1941	2.4				
1942	2.0				
1943	2 0				
1944	7 8				
1945	0 0				
Total	26 4	26.4[1]	26.4[1]	52.8[1]	0.0
Avg.	2.6	2 7[1]	2.6[1]	5 3[1]	0 0
1946	7.3	1.3	1.3	2.6	2.5
1947	7 3	4 9	4.7	9 6	2.5
1948	7 2	5 9	5 7	11.6	2.5
1949	0 0	5.1	4 9	10.0	2.5
1950	6 5	7.7	7 1	14.8	2.5
1951	6 5	4 7	4 6	9 3	2.5
1952	7.3	6 3	5 9	12 2	2 5
1953	7.2	7 8	7 7	15 5	2 5
1954	8 4	8.0	8 4	16.4	2.5
1955	8.4	11.5	9 5	21.0	2.5
1956	12.9	11 6	9 2	20.8	1.0
Total	79.0	74 8	69 0	143 8	3.5
Avg	7 2	6.8	6 3	13.1	
1957	29 8	28.1	12 9	41 0	1.0
1958	38 2	31 1	11.7	42 8	5 6
1959	45 9	40.6	13 2	53 8	11.6
1960	50.7	41 6	15.4	57 0	13 1
1961	40 6	47 2	16 3	63.5	10 8
Total	205 2	188.6	69.5	258.1	42.1
Avg.	41.0	37.7	13 9	51 6	8.4
Grand total 1936–1961	310.6	289.8	164.9	454.7	45.6
26-yr avg.	11 9	11 1	6.4	17.5	
1962	46 1	46 1[1]	15 9[1]	62 0[1]	
1963	49.2	49.3[1]	17.0[1]	66.3[1]	
Total	95.3	95.4	32.9	128 3	
Avg.	47.6	47.7	16.5	64 2	
Grand total 1936–1963	405 9	388 2	197 8	583.0	
28-yr avg.	14 5	13 7	7.1	20 8	

Note: In addition to normal program funds, a total of $11,820,024 (Federal funds) was expended from 1955 to 1961 for the Illinois Road Test (AASHO).

[1] Estimated

year, and work programs $143.8 million, an average of $13.1 million a year with both State and Federal funds. During this period a total of $3.5 million was released to construction upon a showing by individual States that an adequate planning program was under way and that Federal-aid funds were in excess of those programs.

Since 1956, the authorization of Interstate funds has made a larger amount available for Federal-aid programs, including the program of highway planning. In these last years a total of $205.2 million of Federal-aid funds has been apportioned for highway planning purposes, an average of $41.0 million a year. Work programs have totaled $258.1 million, an average of $51.6 million. During this same period an average of $8.4 million a year has been released to construction under the same terms as in the previous period.

In 1962 and 1963, work programs are estimated to be $62.0 and $66.3 million, respectively, with Federal-aid funds of $46.1 and $49.2 million.

The current highway planning and research program is shown in total in Table 2, broken into amount and percent for each of the principal divisions of work. There has been an increasing amount of work in transportation planning studies with some 25 percent now programmed for this work in comparison to about 16 percent in 1957, and research work at 14 percent now in comparison with 3 percent in 1957.

In many States the use of the 1½ percent funds is almost completely budgeted for highway planning and research purposes, but in other States there is some question as to whether this allocation can be fully utilized under present personnel policies and restrictions. In some States special items such as urban transportation studies are a sizable proportion of an annual budget. As these studies are completed or are moved into a continuing status, they will become less of an expense, and it is probable that more of these 1½ percent funds will be available for other planning and research problems. A thorough examination of the program should be made to determine what the planning and research needs of the State are so that in future years recommendations and answers will be available to the administrators and to the legislatures for use in establishing long-range programs through advance planning and urban planning operations.

TABLE 2

CURRENT HIGHWAY PLANNING AND RESEARCH PROGRAMS CONDUCTED BY STATE HIGHWAY DEPARTMENTS USING 1½ PERCENT FUNDS[1]
1961–1962

Type of Work	Amount (millions of $)	Percent
Planning surveys		
Inventory and mapping	7 9	12.4
Traffic counts	6 5	10.2
Finance and statistics	2.2	3.5
Loadometer studies	1 8	2 8
Road life studies	1 0	1 6
Special studies	7 3	11.5
Subtotal	26.7	42.0
Transportation and urban planning		
Origin and destination studies	1.4	2 2
Route location studies	5 3	8.3
Urban transportation	9.0	14 1
Special studies and miscellaneous	9.5	15.0
Subtotal	25.2	39 6
Research projects (other than planning)	8 9	14 0
Administration	2 8	4 4
Grand total	63.6	100.0

[1] Includes State matching funds: $16 3 million, 25 6 percent.

Current Planning

During the past year there has been more contact among State and Public Roads personnel on highway planning matters in conferences than in any previous similar period since World War II, excepting for the preparation of Interstate System cost estimates. The WASHO Factual Surveys Committee and Public Roads Regions 1 and 3 have had joint conferences on highway planning matters at which 30 States participated. Meetings were held in 6 of Public Roads regions involving 38 States at which the various kinds of traffic counting equipment were discussed. It is this latter type of meeting that is particularly helpful because the personnel at the working level have the opportunity to participate. The devel-

opment of more of these workshop type conferences should be planned for the purpose of discussing problems in specific areas of work.

Generally speaking, the mapping program (actually a remapping program) is being accomplished at far too slow a rate to be of greatest value and use to the highway departments, the Bureau Public Roads, and others among whom the maps have widespread use. In 1960, 358 county general highway and traffic maps were revised or redrawn in 31 States, together with the preparation of 10 State general highway maps, 27 State traffic maps, 327 city maps, 64 city traffic maps, 114 county traffic maps, and 333 urban area maps. Inventory operations were a continuing function in 44 States and Puerto Rico.

