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To be used in replying to requests for information, principally requests from schools.

HIGHWAYS IN THE UNITED STATES

Introductory Statement by Thomas H. MacDonald,
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There are two underlying facts that have at once demanded and made possible so extensive a development of highways in the United States during the past quarter of a century.

The first of these is the acceptance of the motor vehicle as a universal utility. Except for a brief period when the motor vehicle first came into being, it has not been regarded as a luxury, subject to the costs and expenses of this class. On the contrary, general ownership has been made possible by the design and mass production of cars, with the lowest price ranges brought to very moderate figures, thus insuring extensive utilization by the families and business organizations of the United States.

The second reason is that the motor vehicle brought its own capacity to pay for the highways which were essential for its operation. This capacity to pay has been increased by the collection of the major part of the annual tax revenue in small installments as the vehicle is used, and not through heavy imposts payable at one time and for an extended future period.

Because of these two factors more than any others, in a period of little more than 25 years highway transportation has developed to unforeseen dimensions. Prior to the coming of the

motor vehicle, highway transportation was used only as a local utility and as the necessity required. It was limited in daily radius to the possibilities of horsedrawn vehicles and earth roads, dusty in summer and muddy to the point of impassability in winter. Now, the combination of the motor vehicle and the improved highway provides transportation of people and goods over so large a network of serviceable highways that it is a major aspect of the social and business life of the nation.

In 1913 there were less than one-half million motor vehicles and about 200,000 miles of surfaced roads. Today there are 26 million motor vehicles operated on more than one million miles of surfaced roadways. These vehicles and roads give indispensable service to agriculture and industry. The social and recreational possibilities, both rural and urban, have been completely changed by the availability of relatively cheap transportation which may be used by all classes. It is estimated that in 1935 the use of motor vehicles of all kinds for business and social purposes totaled 192 billion vehicle miles.

Perhaps these statements summarize inadequately the overall aspects of modern highway transportation in this country and its extensive ramifications, but they do point to the inescapable truth that in any country the rate of development of highway transportation will depend upon the public policies adopted. The rate to which reference is made here is the potential rate applicable to a single country, since it is known that the ruling conditions vary widely between the countries.

In the United States the high rate of growth is attributable to two reasons, - the successful effort to keep the motor vehicle out of the luxury class, and the determination to devote the proceeds of taxation upon the motor vehicle to the improvement of the highways over which motor vehicles can operate. The soundness of these policies has been demonstrated most clearly in the States which have in some degree failed to live up to them. The partial diversion of the income paid by the road user for gas taxes, registration fees and other special taxes to other purposes than road improvement, has almost immediately produced a serious situation within the States, not the least of which has been inability to secure promptly Federal funds allotted to the State as an aid in road building.

State highways were initially financed from general funds and from tax levies on property, or through loans to be repaid from these sources. As the use of the highways increased, more and more of the cost was placed on the user, until highway user taxes now constitute the principal source of revenue for the main roads of the nation.

The principle has been well demonstrated that the main highways can be made self-supporting if the revenues from the road users are devoted exclusively to highway improvements and if highway transportation is permitted to develop without excessive taxation.

Federal assistance to the States for the improvement of highways has had an important influence. The policy first adopted in 1916 required as a condition precedent to making available to any State the benefits of the Federal appropriations, the creation of a competent State highway department. At that time some States had State highway departments, a number did not have departments, and a number were in the intermediate stage of having small departments without any considerable authority and very limited support funds. Undoubtedly the greatest benefit from the establishment of the Federal-aid highway policy came from this requirement that each State should place a competent highway department in charge of its highways.

Federal funds have greatly accelerated the improvement of the main highways and have been the means of coordinating State activities and encouraging high standards of construction. Cooperation between the States and the Federal Government has been carried on effectively since 1916 and has become firmly established as a policy of government.

