

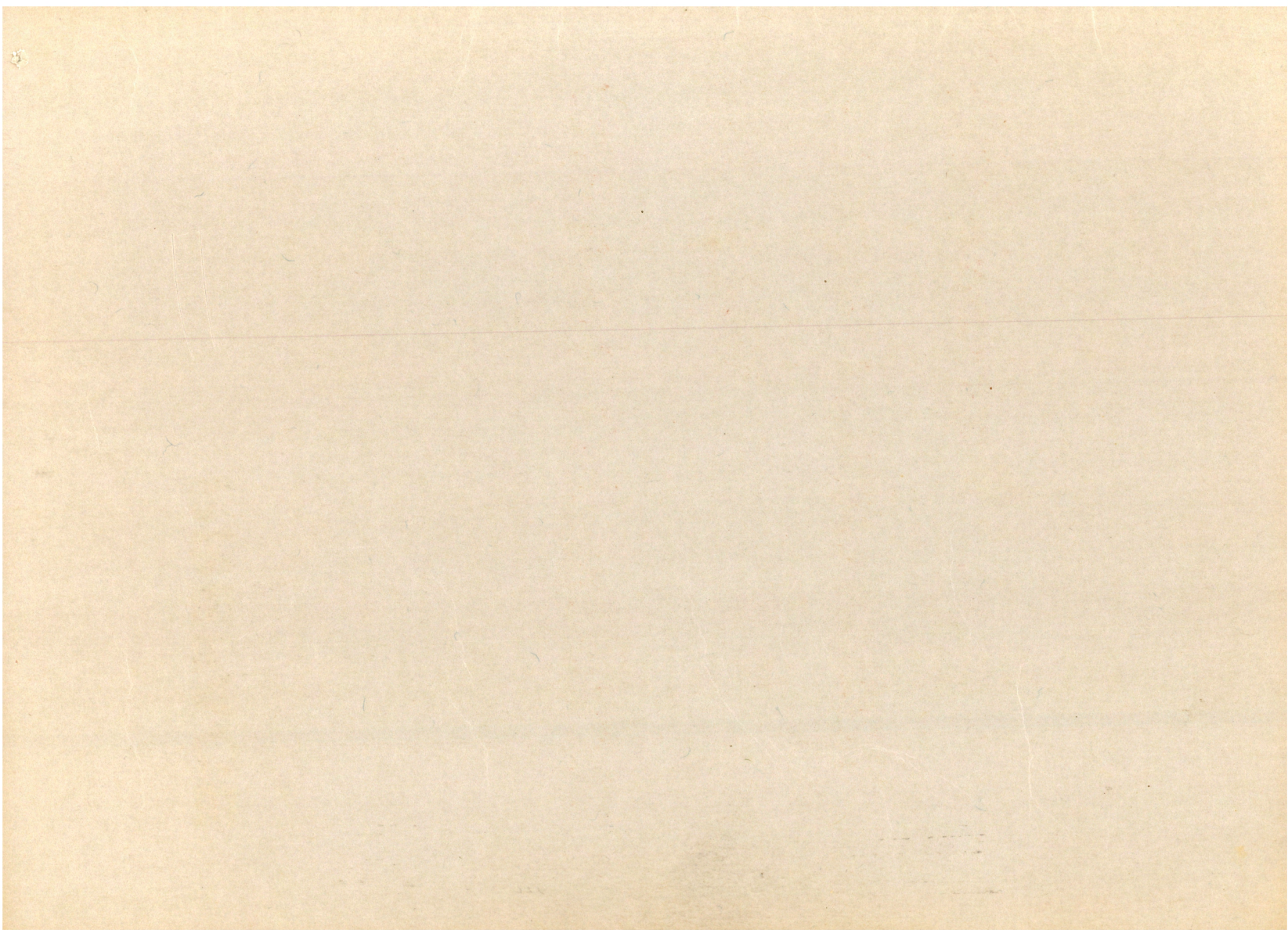
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# DEVELOPMENT Of The State Highway System

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NEW JERSEY STATE HIGHWAY DEPARTMENT



# PREFACE

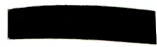
WITH FREQUENT REGULARITY, the State Highway Department receives letters in which the writers relay a very simply stated but all-encompassing request: "Please tell me all about highways in New Jersey."

Although the Department's Bureau of Public Information has, over the years, become used to handling most informational requests in stride, this particular type of inquiry has heretofore hit a most vulnerable spot. Actually, it has presented a problem in answering only because we like to be thorough, but to do so in this instance would require volumes if only the directly related phases of current highway operations were to be touched upon.

After having explored many of the possibilities suggested to us in handling these "all about highways" requests, and having found no pamphlet or brochure suitable to the purpose, we have come up with our own answer in the form of this booklet. It is presented as a brief history of roads and highways in New Jersey, a review of the Department and its current operations, and a "crystal ball" glance at the highway future of our state.