Traffic counting programs generally should be strengthened, particularly in urban areas. When the highway planning work was started (1935–1939) the counting, classification, and weighing of vehicles was largely a rural operation. Now with the decided shift in population from rural to urban areas, and the shifting of population and economic activities within the urban horizon, there is a definite lack of information for determining the usage of highway facilities within this horizon—volumes and trends of total traffic; proportion of commercial vehicles; proportion and trends of heavy loads; and distribution of usage on expressways, arterials, feeders, and local service streets. This weakness is particularly noticeable when information is needed for design-hour volumes, directional volumes, truck volumes, and support for forecasting and assignment analyses.

Some 23 States have reviewed their traffic counting programs in rural areas in the past 5 to 8 years and have improved their efficiencies or extended coverage at no added expense by recognizing standard statistical sampling techniques and the limits of accuracy required.

Some 20 to 25 regularly scheduled annual statistical reports are prepared each year by each State—State and local finance, mileage, motor-vehicle registrations, motor-fuel consumption—an estimated 1,250 tabulations plus others of special nature to answer immediate and nonrecurring problems.

Over the period of time since the several elements of the highway planning program have been active, the initial manuals and guides under which the work was done have been modified from time to time by memoranda and instructions on individual problems to the point where now there is no one source of instruction. A few States have issued a consolidation of instructions eliminating obsolete or superseded methods and techniques. This should be a more general practice.

Some uses of the highway planning information were entirely unforeseen—incidental in some instances, more fundamental in others. But these uses could not have been made had there not been a highway planning operation. It is a rather interesting listing:

1. Hours of driving, requested for use by ICC;
2. Locations and length of winter and spring road damage;
3. Transcontinental traffic;
4. Traffic on selected U. S. numbered routes;
5. Trucking information for National Bituminous Coal Commission;
6. Cabbage shipments by highway (pilot study for commodity study feasibility);
7. Movement of commodities from seaports;
8. Trucks with ICC plates;
9. 1938 and 1952 Traffic Flow Maps;
10. Toll bridges, ferries, and tunnels; and
11. Highway facility data for Industry Evaluation Board.

Advance Planning

Advance planning might be considered as the development of practicable means of carrying out the findings of the statewide and systemwide needs studies by means of long-range construction programs that will give first priority to the projects that are, in fact,

most urgent—well ahead of actual work. Adequate advance planning is based (a) on an accounting of existing road facilities, (b) on thorough studies of the kind and volume of traffic, and (c) on systematic grouping of similar roads into classes. With this foundation, programming can be established with the development of a financial plan, and the assignment of priorities to work projects and the scheduling of them into long- and short-range road improvement programs to meet the needs of travel growth (Fig. 3).

Classification of roads and streets is a procedure whereby roads and streets that have similar characteristics are grouped into distinct classes. An adequate classification recognizes which government agency should have responsibility for which roads. This is usually based on the service performed by each road. Some roads are intercity routes carrying a relatively large proportion of long-distance movements. These are important to the State as a whole. Some roads may serve as collectors or distributors to and from communities or the intercity routes. These are of principal importance to a small segment of the State. Other roads are dominantly of land use service only and hence of local service and access only. These three types are generally identified broadly as of arterial, feeder, and local character. A good classification recognizes reasonable distances and intervals between roads of the same class to serve the population of the area adequately.

It is also the key to determining improvements in each road class—the next stage in advance planning. There is evidence that some roads now on a secondary road system have all the characteristics of a primary road and have, in fact, been improved with secondary funds to primary road or expressway-type standards. This tends to make a farce of separate apportionments for primary and secondary systems. In the opposite manner, some roads formerly classed as primary roads are continued in this class although the characteristics are no longer of that class because of other road developments or changes in the local economic conditions.

In another aspect some system classification changes are submitted for administrative decision in segments of routes rather than on an entire well-integrated system of routes. In one instance, for example, the expansion of the Federal-aid secondary system is initiated by county judges without reference to or benefit of a statewide long-range plan.

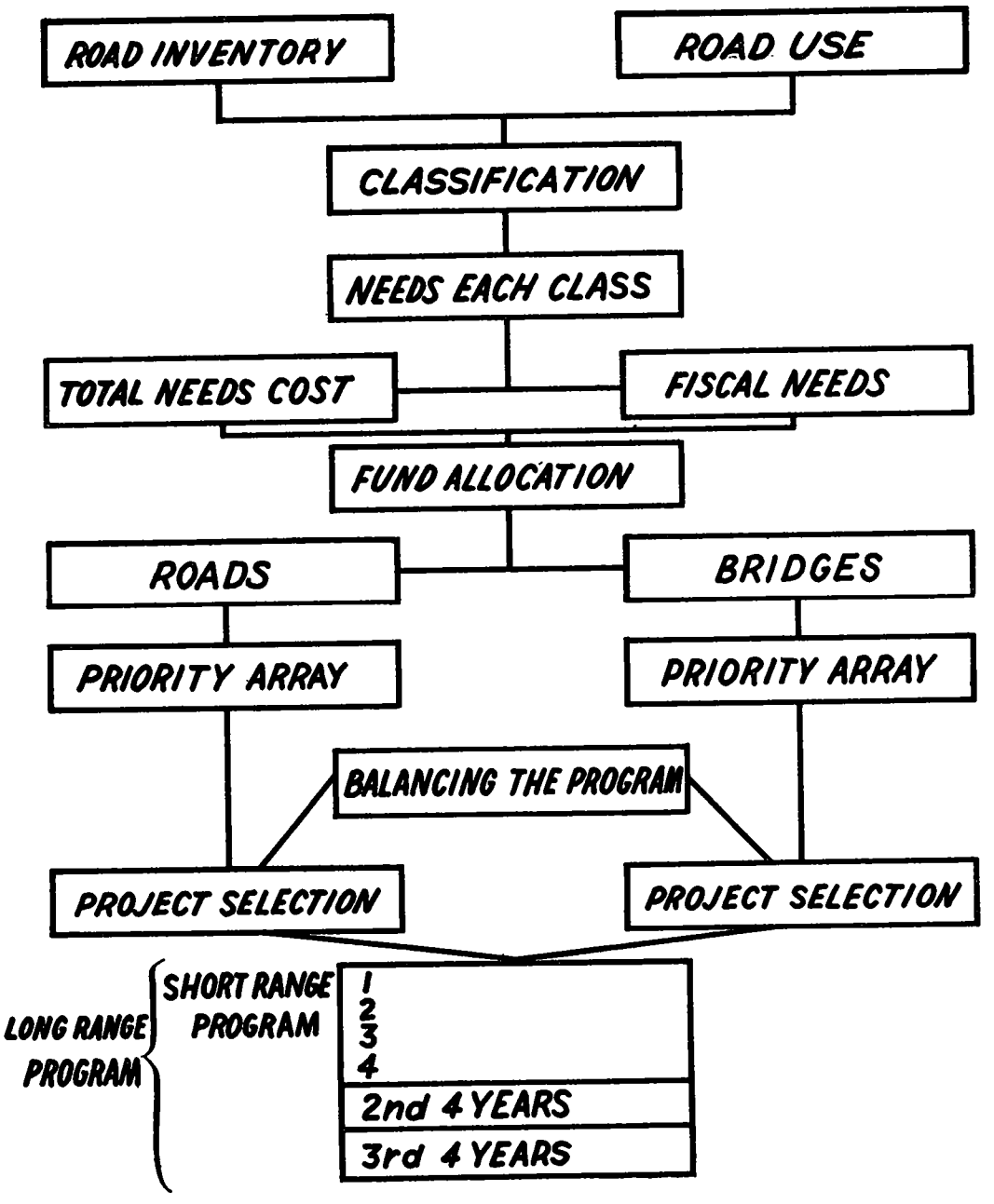
With the construction of the Interstate System there may be reason to consider the primary route which it parallels or replaces to no longer be a primary road in fact. Some are close enough to be absorbed by it, some far enough away to function independently.