Great progress has been made in highway improvement, but the United States does not yet have an adequate system of roads. Actually, the problems of financing became more acute so that it is now apparent that the only possible answer is a long-time program which will embrace construction, reconstruction and maintenance of highways with financing adjusted to this necessary program.

The program itself must be the product of comprehensive studies which will provide the detailed data as to the existing improvements, the traffic, the present and probable land use, population distribution and all other details of information which will determine the future service requirements of the highways. A study of this character is now under way in forty States as a cooperative undertaking between the highway departments and the Bureau of Public Roads. This highway planning survey will provide the foundation for a sound financial and improvement program.

Highway Statistics for the United States

Population - - - - -	122,775,046
Area (exclusive of insular possessions)- - - - -	2,973,776 sq. miles
Number of vehicles registered in 1935	(Passenger vehicles - - - - - 22,565,347
	(Motor trucks - - - - - 3,655,705

Road System:

State highways - - - - -	331,867 miles
County and other local roads - - - - -	2,669,000 miles

Historical

Construction of pioneer roads in the United States began when settlers could no longer find good lands along waterways and began to push their way inland but the early roads were hardly

worthy of the name. By 1800 the population back from the seacoast had increased to the point where considerable land transportation became necessary and surfaced roads were being built.

Population and need for land transportation increased rapidly and by 1830 it appeared that the country was to experience intensive development of highways and stage-coach lines. At this time railroad development began and highway transportation entered a period of neglect from which it did not begin to emerge until about 1890.

The railroad proved the ideal instrument for transportation over great distances. Lines were pushed westward with land settlement following immediately behind until the Pacific Coast was reached.

In 1890 lands back from the railroads had been settled and farmers began to demand better roads over which to reach their markets. At the same time the new vehicle, the bicycle, began to appear in numbers and riders demanded smooth surfaces for their use.

At this time rural roads were administered entirely by local officials, most often those of counties, and the end of each year found the roads as bad as they were at the beginning of the year. As a result of the demands of farmers and bicyclists for roads there began a movement that received great impetus through the advent of the motor vehicle a few years later and which has continued up to the present time.

Throughout the modern period of road development there has been a continuous trend toward State and Federal administration and toward paying the cost of main highways through imposts on highway users.

Federal participation in road matters began with the establishment of the Office of Road Inquiry in the Department of Agriculture in 1893 for study of road problems and dissemination of information. This organization was later to become the Bureau of Public Roads. State participation began in 1894 when New Jersey established a department to administer State aid to counties for roads. One by one various States followed New Jersey's lead, first establishing a small State highway organization and giving aid to local units, then designating a State system and beginning its improvement with State funds, often supplemented with local funds and leaving maintenance to local units. The final step was full State control over construction and maintenance of State systems with funds under State control.

A few States began this movement between 1894 and 1900 and many of them did not pass through the final stages until about 1920. A much longer time would have been taken but for the effect of Federal action taken in 1916 when the policy of Federal aid to the States for road construction was inaugurated. Under this policy annual authorizations have been made with the exception of the fiscal years 1934 and 1935. Authorizations are apportioned to

the States on the basis of area, population and mileage of rural post roads. In general the Federal payments are limited to half the cost of construction. Administration was placed under the Bureau of Public Roads, then known as the Office of Public Roads and it was required, as a condition to receiving Federal aid that a State highway department exist to cooperate in Federal-aid work. It was also required that a State pledge itself to maintain the roads constructed. This legislation greatly increased the importance of the existing State highway departments and caused them to be created in those States that still lacked such an organization.

In 1921 it was required that all Federal aid be expended on a system to be designated, consisting initially of not to exceed seven percent of the rural road mileage. From this time on the construction of main highways has progressed rapidly. The impetus given to road construction by Federal aid resulted in the States carrying on large programs independent of Federal aid.

In 1933 when the Federal government greatly enlarged its road construction program as one of the measures taken to relieve unemployment the Federal policy was broadened to include the improvement of routes through cities and of secondary or feeder roads. Such work is now included in Federal-aid work as a regular policy.