We do not claim complete coverage, but believe we have hit most of the high spots in enough detail to provide a good general background on the subject. Although our own files were complete enough to cover the Department's history, current operations and future planning, we take pleasure in announcing that the main source for our early road history was a publication of the New Jersey Historical Society, entitled "New Jersey — A History."

We sincerely hope that you will find this booklet both interesting and informative. If you have any questions that it leaves unanswered, please let us know.



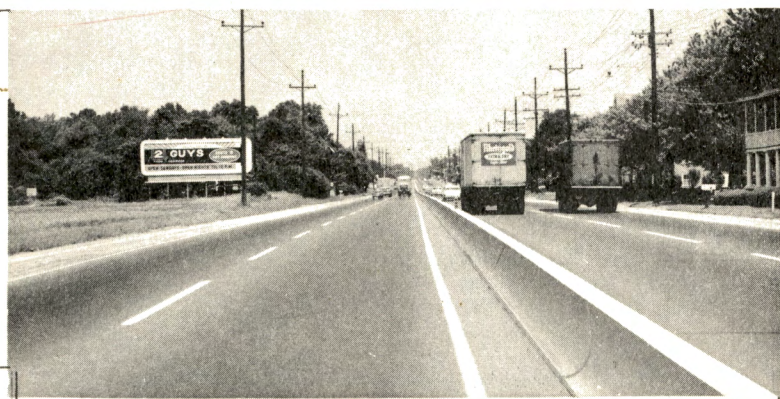
ROUTE-1972  
1920



Route 1 1933



Route 1 1938



Route 1 1960

# DEVELOPMENT OF THE STATE HIGHWAY SYSTEM

## *Historical Development*

THE EARLIEST VESTIGE of what might be considered highways in New Jersey were the trails that connected seasonal hunting grounds of the native Indians. It was from the network they formed that the earliest roads grew.

Largely footpaths only twelve to eighteen inches in width, they connected the natural waterways and inland points and provided long overland routes.

The three major overland trails in use before 1700 by the English and Dutch were known as the Minnisink Trail, the Upper Road, and the Old Burlington Path.

The Minnisink Trail afforded a route for the Minnisink Indians to travel from their Pennsylvania hunting grounds to the seashore. There they obtained fish for food and shells for wampum. The trail started at Minnisink Island, in the Delaware River below Port Jervis, went north of Morristown, west of Springfield, six miles west of Elizabeth, four miles west of Amboy, through Shrewsbury, then to the sea.

The Upper Road was an adaption of several trails by the Dutch and afforded a route between New Amsterdam and their Lower Delaware settlements. It started at Elizabethtown, passed through Woodbridge and Piscataway, New Brunswick, Kingston, Princeton, Trenton, into Pennsylvania and on down to Bristol, New Castle and Philadelphia.

A variation of this route branched off about five miles past New Brunswick, went down through Cranbury and Burlington, crossed the Delaware at Mattinicunk Island halfway between Burlington and Bristol, and rejoined the Upper Road in Pennsylvania.

The Old Burlington Path originated in Monmouth County near Sandy Hook, passed through Shrewsbury, Middletown, skirted Freehold, and went through Allentown, Crosswicks, Bordentown, Burlington, and Haddonfield on its way to Salem.

Both the Upper and Lower Roads, as well as the Old Burlington Path, became known as The Kings Highway.

#### *First Legislation*

The first movement toward formalizing roads, as such, came in 1673. At that time the General Assembly of the Colony of East Jersey passed its first Public Roads Act. This was followed in 1676 by the second Public Roads Act, aimed at providing a road from Middletown to Piscataway.

The road building horizons were widened in 1682 when the General Assembly passed an act for "making and settling of highways, passages, landings, bridges and ferries . . . fit and apt for travelling" and named specific men in each county to lay out and build roads—the expense to be met by county taxes.

Early Road



Under that act roads were opened in all directions, connecting the existing two main roads at various points and linking then-existing plantations, farms and growing towns. The impetus lasted into the beginning of the eighteenth century. It was early in this period that a route later to be known as the Lower Burlington Path was established. It started in New Jersey at Perth Amboy, where a ferry connected to New York, and went through South Amboy to join the Old Burlington Path.

The Province of West Jersey first officially felt the need for a road system in November, 1681, at which time its General Assembly required that a road be built connecting Burlington and Salem. In 1684 it enacted several more road projects between Delaware River towns.

None of the roads achieved much distinction in the fields of safety or comfort. The evolution of most from Indian footpaths to horse-and-rider trails, and then to a width sufficient to accommodate a wagon or coach, left much to be desired. Little pains were taken with the roadbeds and even the traveler on horseback had to be wary of the stumps and mudholes met with.

So, at the turn of the century, New Jersey still had little in the way of formal roads and the roadbuilding process was very slow. Although counties and townships had some authorization they had little power



Covered Bridge

to collect taxes. The road work was largely dependent upon compulsory road service required of all inhabitants. The law usually limited such service to 6 or 8 days a year.