It is important that the most critical needs be satisfied first and this can be done by sorting out projects in a priority sequence. There are several methods for doing this and many States are doing it in one form or another. Generally, a road is measured according to its importance in terms of service rendered and usage. A second factor is the consideration of condition. A combination of these serves to rank projects consistent with urgency for improvement.

The lack of advance planning and the long-range program which is its product indicates that either information is lacking as to what the needs are and what the systems are, or that if the information is available it is not used.

Too often a Federal-aid program is submitted just prior to advertisement for bids and usually this must be handled by Public Roads at the same time as the PS and E review and authorization. Often construction projects are submitted in a program on a year-to-year basis with no long-range program worked out or finalized. There are also programs that are formulated by a rather random selection of projects and others influenced by public pressure. This is not advance planning.

With respect to the Interstate System the routes have been designated and, except for minor changes, the system is firmly established. Its needs have been estimated in response to Section 108(d)



Source: National Association of County Engineers

Figure 3.

of the Federal-Aid Highway Act of 1956 and Section 104(b) (5) of Title 23 U.S.C. Its financing seems assured under the operation of the Highway Trust Fund.

In 1960, a review was made of the practice in use of "ratings" among the several State highway departments. Methods of rating vary considerably. The term "sufficiency rating" is used most generally to describe these methods but other terms have been used such as deficiency ratings, service ratings, congestion warrants, priority analysis and adequacy ratings, in a few instances. Thirty-eight States rate the rural primary system. Thirty States also rate the secondary road system, and 17 make ratings on urban primary extensions. Seven State highway departments are required by law to make ratings. The use of these ratings varies considerably from "very limited" to "guide in priority determination."

Generally speaking, the use of ratings is considered to be of value in guiding the judgment of the administrators and most of the States that make adequacy ratings supplement these studies with other analytical methods for priority considerations.

Before a State can develop a 5- or 10-yr program of road improvements there must be a determination of highway needs. When each road is studied, a determination can be made of its adequacy to serve present and foreseeable traffic. From this study comes a total, when all roads are put together, of the nature and extent of physical improvements, the cost of making the improvements, a financial plan, and the length of time necessary to make them.

Some 32 States have made needs studies and 8 States have followed these up with a second study or have kept the study current as to improvements and changes in needs. (*2*)

It is difficult to evaluate the results of highway needs studies. Generally the studies are made at the direction of a legislative study commission, and this is indicative of the importance attached to studies and the problems before the legislature and the highway administrator. But what happens after the report is made and accepted by the commission is fundamental and most important.

Without question the staff of the highway department has gained some experience in the development of the study and in knowledge of the needs of the highway systems.

The legislative commission members gained an insight into the nature of the highway needs, the engineering appraisal, and the financial requirements. Usually groups of local citizens and officials at city and county levels also participated in the formulation of the parts of the study relating to those local areas. In this way the development of a highway needs study educated a segment of the highway users in the needs of the highway systems so that they could exert their influence in support of a financially feasible highway program.

But if the recommendations of the study are not acted upon, then the true objective of the study is not served. To some extent each study presumably was used within the department for internal planning. In one State the legislature adopted a majority of the recommendations but the highway department disregarded the needs data. In a couple of other States practically the opposite situation developed. In California, Oregon, and Washington, to cite three instances, tangible results came in the form of legislative interest—revenue bills and interim commission studies.

The importance of highway planning is receiving increasing attention in the area of advance planning. In North Carolina, a statewide commission has been established staffed with personnel of several disciplines in addition to engineering. Funds are allocated for highway improvements based on relative statewide needs rather than on any formula. This advance planning unit makes long-range improvement plans based on over-all statewide needs, keeps the public informed as to the plans, and makes certain that proper integration of land and building developments are included. It cooperates with local authorities for local and secondary roads and discusses advance plans with local

authorities for their consideration and recommendation.

It holds meetings in various sections of the State, holds public hearings on major projects, is responsible for keeping the public informed, and develops public relations and considerations of property owners.

Specifically, the advance planning section is responsible for the selection of a statewide "trunk-route" system, the study of every proposed major improvement project, and the justification for such projects, including benefit-cost ratios, general location and geometric design, and traffic service and operation. It works with cities and towns on local long-range transportation and traffic plans, prepared a 5-yr needs study of the trunk-route system, and coordinates the programming of approved projects with the chief engineer and with the Bureau of Public Roads.

The organization of this advance planning unit is under the direction of an advance planning engineer and includes on the staff urban traffic specialists, a regional planner, a highway engineer, a geographer, several highway planning engineers, draftsmen, trainees, and secretarial personnel.