Until recent years, those roads not included in State systems, have remained under the control of local officials.

In the aggregate a large mileage of such roads has been improved to varying degrees of adequacy. However, as a general matter, there is need for much further improvement. In an attempt to make better provision for these roads 14 States have placed all or nearly all local roads under supervision of State highway departments, and there is a general trend in this direction. Failure to provide adequate funds has prevented the changes in administration from being as successful as was expected.

Reviewing the past 36 years briefly, from 1900 to the end of the World War the United States passed through a period of preparation, promotion and organization to build highways during which surfaced roads increased from 150,000 miles to over 300,000 miles. Since then surfaced roads have increased to about 1,000,000 miles and the country is at the end of what may be called the pioneer period of road development.

Nearly all of the main through highways have a surface of some kind but these roads need much further improvement.

Road Administration

There are approximately 3,000,000 miles of rural road in the United States. This mileage is divided into two general classes, (1) State highway systems including 331,867 miles under the administration of State highway departments, and (2) local or secondary roads, in greater part under the administration of local authorities.

The State systems contain those roads of general interest connecting the centers of population and, in many States, the system has been adopted by legislative enactment. In others it is fixed by the State highway department. There has been superimposed on the State systems the Federal-aid system consisting of the more important State routes. Routes on this system are eligible for improvement with Federal-aid funds. This system includes 224,000 miles. Further superimposed on the State systems is the system of numbered United States highways consisting of 128,000 miles. This system is laid down largely on the Federal-aid system. The United States highways have been designated and numbered according to a uniform system for the convenience of highway users. No special funds are available for these roads and no special laws apply to them by reason of their being U. S. highways.

There are no highways, except in Federal areas, that are constructed and maintained wholly by the Federal government such as are called national highways in other countries.

In large part, the local roads are under the control of county officials, but in some States administration is by a still smaller unit, the township. There are about 3,000 counties in the United States. Many of the more prosperous counties employ experienced highway engineers, are well equipped for road

construction and conduct the work efficiently. Other counties, generally those lacking in financial resources, are not so well organized and do not realize the full benefit from the expenditures made.

Fourteen States, impelled by a desire for more efficient administration of local roads, have placed all or a large portion of local roads under the State highway department. In no case have all the funds previously used on these highways been made available to the State department. The administrative changes could greatly benefit the public if they rested on a sounder financial basis. As it is there is the possibility, in some cases already an actuality, of much needed main highway development being checked because of application of funds to secondary roads.

The State highway departments have full control of construction and maintenance of State systems with funds under the control of the departments. The State departments are usually directed by a commission of 3 to 5 members, with the chairman of the commission or the chief engineer of the department as the principal executive officer. The States are divided into districts with construction and maintenance organizations under district engineers.

In many States the State system extends through cities and the work of the State department does not stop at city limits. In other States the work is confined to rural highways.

Federal participation in road construction is administered by the Secretary of Agriculture acting through the Bureau of Public Roads. Federal aid to the States in improvement of the Federal-aid system has been a fixed policy since 1916. Recently this policy has been broadened to include aid to the States in grade crossing elimination and improvement of secondary roads. Special funds for highway improvement have been authorized as an emergency measure to provide employment. The Bureau of Public Roads also administers construction of roads in Federal areas in cooperation with other Federal agencies.

In the administration of regular Federal-aid funds authorizations are apportioned to the States according to population, mileage of post roads and area. The initiative in selecting roads for improvement rests with the States. Improvements must be on the Federal-aid system. Federal participation is, in general, limited to half the cost. The States prepare plans, let contracts and supervise construction, all subject to Federal approval. Close contact with the States is maintained by the Bureau of Public Roads through 12 district offices, a regional office at San Francisco and an engineer representative in most States.

Funds for elimination of grade crossings and for secondary roads are administered according to the same general plan except use of the funds is not limited to the Federal-aid system and the grade crossing funds do not have to be matched with State funds.