Natural earth was the universal roadbed. Steep grades, deep ruts and seas of mud were common. Sometimes, attempts were made to alleviate these conditions by laying tree trunks across the roads—a device known as “corduroying.” Coaches frequently overturned. The ruts were so deep that the driver would get assistance from the passengers in keeping the coach upright—“Now, gentlemen, to the right”—etc.

#### *Post Revolutionary Days*

After the Revolution, there was a rapid increase in the use of vehicles and, as a result, the roads were increasingly in disrepair. The compulsory labor system broke down. Taxes were inadequate, also hard to collect. The trip from New York to Philadelphia by stage coach took two days.

It cost about as much to transport goods as it did to produce it. And, in some instances, it cost more. Salt, for example, sold for a penny a pound at the shore. It sold for 6 cents a pound inland.

In the latter half of the century, the science of road building was beginning to be recognized. In England turnpike companies were established to improve the roads. The 400-mile trip from Edinburgh to London took 12 to 16 days earlier in the century and there was one stage coach a month. By 1783, the roads had been improved to such an extent that there were 60 coaches a month and the trip was made, first in 4 days, and later in 60 hours. In America at the same time, coaches were making 20 to 25 miles a day.

English road building methods were called to the attention of the New Jersey legislatures. In 1788, Pennsylvania started talking about a turnpike for the Lancaster Road and, after resorting to lotteries to make repairs, finally granted turnpike rights to a private company.

#### *Early Major Roads Construction*

4  
New York and New Jersey inaugurated a system under which major roads were built by the state but were maintained by the townships. New York state put in effect a plan under which land grants were



Hand Labor

offered to those who built roads. Money grants were also made to townships to repair roads and build bridges.

New Jersey tried the lottery idea for quite a while. In 1795 a company was formed to build a road from Philadelphia to New York. It was estimated to cost \$300,000. About one-fourth was subscribed but the plan lapsed. In 1801, the Legislature granted a charter to the Morris Turnpike Company for a road from Elizabeth through Morristown to the Delaware.

#### *The Turnpike Era*

The First Turnpike Era, so called, lasted from about 1800-1830. Virtually side-by-side with it, grew the canal era. It began in 1785 with a Maryland to Virginia proposal by a company headed by George Washington.

New Jersey became one of the greatest thoroughfares in the United States, mainly because of its position between New York and Philadelphia.

The first Turnpike was the road from Elizabeth, through Springfield, Morristown, Succasunna, Stanhope, Newton and Culver Gap to the Delaware opposite Milford, Pa. In 1802, the Legislature authorized

Early  
Improved Road

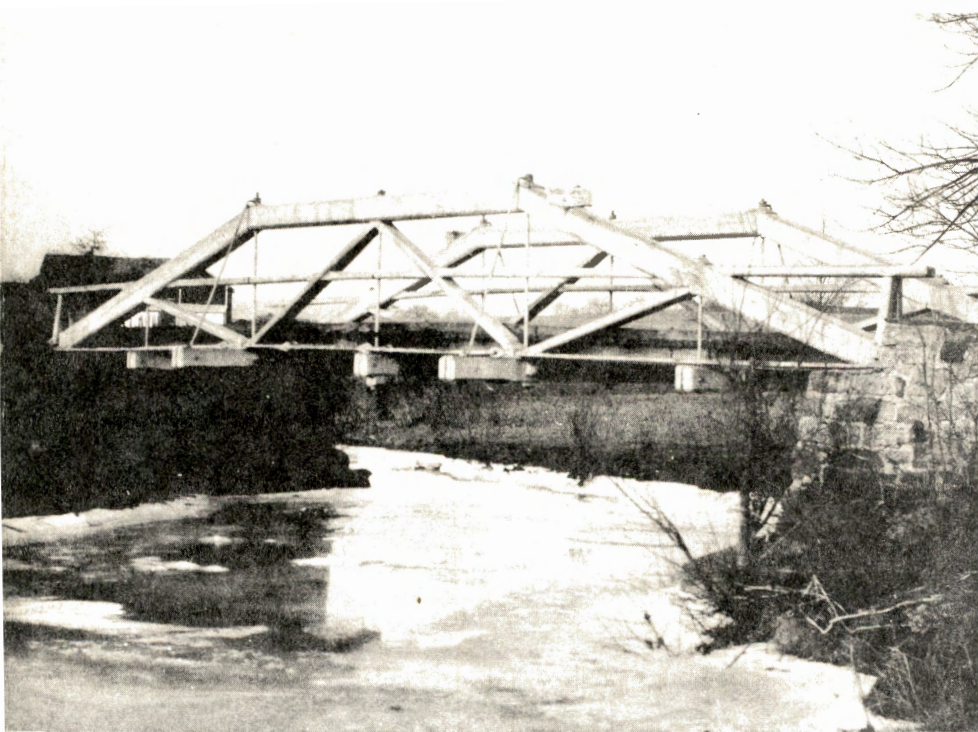


the Belleville Bridge and Turnpike Company and the Bergen Turnpike Company. The latter road, on which tolls were collected for more than a century, led from a ferry in Hoboken, across Overpeck Creek and the Hackensack River to Hackensack.