Urban Planning

One of the more important groups of studies financed with 1½ percent funds is the origin-destination, travel habit, parking, and transportation studies in urban areas. It is not surprising that this is so. The increase of total population, coupled with the shift of the population to urban areas, has created problems in those areas that neither Charles Duryea or Pierre L'Enfant could possibly have envisioned. Highway engineers and city planners alike need more information for the best planning possible to fit these changing conditions.

Although a few studies of the origin and destination of traffic had been made prior to 1944, it was not until Federal-aid funds were made available in the highway act of that year for projects in urban areas that more extensive studies were made in urban areas.

At that time there was a lack of information on travel in urban areas which could be used as a basis for the planning of highway facilities that would best serve the public. In fact, the same could be said for the planning of transportation in general. No comprehensive survey methods had been developed which would give the needed information, and the tremendous volume of data obtained even with low-rate sampling procedures made the analysis a time-consuming operation. The complex nature of the city street network and the shifting of travel from route to route in search of the most favorable, or least unfavorable traffic volumes on existing streets, are not a satisfactory guide to needed improvements. A study of origin and destination of trips and the basic factors affecting travel was needed.

Studies of travel habits have since been made in more than 800 different cities varying in size from places of less than 5,000 to cities of several million as in Chicago and Detroit. The scope of these studies varied from several hundred of the relatively simple screenline and cordon-type traffic studies to 150 of the comprehensive metropolitan area transportation studies. (*3*) In 31 of these cities a second study has been made to update the information obtained earlier and in 4 cities the work is being established as a continuing function.

These urban travel studies have been used in the planning of highway facilities, particularly expressway systems, and in determining the design features for these facilities. To be of maximum use for these purposes, the travel data must not only be brought up to date, but they must be projected into the future.

The development of the high-speed computer has made it possible to attempt research work and statistical analyses that previously could not even have been attempted.

This urban work can be generally described as being of operational or research character depending on its immediate use, and much of the research involves the use of results on actual problems. There is no laboratory

for small-scale tests or models. Factors dealing with such items as land uses, sociological aspects, levels of income, distances from home to work, cannot be put in a test tube but require city-size laboratories for realistic observations.

It is not easy to appraise the value of these studies that have been and are being done in urban planning. Quantitatively, studies have been made in 800 cities with a total population of perhaps 50 million people. Qualitatively, however, a better concept of the scope of the work that has been done and the kind of knowledge that the urban planner and highway engineer of today should have or should be looking for as he is confronted with his daily tasks can be obtained.

The listing of the elements of the studies reveals the scope of activities. It indicates that analyses of these elements, either as independent elements or in correlation, should be of fundamental value in the guidance of the planner and the engineer.

With respect to transportation, these studies develop the number and frequency of trips, car ownership, the mode of travel—sometimes referred to as modal split—and the purpose of trip. Analyses of particular significance to engineers are the forecasting of trips, the distribution of traffic approaching cities, the distribution of traffic within cities, the generation of traffic with respect to distance from destination—such as the central business district and other commercial and shopping centers. Information and results of particular signficance to planners revolve around land uses, rental groups, income levels, ratio of characteristics, occupation, sex, employment centers, residential area characteristics, population density in relation to geographic locations within the area, and the volumes of traffic involved in the interchange of travel.

These factfinding origin-destination trip studies, coupled with information available from Census statistics on population, personal income, and retail trade, analyzed by engineers, planners, and geographers, are beginning to reveal relationships between travel and such factors as land use and employment. From these relationships methods are being developed for traffic forecasting and trip assignments to route locations, street and highway systems, and entire networks, including the probable proportioning of trips between private automobiles and public transit. These are new techniques that are being developed and will be strong aids to orderly, practical planning. However, not enough is known about the city organism and its probable future behavior under the many factors that affect it. The availability of information from these travel habit studies makes it possible for the first time for urban and regional planners to attempt to study the factors involved in the coordination of transportation and over-all planning. No group of regional or urban planners has ever before had access to so much statistical information on which to project growth for the future. These techniques promise to contribute much as a scientific tool for this planning process.

The use of high-speed computers now makes it possible to analyze many more alternatives of route location and systems of transportation than were ever possible in the past, both in terms of transportation systems and land-use alternatives. While these computers are being used more and more for this kind of work, they also make it possible to extend research into areas that were impossible a few years ago because of the sheer volume of data. Only now are some of the empirical relationships that exist between transportation and the economy of the community, its land uses, and its social structures being recognized.

These new techniques that can help the highway planning processes can now be talked about with some assurance. There are the "treebuilding programs"—the calculation of minimum paths of travel from an origin to all destinations which when delineated has resemblance to the trunk-branch-limb-twig characteristics of a tree. Similar trees would of course be built for all other origins for a complete analysis of an entire area. Then there is traffic

forecasting based on growth factors with an iterative approach—the so-called gravity model, the opportunity model, and multiple regression.

At the present time there is no computer program that is established to handle land-use forecasting from beginning to end. Some steps have been "programmed" but some of the steps are done on a manual basis.

The presentation of travel-habit data is an adaptation of these programs. Computers have been useful in development of data showing desire line-of-travel contour maps, for composite desire-line charts, and for the cartographatron which plots maps electronically. It utilizes an electronic analog device displaying dots or lines on a cathode-ray tube and recording the traces on a photographic negative. Most recently the Penn-Jersey Transportation Study is finding that the results of the study can be plotted directly on charts with an automatic data plotter.

Although much has been learned about the influence of highway facility improvements on traffic distribution, there is need for more research to be done and probably what is much more important to the highway user is the translation of this knowledge into an economic system of transportation. This will require the training of many engineers and planners in the use of these new facts and how they can be used in any local or regional community. It is encouraging, however, that there will be a more satisfactory solution to the very complicated problem of urban transportation when the results of such studies as those described (or similar, more extended studies that are now under way) are obtained.

National Planning

From time to time it has been possible to study and to report on problems of national scope because information is available in each of the State highway departments as a product of its highway planning program. In some instances it has been necessary to obtain some additional data for these studies but this has been possible, and greatly facilitated, because there is an existing organization in each State with personnel trained to do this kind of work. These studies and reports have been utilized to recommend Federal legislation and policy, and to make statements relating to situations of national scope.