Since 1933, \$1,200,000,000 has been authorized by the Federal government for highway construction as an emergency measure to provide employment. These funds have been administered by the Bureau of Public Roads in cooperation with State highway departments, and have been used for the improvement of all classes of rural roads, city streets, and elimination of hazards at grade crossings.

Finance

A. Expenditures

Expenditures for rural highways including interest on highway debt have amounted to over a billion dollars for each year from 1922 to the present time with the exception of 1923 when they fell somewhat below this amount. They rose to the highest point in 1930 when \$700,000,000 was expended by local units, and \$980,000,000 by State highway departments making a total of \$1,680,000,000.

Expenditures by State highway departments in 1935 were as follows:

Construction of roads and bridges - - - -	\$416,412,000
Maintenance of roads and bridges - - - -	184,458,000
Equipment - - - - -	6,819,000
Administrative, engineering and miscellaneous	30,553,000
State highway police - - - - -	6,806,000
Interest on State highway obligations - -	<u>67,913,000</u>
Total	\$713,066,000

These expenditures were made in greater part on rural sections of State highway systems and they include Federal funds expended in cooperation with State departments. A majority of the States did no work on county and local roads but nine States reported construction expenditures on this class of roads amounting to \$17,757,000. These same States and one additional State reported maintenance expenditures on this class of roads as \$29,861,000.

Expenditures on urban extensions of State systems are not always segregated from other expenditures on the systems. Amounts segregated were reported as \$42,210,000 for construction and \$4,262,000 for maintenance.

The annual expenditures of State highway departments are large but they are not sufficient to provide adequately for existing traffic needs. The main through highways composing the State systems have been almost completely improved with some form of surfacing and to some degree of adequacy. In the immediate future a large amount of work should be done in making more adequate for traffic that already exists those highways deliberately improved under a policy of stage construction to a degree known to be less than that ultimately desirable. There is also a need for the further extension of improvements to the more useful secondary and land-service roads, many of which still await improvement. Needed improvements on the main highways include considerable improvement of alignment, reduction of grades, and elimination of railroad grade crossings and separation of grades at intersections of heavily traveled highway routes.

For the past several years there has been a definite trend toward the placing of greater responsibility on the State highway departments. Only a few years ago the responsibility of these departments was confined almost entirely to the main rural highways. Now there is a large mileage of city streets which are extensions of the State systems that have been placed under State control; and 14 States have placed all or a large part of the county and local roads under the supervision of the State highway department. None of these States has turned over to the highway department the full amount of funds formerly used on the roads transferred to State administration. The State highway departments would have found themselves wholly unable to meet this new situation had not large sums of Federal money been provided for highway construction as an employment measure and had not the Federal policy been broadened to permit the improvement of all classes of highways.

Expenditures for rural roads not on State systems are made by a great number of counties and smaller units that do not report to any central agency. Accurate data are not available for any recent year. Estimates indicate that local expenditures had declined from the high point of \$700,000,000 in 1930 to \$362,000,000 in 1934.

B. Income

Until about 1920 highway improvement in the United States was supported almost entirely with funds derived from the taxation of property. Small amounts had previously been derived from motor vehicle fees. The first gasoline tax was imposed in 1919. From 1920 to 1930 motor vehicle registrations and registration fees increased rapidly while at the same time State after State imposed a tax on gasoline and consumption of gasoline increased to bring in still more revenue.

By 1930 property taxes had become a minor source of State highway revenue and imposts on highway users constituted the principal source of funds for main highways. There is every indication that this condition will continue in the future. Property taxes continue as an important source of funds for local roads but these roads also receive substantial amounts of motor vehicle revenues.