The Turnpike movement reached its height in New Jersey in 1804 when the Trenton-New Brunswick and the Newark Turnpikes (which made up part of what was to become the most important through road from New York to Philadelphia) were authorized.

The Trenton-New Brunswick Road, was finished in 1807. Albert Gallatin, U. S. Treasury head, reporting on a national road a year later, described it as "36-feet wide, 15 feet of which are covered with about 6 inches of gravel." A few wooden bridges with stone abutments and piers were built. The cost for the 25-mile stretch was about \$2,500 a mile.

Except in one instance, New Jersey took no part in the movement to give state aid to Turnpike companies. The one exception was the Newark Turnpike, for which the Governor was authorized to subscribe \$12,500 for company stock.



Early Bridge

1806 saw the chartering of several other roads, including the Newark and Pompton and the Paterson and Hamburg Turnpikes. The former ran from Newark (North Broad Street) through Bloomfield to Pompton; the latter ran from Acquackanock Landing (now Passaic) through Paterson, Pompton, Newfoundland, Hamburg and Deckertown (Sussex) to the Delaware opposite Milford, Pa. Extensions carried one branch to the Passaic River at Belleville and another from Passaic to the Hackensack and Hoboken Turnpike on the same line that was later used for the so-called Paterson Plank Road.

The last-named route was chiefly for truckers. It brought the produce of New Jersey farms to New York.

The first New Jersey Turnpike, chartered in 1806, ran from New Brunswick to Bound Brook, and thence to Somerville, Potterstown and Bloomsbury to Phillipsburg, opposite Easton, Pa. It was later extended to Perth Amboy through Metuchen. The Bordentown and South Amboy Pike came along in 1816 to fill in the New York-Philadelphia route.

Between 1801 and 1828, charters were granted for 54 turnpike companies, but only about 30 turnpikes were actually built.

About 500 miles of roads were constructed. The surfacing was almost entirely dirt and gravel. Very few were stone surfaced. The three great centers of the network were Newark, Morristown and Paterson. Three thoroughfares ran between Philadelphia and New York—(1) Trenton, New Brunswick and Newark; (2) Bordentown and South Amboy; and (3) Lambertville, Somerville, Plainfield and Newark.

Between 1828 and 1849, only five new turnpikes were chartered. But in 1849, with the new plank road enthusiasm in full swing, 10 new roads were legislated and during the next quarter century some 200 companies were chartered. Most of these were in the south sections of the state where Camden and Mt. Holly became road centers.

Some states permitted construction of free roads from one point on a turnpike to another. These were known as "Shun Pikes." The turnpikes were successful in getting legislation against such roads. A New Jersey Act provided a penalty of three times the legal toll for getting on one of the shun pikes and avoiding passing through the toll gate. Other New Jersey acts provided that a person who willfully broke or defaced a road marker or milestone, injured the gates, or forcibly passed through without paying toll, be subject to fine of \$20 in addition to a civil suit for damages.

#### *Turnpike Construction Methods*

The Turnpike Companies were given two years from the date of the charter to begin construction. Generally, the time allowed for construction varied with the length of the highway.

Even the poorest turnpikes, however, were built with some scientific features in mind—distances were shortened by keeping the roads from winding more than necessary; grades were diminished; road beds were raised and given a proper shape for drainage, ditches were provided and bridges were built over intervening streams.

The surfacing varied. Most Acts provided the road "shall be bedded with stone, gravel, sound wood or other hard substances, well compacted together and of sufficient depth to secure a good solid foundation." The New York law required a facing of gravel or broken stone to a depth of nine inches; actually, the surface was formed of whatever was available in the vicinity. In New Jersey, roads were almost entirely earth and gravel.

The contracts were let, usually, for five or ten mile sections. The contractors lived along the route and were, generally, members of the

Turnpike Corporation. Labor was drawn from the surrounding county and the work was usually done in late summer and early autumn, when farm work was the least pressing.

The first job was to clear the right of way of timber and then grub out the stumps and large rocks. The roadbed was then raised by throwing earth from the sides to the center, automatically creating drainage ditches on both sides of the road. In many instances this remained as the riding surface.

Where stone-faced turnpikes were built during this era, most surfacing utilized the so-called Telford method. The lower part of the stratum was composed of stones broken into pieces five to eight inches in diameter. Over this was spread a layer of one-half to two and one-half inch stones to a depth of six inches in the center, falling away to three inches on the sides. Over this was spread a thin layer of stone dust, gravel or coarse sand to bind the materials together. Early engineers began to doubt the wisdom of the difference in the size of stones and by 1830, the macadam system of compacting a layer of small broken stones on a convex well-drained earth roadbed became the popular type of construction.

Compacting of the surface, despite the turnpike acts calling for it,



Farm Hauling

was seldom accomplished. Therefore, travelers would use the "summer road" when possible to avoid the covering of loose stone and gravel when the seasons were dry.