One of the first of these was the "Toll Roads and Free Roads" report of 1939.(*4*) It emphasized the need of a special system of direct interregional highways, with all necessary connections through and around cities, designed to meet the requirements of the national defense and the needs of a growing peacetime traffic of longer range. It showed that there is need for superhighways, but made it clear that this need existed only where there is congestion on the existing roads, and mainly in metropolitan areas. Improved facilities, needed for the solution of city street congestion, were shown to occupy a fundamental place in the general replanning of the cities.

"Highways for the National Defense"(*5*), a second report of significance, recommended two general programs of highway improvement. The first and more urgent was directed to program highway improvements for military reservation roads, access roads and tactical roads. The second program recommended improvements of a strategic network connecting important centers of defense industry and all military and naval concentration points including all routes of the interregional highway system previously recommended in "Toll Roads and Free Roads."

"Interregional Highways" (*6*), submitted to Congress in 1944, recommended the designation and improvement to high standards of a national system of rural and urban highways totaling approximately 34,000 miles and interconnecting the principal geographic regions of the country.

The recommended system followed in general the routes of existing Federal-aid highways, and when fully improved will meet to optimum degree the needs of interregional and intercity highway transportation. Its development will also establish a transcontinental net-

work of modern roads essential to the future economic welfare and defense of the Nation.

Continued development of the vast network of rural secondary roads and city thoroughfares, which serve as feeder lines and provide land-access service, likewise was considered to have an important place in the over-all program, together with the repair or reconstruction of a large mileage of Federal and State primary highways not embraced within the interregional network.

As a result of this report Congress authorized in the Federal-Aid Highway Act of 1944 the designation of a 40,000-mi Interstate System of highways.

"Highway Needs of the National Defense" (*7*) reported on the status of improvement of the National System of Interstate Highways. Of this system 37,800 miles was determined to be of greatest strategic importance for service of the highway necessities of war. The conditions of the system were weighed against standards, deficiencies were found and an estimate made of the cost of needed improvements. Federal participation in cost of improvements in a ratio greater than the normal 50 percent seemed appropriate. It was recommended that Federal-aid appropriations for the Federal-aid primary, secondary, and urban system should be continued. Provision for emergency construction and repair of roads and bridges was considered desirable together with the stockpiling of materials and equipment.

These four reports resulted in the setting up of what is now known as the Interstate System, authorized in 1944. It is estimated that this 41,000-mi system (including an additional 1,000 mi added under the authorization of the 1956 act), constituting slightly more than 1 percent of the road and street mileage, will carry 20 percent of the total traffic upon completion.

Other reports to Congress have had important effects on Federal legislation. The report of the Local Rural Road Problem (*8*) was summarized in a letter from the Board of County Consultants to the Bureau of Public Roads.

"The Factual Discussion of Motor-truck Operation, Regulation and Taxation" (*9*) was made in response to a request of the Committee, Senate Resolution 50.

The report was developed from data that came largely from the highway planning programs of the several State highway departments and from the long continuity of records, studies and statistical analyses which matured from the operations and research of the Bureau of Public Roads. The report discussed the growth of motor vehicle registration and use, the effects of size and weight of vehicles on the geometric design and traffic capacity of highways, axle loading—its effect on roads and legal limitation—the weight of vehicles and its effect on bridges, the character of overloaded vehicles and their payloads, highway-user tax payments in relation to highway revenues and expenditures, and the allocation of highway tax responsibility.

The recommendations of "Progress and Feasibility of Toll Roads" (*10*) were (a) there should be no Federal participation in toll roads; and (b) toll roads should be included in the Federal-aid system when they meet the standards for that system, and when there are reasonably satisfactory alternate free roads on the Federal-aid primary or secondary systems.

The "Needs of the Highway Systems, 1955–1984" (*11*) estimated the cost of needed construction, designed to modernize the Nation's roads and streets over the 10-yr period, 1955–1964, and was based on information obtained from the highway planning studies.

The Congress, in passing the Federal-Aid Highway Act of 1961, placed the highway program on a firm financial basis. The establishment of the Highway Trust Fund guarantees that imposts on road user for motor fuel, tires, and other automotive products shall be deposited in the Highway Trust Fund and shall be expended only on the Federal-aid highway program. The research work in vehicle distribution and use is accepted as authoritative, and Congress based its establishment of tax rates on automotive products on these

forecasts. A continuing study of these revenues makes it possible to recommend action, if necessary, to take to accomplish the program on schedule.

Section 114 of the Federal-Aid Highway Act of 1956 directed that a study be made to determine whether or not the Federal Government should equitably reimburse the States for toll or free highways on the Interstate System built between 1947 and 1957. A report (*12*) was submitted to Congress in 1958, "Consideration for Reimbursement for Certain Highways on the Interstate System." This report indicated that in this nearly 11-yr period improvements were made in varying degrees on 10,859 mi of the Interstate System at a cost of $6.1 billion. Twenty-six States reported construction on 1,950 mi of toll roads incorporated into the Interstate System. All States, except Delaware, Alaska, and Hawaii, reported construction of free roads totaling 8,909 mi. The report summarizes the Federal-aid and other funds used in making these improvements. It also made a distribution by cost items essential to computing depreciation.

The report "Maximum Desirable Dimensions and Weights of Vehicles Operating on the Federal-Aid Systems" (*13*) was submitted to Congress in accordance with the provisions of section 108(k) of the Federal-Aid Highway Act of 1956.

The purpose of this study was to make specific recommendations with respect to weights and dimensions of vehicles permitted to operate on the Federal-aid systems in order that the Federal investment in the National System of Interstate and Defense Highways shall be protected.

The final report will be made upon the completion of the series of tests known as the AASHO Road Test at Ottawa, Illinois.