Income to State highway departments in 1935 was as follows:

From Current State Revenue Sources	
Property taxes and appropriations from general funds - - - - -	\$7,843,000
Motor fuel taxes - - - - -	392,658,000
Motor vehicle registration fees - - - - -	188,433,000
Motor carrier taxes - - - - -	5,955,000
Tolls on State-owned bridges, etc. - - - - -	2,772,000
Miscellaneous - - - - -	<u>349,000</u>
Total	\$598,010,000

From other than Current State Revenue Sources

Federal funds - - - - -	\$219,381,000
Transferred from local units - - - - -	20,366,000
From bonds, notes, etc. - - - - -	55,883,000
Miscellaneous - - - - -	<u>8,370,000</u>
Total	\$304,000,000
Grand total income	\$902,010,000

The largest single item of income is the motor fuel tax.

Every State imposed a tax on gasoline, the rate ranging from 2 to 7 cents and averaging 3.8 cents per gallon. The total receipts from State gasoline taxes amounted to \$619,802,000 in 1935. Of this amount \$348,652,000 was assigned to State highway purposes but this figure does not represent actual receipts during the year by State highway departments which are shown in the above tabulation.

Local roads and streets received \$150,546,000, highways in special areas and park and forest areas received \$775,000, non-highway purposes \$110,471,000, and \$5,136,000 was used to pay costs of collection and administration. A balance of \$4,222,000 was undistributed.

In addition to State imposts, the Federal government imposed a tax of 1 cent a gallon on gasoline, the proceeds going to general treasury funds.

Motor vehicle registration fees supplied a total income to the States in 1935 of \$318,747,000. Of this amount, \$167,905,000^{1/} was allocated to State highways, \$86,157,000 to local roads and streets, \$33,909,000 to non-highway purposes and the remainder was applied to collection costs and miscellaneous purposes.

^{1/} Actual receipts by State highway departments of allocations from motor vehicle fees and fines were \$188,433,000.

A study of the taxation of motor vehicles in 1932 shows the wide variation in taxes paid in different States. The average passenger car in the United States paid \$10.28 as a registration fee and \$18.07 in gasoline taxes. Registration fees for passenger cars ranged from an average of \$21.45 in the State with the highest average payment to \$2.94 in the State with the lowest. Similarly it is estimated that gasoline taxes amounted to \$10.32 per passenger vehicle in the State with the lowest rate of tax and to \$43.65 in the State with the highest rate.

The average registration fee for all trucks was \$21.92 and the average gasoline tax derived from these vehicles was \$39.19.

Federal funds received by the States in 1935 amounted to \$219,381,000. This represents actual payments to the States for completed work. In this particular year the payments were almost entirely in connection with the emergency program of highway construction to provide employment. Funds of \$400,000,000 and \$200,000,000 were authorized in 1933 and 1934 as emergency grants to the States for highway construction. In 1935 an additional \$200,000,000 was authorized for highways and \$200,000,000 for elimination of hazards at grade crossings. These funds were direct grants and did not have to be matched by the States. Payments were made to the States under these authorizations as work was completed.

For each of the fiscal years 1936 and 1937, \$125,000,000 has been authorized as a continuation of the regular Federal-aid program. Similar amounts are authorized for the fiscal years 1938

and 1939 and the program has been broadened by authorizations of \$25,000,000 for secondary or feeder roads and \$50,000,000 for the elimination of hazards at grade crossings in each of these years. In general, these funds must be matched with equal amounts of State funds with the exception of the authorization for grade crossing work. In certain of the western States Federal participation may exceed 50 percent.

Road Work and Unemployment Relief

Since 1933 the Federal government has authorized over one billion dollars specifically for highway construction and elimination of hazards at grade crossings as a means of providing unemployment relief. The work done with these funds has demonstrated that highway construction is highly effective in providing employment while at the same time creating useful public improvements. Since 1932 there has been a marked drop in funds provided for local roads, and there has also been a decrease in funds for State highways from sources other than motor vehicle taxes. Construction financed with Federal funds has kept many men employed who would otherwise have been forced to go on relief rolls.