### *Canal and Railroad Era*

Canals and railroads drove the turnpikes out of existence. Canal building had begun in other states virtually with the turnpikes. Railroads followed in the 1830's the first being used in 1826 to carry coal —(Mauch Chunk). New Jersey was late with canals. The Delaware and Raritan, began in 1834 and completed in 1838, was one of the most successful ever built. The Morris Canal opened 1836.

The canals lowered freight rates substantially. The Erie Canal, for example, dropped rates from Buffalo to New York from \$100 to \$5 a ton and cut the time to one-third.

### *Plank Toll Road Movement*

Toll roads came back into the picture about 1850 with the plank road movement. These had a floor of sawed timber and were regarded as the cheapest and easiest road to build. They began in Russia early in the 1800's and were introduced in Canada in 1834, after which they spread to the United States.

Before the era ended, New Jersey had 25 such roads. At least \$10,000,000 was spent in building about 7,000 miles of planked roads in New York, Pennsylvania, New Jersey and Maryland. There were small enterprises, ranging from \$4,000 to \$100,000; few exceeded \$50,000. They were usually financed by individuals and business interests along the roads.

They were the smoothest roads built in their time. Normally built right on top of existing roads, they consisted of a base of 3-inch thick and 6-inch wide hemlock laid 6 inches apart and overlapping, and filled in with well-rammed earth. A 3-inch thick wooden floor was built on top of that. It was from 8 to 11 feet wide. Because approaching and overtaking vehicles had to run one set of wheels off the planking in order to pass, shoulders were made even with the planks. Cost of construction ranged from \$1,000 to \$5,000 a mile, and the average was about \$1,800 a mile. Two-animal vehicles paid tolls of about 1½ cents a mile. Life of the planking was about five years.



Early  
New Jersey Canal

*Public Roads State Aid*

In 1891 New Jersey moved to the foreground in the national roads picture by becoming the first state in the Union to grant state aid in the building of public roads. The legislative act that accomplished this provided aid to the counties in the construction of highways to the extent of one-third of their cost, and appropriated \$75,000 annually to be expended by the state's Secretary of Agriculture.

The legislature followed through in its recognition of the need for improved roads by providing for the appointment of a State Commissioner of Public Roads in 1894. The commissioner was required to perform all duties with respect to the public roads of the state that had previously been conferred on the Secretary of Agriculture. In addition he was authorized to collect such data with respect to permanent road construction as would best serve the interests of the public.

By the turn of the century a new and powerful voice had been added to the clamor for good roads. In addition to the farm-to-market group the growing number of bicycle clubs became a factor in the movement. They needed hard-surfaced roads to accommodate the wide activities of their membership. The answer was an increase in the number of roads surfaced with water bound macadam.

This type of surfacing consisted of a layer of large pieces of broken stone, the voids of which were then filled with smaller pieces of stone and stone dust. The smaller aggregate and particles were flushed in with water. Long handled brooms were used to work surplus material on the top of the layer and form a relatively smooth surface. A tightly knit pavement resulted when the material dried as a natural cementing action took place to some degree.

#### *First State Highway Commission*

The next important step in New Jersey highway development occurred in 1909 with creation of a State Highway Commission by the legislature. The commission consisted of the Governor, President of the Senate, Speaker of the House, and the Commissioner of Public Roads. The main function of this commission was limited to supervising preparation of a plan for an "Ocean Highway" from Atlantic Highlands to Cape May.

Three years later, in 1912, the legislature recognized the need for an integrated system of state built roads in directing the State Highway Commission to establish a comprehensive scheme of roads to be known as the State Highway System. The system was not to exceed 1500 miles of roads.

Early Construction



Following World War I the automobile came into more common use and the need for more and better routes was immediately evident. Also, the demand was created to "get the farmer out of the mud" and this resulted in many hard-surfaced roads being constructed by counties as well as by the State in the more sparsely settled sections of New Jersey. Late in the 1920's roads were widened to three lanes and emphasis was placed upon the further development of the intersection. This was the period when New Jersey built its first clover-leaf and first traffic circles, as well as its first divided roadways. State highway expenditures reached their peak in the early 30's when many new routes were built and dual highways became the design standard where traffic volumes justified their construction.

Bridge design also underwent a change during this period with the trend being more and more to the high-level permanent type of bridge rather than the movable bridge which held up traffic, the volume of which was increasing rapidly each year.

Organizational refinements of the Highway Department were undertaken by the Legislature during the period of highway construction and expansion. In 1923, the eight-man commission was replaced legisla-



Post World War I  
Traffic

tively by a four-member commission, then in 1935 completely supplanted with a single Highway Commissioner to serve under the Governor as administrative and executive head of the Department.