Section 104(b)(5), Title 23, U.S.C. provides that the Bureau of Public Roads, in cooperation with the State highway departments, make periodic detailed estimates of the cost of completing the Interstate System. Such estimates, when approved by the Congress, are used in apportioning Federal-aid funds for the Interstate System among the States. The first such estimate was reported to the Congress in January 1958 (*14*) and was used as a basis for apportioning the Interstate funds authorized for the fiscal years 1960–62. The first revised estimate of cost undertaken during the fiscal year 1960 was used for establishing factors for the apportionment of Interstate funds authorized for the fiscal years 1963–66. (*15*)

The preparation of these estimates utilized the wealth of information available in the Division of Highway Planning in the several State highway departments. The organizational units responsible for these programs in the States were, for the most part, the manpower sources used in preparing the estimates. The principal role of highway planning in this undertaking is the forecasting of 1975 design hourly volumes of traffic for each road section. This involves a study of traffic diversion, generation and growth under anticipated conditions. Although these determinations are difficult because of lack of experience with an extensive network of freeways, as the system is developed these factors can be studied, evaluated, and modified, to reflect actual developments so that future estimates can be more accurately made.

The Highway Cost Allocation Study, conducted pursuant to Section 210 of the Highway Revenue Act of 1956, has been completed except for a supplement which is being prepared to reflect the final results of the AASHO Road Test in Illinois.

The purpose of the study concerning highway cost allocation is to make available to the Congress information on the basis of which it may determine what taxes should be imposed by the Federal Government, and in what amounts, in order to insure, insofar as practicable, an equitable distribution of the tax burden among the various classes of persons using the Federal-aid highways or otherwise deriving benefits from such highways.

Five reports (*16*) have been presented, the first four of which were in the nature of progress reports.

The first progress report of the highway cost allocation study described the nature of the problem of taxation for the support of the Federal-aid highway program, on which the Congress sought the aid of the Secretary of Commerce under the terms of Section 210. This report also described the proposed methods of approach to the problem and outlined the series of component studies that would be necessary to the completion of the task. The second progress report was very brief, being concerned chiefly with a narrative of the work on the several phases of the project during the preceding year.

By the time of the third progress report, several of the major data-producing studies had been completed, or at least brought to the point where some results could be published. This report gave the essential facts of a detailed classification of motor-vehicle registrations in 1957 by visual types and registered-gross-weight groups; and a similar breakdown of 1957 travel by vehicle types and road and street systems. Making use of forecasts of population, vehicles and travel prepared in the individual States, it projected the registration and travel figures to the year 1971, with extrapolation of the travel total to 1991. This report also included a digest of a series of studies undertaken in order to develop the story of benefits derived from highway improvements by others than the direct users of the highways.

The fourth report gave a short but sufficient account of the work done on the project during 1959 and an indication of the work remaining to be done. The final report brings together the results of the entire study including results of work completed in the last year on studies of the economic and social effects of highway improvement.

A supplemental report presenting the results of the cost allocation by the incremental method will be made to revise the preliminary analysis of the earlier reports by using the final results of the AASHO Road Test. This same supplemental report will also contain a revision in the differential benefit analysis of the cost allocation study.

Another significant advance in highway engineering during recent years has been possible because of the highway planning studies and processes. More exact information concerning road usage in relation to the physical dimensions of highways has made it possible to evaluate highway design elements that directly affect highway capacity in the movement of vehicles. Knowledge of travel characteristics, *i.e.*, trip length and trip purpose, distribution of driver population in age groups, mode of travel, proportions of the several vehicle types, and distribution and frequency of loadings, is necessary for adequate planning and design. With proper consideration of the interrelation of these characteristics and engineering elements, needs can be developed, cost estimates made, and financing arranged which will produce an improvement program that is logically planned and based on fact.

Some 25 years have now passed since these highway planning studies were first formally initiated. The preceding statements are but brief expressions of what has been involved in the collection of data, in its analysis, in its usage, and its gradual acceptance and growth as an administrative function. It should be evident that the scope of work is wide and that the uses have been and are many and varied. Although much of the work in the initial years was fact-gathering and factual reporting, it is now apparent that highway planning is being utilized as a tool in the administration of highways. In fact this administration would have been severely handicapped without these facts.

The Highway Research Board some years ago compiled a most impressive list of applications that had been made of the results in all parts of the country. They were not and are not confined to highway departments and the Bureau of Public Roads. Many commercial organizations, whose business is dependent for its market on the highway user, find the information on highway usage and financing most fundamental for their planning.

Since this listing was compiled, much planning information finds its way into

highway needs studies, truly a highway planning function in contrast to the assembly of factual information. There is also the increasing amount of work that requires coordination with other planning agencies, particularly with city and regional groups and the Federal HHFA offices. This problem of urban highway development is assuming increasing significance in development of highway programs—programs that should not be decided by highway engineers alone, or in areas that are themselves unprepared for the future.

It should be apparent that as the workload changed from one of data collection to one having considerable analytical and research responsibilities, so may these conditions change again to reflect our changing economy and technical developments in transportation. The highway planning function should anticipate these changes with continuing studies so that facts will be available for administrative decision when the time comes to accommodate these newer or changed elements in their proper place in the highway program.

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APPENDIX

SUPPLEMENT TO HIGHWAY RESEARCH CORRELATION SERVICE CIRCULAR 287, AUGUST 1955

HIGHWAY NEED STUDIES

PART 1. BASIC NEED STUDIES

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DISCUSSION

Hill.—Mr. Hitchcock's chart (Fig. 3) showed funds allocation on one side, and allocations to roads, and another allocation to bridges. Why would you make a separate allocation to roads and bridges? In the needs study, would not you consider bridges a part of roads and allocate funds to the section of road which would include bridges as well?

Hitchcock.—Yes. However, bridges sometimes have to be built earlier than roads, and it seemed best to show the development of a bridge program separately from the highway program and then have it come together at the end. They have to be considered together, but the studies and estimates will be made separately.

Hill.—Mr. Haas mentioned that funds for planning and research have been utilized to the extent of only 0.17 percent.

I cannot believe that this is a realistic figure. I know that in Michigan we have spent much money for research which has never been allocated against the Highway Planning Survey (HPS) funds. It sounds like the highway departments are spending very little money for research. However, we are spending much more for research and planning than that 0.17 percent. I do not think the figure should be used as often as it is.