Employment on State and Federal highway work has been as follows:

Fiscal years	Men employed on construction financed with Federal funds	Men employed on all State and Federal highway con- struction and maintenance
	Man-months	Man-months
1932	876,736	3,441,356
1933	1,308,671	3,839,095
1934	2,120,761	4,441,331
1935	2,191,264	4,434,451
1936	1,673,935	3,680,543

These figures represent direct employment on the highway only. A still greater employment resulted in industries supplying road-building materials and equipment and in their transportation. For every man employed directly in highway construction it is estimated that 1.6 men are indirectly employed.

Present Condition of Highway Improvement

Of the 3,000,000 miles of rural highway in the United States it is estimated that 1,000,000 miles have a surface of some kind. Detailed information concerning the condition of local roads has not been collected for some years. The miles of the various types of improvement on rural primary State highways at the end of 1935 is given below:

	<u>Miles</u>
Non-surfaced - - - - -	52,060
Low-type surfaces	
Topsoil and sand-clay - - - - -	17,138
Gravel, chert, etc. - - - - -	104,021
Waterbound macadam - - - - -	19,750
Low-cost bituminous mix - - - - -	27,373
Subtotal - - - - -	168,282
High-type surfaces	
Bituminous macadam - - - - -	14,363
Bituminous concrete and sheet asphalt - - - - -	14,265
Portland cement concrete - - - - -	79,872
Brick & other block pavements	2,873
Timber flooring on bridges - - - - -	152
Subtotal - - - - -	<u>111,525</u>
Grand total - - - - -	331,867

The highways constructed in recent years have wide surfaces with easy grade and curves that give good sight distances. By 1932 there were 4,300 miles of highway more than two lanes wide and a considerable additional mileage has since been constructed. However, many of the older roads were designed for vehicles of an earlier day and are now in need of further improvement.

Highway Planning Surveys

In 1936 it was realized that the time had arrived when the country's future road problems could not be satisfactorily solved without a detailed study of the existing highways, their use, and methods of financing. Most States have either reached or are rapidly approaching the end of the pioneer period of road development. The initial surfacing of the main through highways is now nearly completed. Much remains to be done to these highways to make them adequate and safe for the free flow of traffic. Large sums must be spent for widening, higher types of surface, elimination of dangerous curves, and grades, the construction of adequate bridges and the elimination of dangerous grade crossings. The time has also arrived when more attention must be given to improvement of secondary roads and to the extension of main highways into and around cities. State highway officials have formerly been concerned largely with the improvement of the main through highways but they must now give attention to planning, financing, and constructing three important classes of highways:

The primary or State highways, the secondary or county highways, and extensions of main highways through and around cities.

There is a strong demand for far more improvement than can be provided immediately. In this situation the only sound public policy is to take complete stock of the present highway situation, of highway use and of highway revenues, as a basis for formulating a continuing highway policy that will provide, over a period of years and in a reasonable order of priority those highway improvements that are either economically or socially justified and the cost of which can be met from taxes that may reasonably be imposed.

In response to an invitation from the U. S. Bureau of Public Roads, 40 States have joined with the Bureau in making State-wide highway planning surveys financed in large part with Federal funds authorized for such use by specific legislation.

The surveys are the most comprehensive of any yet undertaken. They are being conducted by the various State highway departments according to a general plan developed by the Bureau, since it is particularly important that data collected in the various States be on a comparable basis.

The three branches of the survey are a road inventory, a traffic survey, and a financial and road-use survey. In the road inventory complete records of all existing roads will be obtained, together with a determination of their condition and

the property they serve. Both State and county maps will be prepared by the States, giving for the first time a complete picture of our road system.

The traffic surveys will result in information as to the character and volume of traffic on each section of highway from which the present relative importance of each highway may be determined.

In the financial and road-use surveys studies are being made of the sources from which highway revenues come, the purposes for which they are expended, and the extent to which rural and urban residents contribute to each class of road and the amount they travel each class of road. Each State survey is to cover a period of one year.

It is believed that the surveys will result in the assembly of all the facts necessary for the formulation of a definite, economically and socially defensible, integrated highway-improvement program.