#### *Present State Highway System*

The present State Highway System in New Jersey is 1,894 miles in length. The system comprises 1,110 miles of two-lane highways, 46 miles of 3-lane width, 157 miles of four or more lanes undivided, 464 miles of dual highways and 114 miles of dual with controlled access. In addition to this there are approximately 6,662 miles of country roads, 21,761 miles of municipal roads and 327 miles of toll roads.

Nearly all toll mileage is accounted for in two of New Jersey's principal traffic arteries—the 131 mile New Jersey Turnpike and the 173 mile Garden State Parkway. Each was initiated by the State Highway Department immediately following World War 2 and some sections built before separate Authorities were created by the State legislature to complete the routes by means of bonds issue financing.

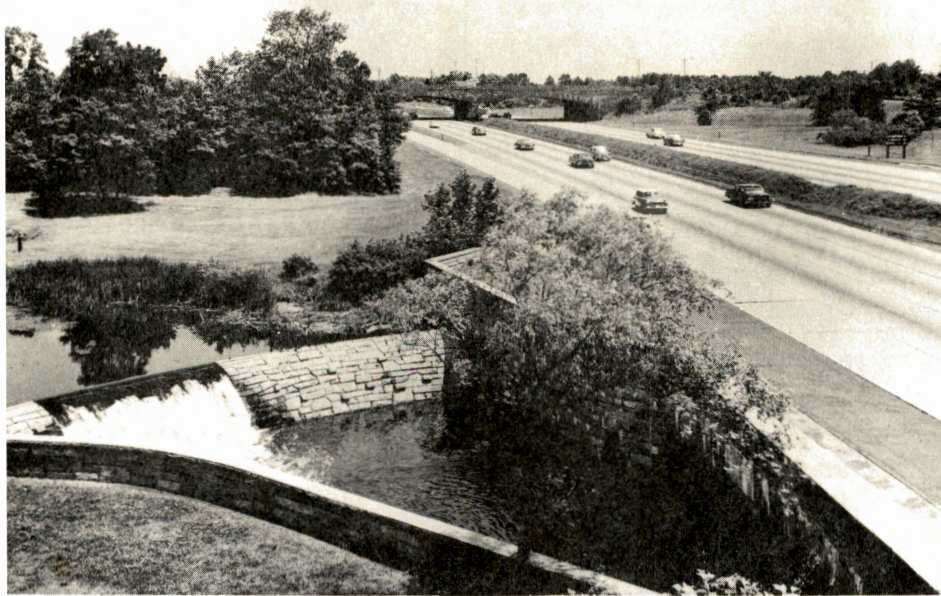
#### *N. J. Turnpike Authority*

The New Jersey Turnpike Authority was established in 1948 and the freeway opened to traffic from Deepwater to near the George Washington Bridge in January, 1952. A 7-mile spur, from the vicinity of Newark Airport to the Holland Tunnel, was completed in 1956. A similar spur, connecting the Turnpike in the vicinity of Bordentown with the Pennsylvania Turnpike, was also opened in 1956. Total cost of the route and its spurs was \$466 million. Truck tolls average 3 cents a mile and passenger cars paid 1½ cents a mile on the basis of original rates.

#### *N. J. Highway Authority*

In April, 1952, the State legislature created the New Jersey Highway Authority to complete the then-proposed 164 mile Route 4 Parkway that had been started by the State Highway Department in 1947. Due to limited available funds the State roadbuilding agency had been able to complete only 19 miles of the scenic freeway. These three sections, the longest of which is a 13 mile stretch between Route U. S. 22 in Union County and the Raritan River at Perth Amboy, still remain under State Highway Department control and are toll-free.

The entire length of the originally planned 164 miles, from Paramus down the eastern third of the state to Cape May, was opened as the Garden State Parkway in July 1955. A 9 mile long extension from the Paramus area to a New York Thruway connector near Suffern,



Garden State  
Parkway

N. Y., was opened July, 1957. Total cost of the route was \$330 million. The Authority's bonds, which financed its construction, were backed by the State's credit and are being retired by passenger car tolls that average 1.6 cents a mile. Basically a scenic and recreational route, trucks are banned north of Ocean County. Truck tolls on the southern portion of the Parkway average 3 cents a mile.

Each operating Authority consists of three members appointed by the Governor, with the advice and consent of the State Senate, to serve nine-year terms. The State Highway Commissioner, by executive order, serves as the Governor's liaison and advisor and acts as coordinator to these authorities.