Holmes.—Mr. Campbell of the Highway Research Board is the source of that figure. But I interrupted when you said that more than that is being spent for research and planning. There is, I think, a misconception in terminology. I think you are referring to total amounts spent out of the highway planning funds for planning and research. This 0.17 percent pertains to research only and does not include the amount spent for planning.

However, it does include, so far as the Special Committee on Highway Research priorities of the HRB was able to determine, every nickel that is being spent for highway research in the country by State highway departments, the universities, and the Bureau of Public Roads.

It includes everything that the Bureau spends, everything for research that is spent by the States out of the 1½ percent funds, everything the States themselves spend that is not matched in any way by Federal-aid funds, everything that is spent by universities. This was determined by a questionnaire that went to all States and universities, and the total amount of that was 17.8 million dollars or 0.18 percent of the total direct expenditures for highways in the United States, in 1958. So I believe that figure is not subject to serious question.

Campbell.—We attempted to find out in each State what was being spent for research, not only in the Highway Plan-

ning Division but in the entire State highway department and also the total amount spent for highway-related research in each of the universities and colleges having a research program.

This included not only the 1½ percent HPS funds but all of the funds that were being spent out of the State revenues and from private sponsorship.

Insofar as could be ascertained, the figure for the amount of money spent out of each highway dollar on research was the best that could be gotten at that time.

That does not mean that some States do not spend more than the average—Michigan and some other States do. But as an average, spread across the 50 States, I think this figure of about one-sixth of a cent out of each dollar is about as reliable as possible for 1958.

Oliver.—Perhaps that does not relate all to road research.

Holmes.—We have been troubled by the question of whether planning can be separated from research when it gets into a study like the Penn-Jersey Study, which is one we use for an example, or where in fact the study itself is developing the methods. You might say it is all research. But when you get through with the research you have the planning. You might call it all planning or all research, and how would you divide the two. I just do not know. I think we may be called on to make such a division some day, however.

Campbell.—We asked each State to use their own judgment as to what they would call research. But we did suggest that routine studies, those studies which were resulting in manuals, and routine studies which have been continuing for years, were not to be regarded as research. But studies which were set up as special projects for research or newly developed studies in practices and procedures would be classified as research.

There is still a good bit of gray area. But judged by the best ability of each State highway department, this is the figure we got.

Telford.—In the Los Angeles Regional Transportation Study we most certainly are engaged in research. We are also engaged in things that are perhaps specifically planning. In the research phase of it, there might be some that is classified as pure research—some of it that is specific. It would be difficult if not impossible to say what part should be charged directly to research and what part to long-range planning.

Froehlich.—When you said this was only research money, you were then ruling out these various transportation studies which are really pioneering in some of these areas of research.

Holmes.—The Chicago Area Transportation Study produces reports about every month of special studies of one sort or another. Certainly those are research studies. I don't know whether any attempt was made to separate costs.

Campbell.—The States were given the opportunity in the canvass to include as research any special studies that were going on at that time. It is probable that the work in Chicago was included, but not all of it would be called research. For example, the origin-and-destination study that preceded the analysis would not be included as research because that technique has become routine continuing work. But a great many of the studies that were incorporation in the CATS work would be included as special research studies.

Generally, replies of the State highway departments varied quite a bit as to percentage figures on research done but in the aggregate about 10 percent of the work done in highway planning divisions was reported as research. In some cases it might not have been more than 3 or 4 percent, and in some cases it might have been as high as 20 percent.

Shaneman.—If continuing traffic studies are excluded from the definition of research you will be excluding a great amount of our expenditures. To me these traffic studies are a phase of research. Maybe they are not research in the same sense as the AASHO Road Test was but it is certainly the gathering of information and it is the seeking of knowledge in this particular field. Excluding traffic studies certainly excludes a large amount of money that should have been counted.

Granum.—Mr. Hitchcock, in Figure 2 showing the functions of the planning surveys, collection of all the facts on the left and the objectives they seek on the right, I notice that finance was omitted from the list, unless it could be contained in the legislation item.

Yet you did make the point that one of the prime purposes of the planning survey or planning functions is to finance the highway systems on a sound and continuing basis in an equitable way. Is there any particular reason for that omission?

Hitchcock.—This would presumably be included under program development. In the development of a program there has to be a consideration of the financing of it. Highways needs and fiscal data would also go into the development of a highway needs report.

Granum.—Is your concept that the highway planning function includes the development of a fiscal plan, along with a physical plan?

Hitchcock.—Yes, those two things go hand in hand. You can't have the one without the other.

Granum.—You said at the outset that highway planning, or planning per se, means different things to different people, and you cited examples of a number of people in the highway field, each of whom I consider was doing highway planning.

By reverse logic would you also think that these people are in fact doing highway planning and are contributing to the objectives of highway planning? If so, what are the interrelations between the highway planning survey or highway planning functions that you are particularly concerned with and the highway planning thinking of these other people?

Hitchcock.—What we had in mind is that any person has to do planning for his job, but the maintenance engineer, in planning for maintenance work, is not doing highway planning. He is doing maintenance planning. The design engineer is not doing highway planning. He is planning for the operation of his design department—for a design problem. It is not highway planning in the sense of the definition of this paper, but the work that each does contributes to it when you bring things together such as the highway needs study or program development, because each of those persons, the maintenance engineer or the design engineer, contributes something in making the cost estimates, for example, in those programs.

Froehlich.—Of course we are talking about planning as a concept here. That is what this whole thing is about; not the very narrow highway planning survey approach, but the over-all planning we must do in our requirements and in our operations. It comes into every phase of the department's existence.

Hager.—Planning, as you showed in Figure 3—to what point does that bring your program? How far is it from the construction stage? How far in advance is this of actual design?

Hitchcock.—Actual design follows it.

Hager.—Then it has been to the extent that it has had a public hearing?

Hitchcock.—I really do not know any public hearing aspect of it; just where public hearings would come into planning as such—probably not until you come to the presentation of the highway need study before a legislative commission, for example. Then you would have public hearings. This would be the result of planning.