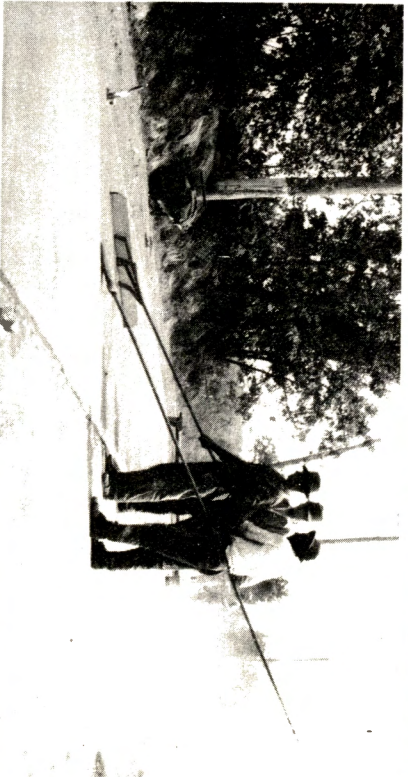
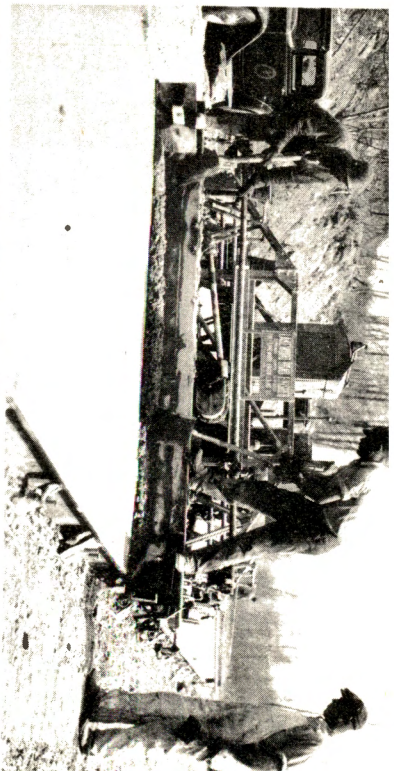
*N. J. Expressway Authority*

A third separate road-building authority was created on February 19, 1962, when legislation was approved and put into effect establishing the New Jersey Expressway Authority. The five authority members serve five year terms upon appointment by the Governor with the advice and consent of the State Senate.

The basic legislation authorized the construction of the Atlantic City Expressway from the southern terminus of State Route 42 in Camden



**Early Concrete**



Road

Building

County southeasterly to Atlantic City, with a spur to Cape May to be added if and when deemed necessary. Construction would be paid for by Authority bonds that would be retired through proceeds from tolls. The major portion of the Expressway, from Route 42 to the Garden State Parkway, a distance of 37 miles, was opened in 1964. The final portion into Atlantic City was opened in 1965. Tolls approximate 2¢ a mile for passenger cars and 2.8¢ a mile for trucks.

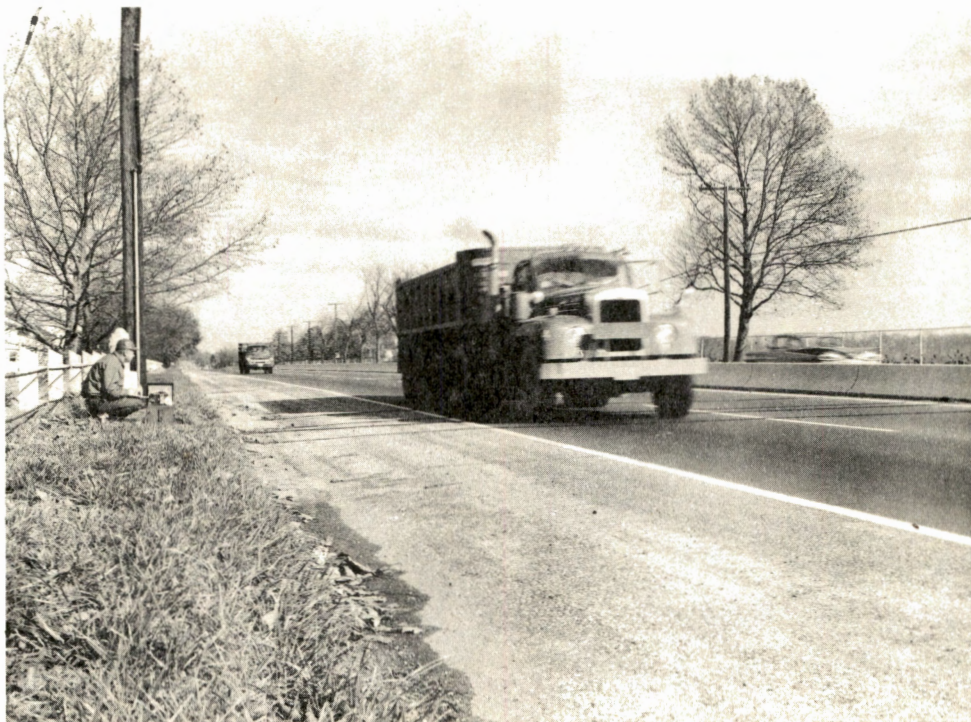
#### *Department Responsibilities*

Vested with the New Jersey State Highway Department is the continuing stewardship and development of the major traffic arteries of our state—with exception only of the Turnpike, Parkway, and Expressway and the preservation of necessary commuter rail facilities.

Carrying out these responsibilities involves four distinct fields, or functions, or departmental operations: highway planning, construction, maintenance, and aiding counties and municipalities in the parallel functions they must perform with relation to the roads and streets under their sole jurisdiction.