Hager.—But then, fixing the corridor, going before the public, which was required by the Federal Act—that would be beyond what you would consider the planning stage?

Hitchcock.—The fixation on the corridor would be planning, but the determination within the corridor as to a location would not be planning.

Hager.—Mr. St. Clair said the purpose of this meeting is to discuss what planning is. I know what it was in our program, and I have an opinion as to what it ought to have been. We in Connecticut carry planning forward to a much broader extent than shown in that chart. We consider planning going right up to almost design. That is establishing the corridor.

Hitchcock.—With 50 organizations there are bound to be some differences

in the development of a functional organization to carry on these different aspects of highway work. What would work in one State might not be quite so good to adopt in another. The laws, the regulations, the personnel, the size of the State and its organization, would have a lot to do with how far you can carry these things.

Telford.—I feel that planning goes perhaps further back than some of us have commented here, and I think it comes on down to some point where design takes over.

There is a specific instance I have in mind in which a legislative committee sat in my office and looked at a plan, which was broad and general insofar as that part of the State was concerned. I wouldn't say the meeting was unplanned, but it was casual. A member of the state Senate, who was most influential at that time, looked at it and said, "Why can't we have this for the rest of the State?" That was planning.

I think every one of you has at one time or another had something like that develop which was effective, but it certainly was planning. A lot of work had gone into that plan, which was for the purpose of leading to a broader and more complete plan.

Then that led to legislation. Getting into this matter of route determination and route adoption, we sometimes spend several years in hammering out differences. Certainly, we do not plan without having some troubles, but we carry planning down to include the actual adoption of the route, endeavoring to hold design to a minimum, because there would never be enough money or people to completely deny all the alternatives.

Carley.—I am beginning to see a little bit of the difficulty between planners and engineers. I would like to say that planning is a process. The highway departments in this country and the Bureau could never be accused of not planning. The problem is they have been accused of not making plans but they have been planning. In my view, the laying down of an actual physical rule, is a plan and sometimes we have not had the plans where we have had the planning. The implementation of the plan is the money factor and a lot of other things, the zoning, the subdivision orders, etc.

I think it might be helpful to think of planning as a process and the plan as a previously determined, formulated goal by which we actually lay out the physical site, the route, the highway.

I think we in Wisconsin go further with planning, with the Highway Commission as well as our own department, and that the actual laying down, the precise physical location of the highway within that corridor, is also part of the plan in Wisconsin.

So I would not only go back further, I would go further in front with this planning process.

Holmes.—Last week in discussions we were having with the housing agency, this whole question of planning was discussed. The comment was made that the city planner is an employee of a planning commission that has no administrative responsibility at all: it is wholly a staff and advisory function almost invariably. As a result, the city planner has no line responsibility and has no means to implement his plans, whereas the highway planner is a part of the executive establishment. He should be in a staff advisory position with respect to the highway administrator, rather than in a line position. Yet his plans, to the extent they are accepted, become implemented.

The planning man in housing rather thoughtfully suggested that the planners have been wrong all these years in wanting to maintain an independence, and in some sense, a position of avoiding ultimate responsibility, perhaps they would have been more successful and more effective had they been part of the executive operation and had some greater responsibility for the implementation of the plans that they developed.

William Slayton, Commissioner of the Urban Renewal Administration, talked to our engineers about urban transportation planning, HHFA, and particularly urban renewal. In that agency he has had his principal contact with the city planners and regional

planners. He expressed the thought that now, because of the 701 program and because of the highway program, as the highway plans are being discussed and referred to by the city and regional planners their plans are going to be implemented.

Suddenly they have found themselves facing the prospect of having something done about what they planned. It is turning out in some cases to be a rather disturbing responsibility that we have not had to take before.

I think there is that conceptual difference between city planning and highway planning, as we have known it, which is another facet that enters into some of these divergencies in views.

I know in setting up our office of planning we talked about the division of responsibility between the office of planning and the office of engineering, and we found there was an area there in which planning cannot operate without the engineers and in which engineers recognize that they can hardly operate without the planners.

Essentially, we are looking toward the determination of the corridor as the end of planning, but we recognize in the determination of the corridor we have to work closely with engineering. Even in the determination of the route within the corridor the engineer cannot depend wholly on costs and benefits and structural design standards, but he has to rely on a planner as to the community benefits and advantages of what he may do in an engineering way in respect to a specific route location.

We have tried to start our planning with the determination of the corridor, but we recognize there is a rather broad gray area in which we have to work rather closely with engineering; and engineering has to recognize when they take over that they cannot ignore the fact that planning enters into their work from there on.

Froehlich.—We are hearing more and more about a joint cooperative effort of AASHO and the Bureau of Public Roads in regard to encouraging planning in various States. This is urban planning, by the way. I would like to hear a little explanation of how it is expected to work out. I was asked for some opinion about this, and observed that it was an excellent idea—but it had to be handled carefully. There was some thought about having a revival type meeting, if I can be a little extreme in saying it that way, a revival type meeting which will get the various cities together on certain population grouping, together with highway department people and possibly Bureau of Public Roads people, and encourage urban planning; and to have some kind of highway study of the particular city.

Now, there are a number of States, particularly urbanized states who have been doing this over a long period of time. The programs of the Federal Government and HHFA have more and more encouraged this on the part of individual communities.

In some cities I know that if we in the highway department came in and waved the flag regarding planning, this would probably set back urban planning quite a bit, because although we may be accepted as a partner, we may not be accepted as a leader.

Babcock.—The Urban Transportation Committee of AASHO is now in the formative stage of developing some of these conferences, and I do not believe that it has gone to a point of conclusion, yet.

There are certain formats that the committee has been putting out as to how this is taking place, and it is thought that there would be some of these regional conferences in this whole area of urban transportation planning.

When and exactly the format—I do not know when and exactly what the format will be, because I just got a copy of the format a week or so ago.

Wiley.—New Mexico does not have any big metropolitan areas. A study is being set up in Albuquerque, which has about 265,000 people in the whole area, and we have, as in a number of other places, set up a coordinating committee composed of representatives of the city, the county involved, the State, the Bureau of Public Roads, and a representative from HHFA. We are still in the very early stages but we have begun.