In the interests of planning for new facilities and the expansion of existing ones the Department must constantly gather, compile and analyze statistics on the use of highways at strategic points throughout the state. This material after analysis by methods that are nationally accepted, is used for many purposes.

Traffic Counting



In one instance it may point up the need for a new facility, in another instance an improvement such as additional roadway width. It may at one location substantiate the desirability of constructing a highway overpass—or indicate that a system of channelization and traffic signals was economically justified. Other analysis gives credence to raising or lowering existing speed limits, creation of “No Parking” zones, and establishing definite areas where vehicles may or may not pass others.

Related to good highway planning is the research and testing that must be done to insure that the most durable materials are incorporated in our highways.

The construction function of Departmental operations is as old as the Department itself. Over each of the past 40 years the Highway Department has maintained a construction and improvement program that has increased steadily in size. It now approximates \$120,000,000 a year.

In these programs are highway widenings; construction of center barriers; intersection improvements that range from simple traffic signal installations to channelizations and costly overpasses; complete dualization of long sections of dangerous two-lane highways; resurfacing or replacing areas of worn, deteriorated or slick roadway surfaces; and constructing completely new sections of highways to modern safe design wherever necessary and possible within monetary limitations.



Modern Interchange

Maintenance  
Operation



The Department's maintenance function embraces all aspects of keeping the state highway system in good usable condition at all times. This demands that road and shoulder surface irregularities be corrected before becoming hazards; that the network of sub-surface storm drains that are an integral part of every major highway continue to function properly; that the inherent dangers of snow and ice are minimized during winter months; that unsightly highway litter is removed and grassy areas are trimmed and kept presentable; that draw-spans over navigable streams be kept both operable and operated; that hundreds of traffic lights at highway intersections serve constantly and under all conditions; that completely adequate and functional directional and precautionary signs be continuously provided, renewed and replaced; and that a myriad of other minor acts of preventive maintenance and repair be performed almost daily.

*County and Municipal Aid*

In its function of aiding counties and municipalities in their road and street maintenance and construction, the Department acts as both the distributor and "watch dog" of the state funds appropriated for these purposes, and as the supervisor of the work. The disposition of these funds is accomplished on a basis established by the state



State Aid Project

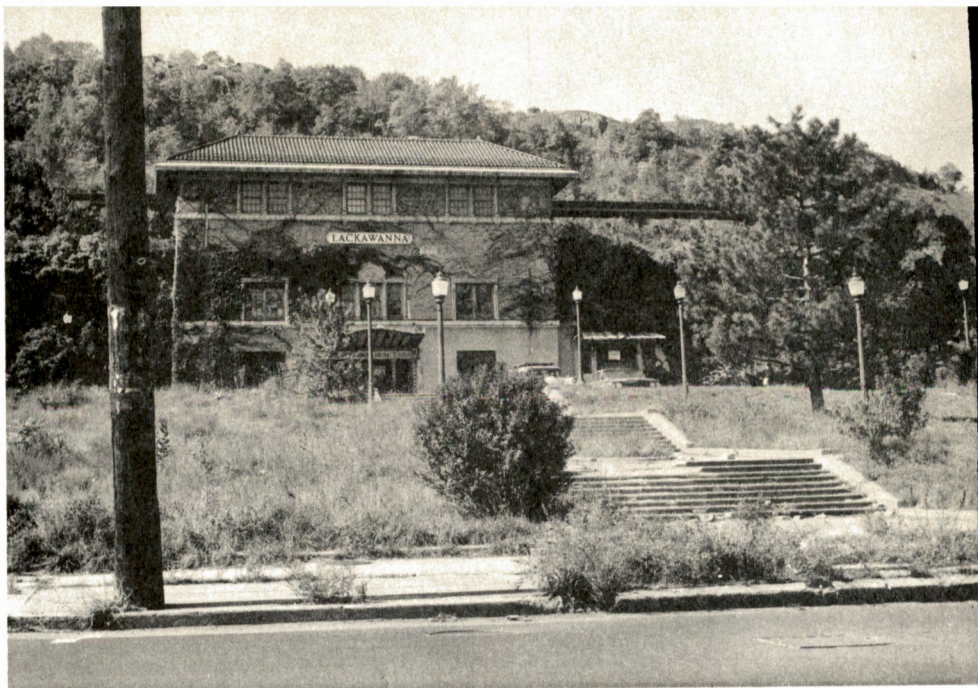
legislature. Supervision of the work is exercised not only in the assignment of inspectors to the construction that is under way, but is also accomplished through advising in the preparation of plans and specifications, reviewing them once they are prepared, and acting as final authority in award of contract.

A similar service is performed by the Department with respect to Federal funds which are available to counties for the purpose of improving their road systems.

#### *Railroad Transportation Division*

The commuter rail transportation activities of the Department were initiated in late 1958 when the Governor requested the State Highway Commissioner to study New Jersey's commuter rail problem and make recommendations toward its solution. Early in 1959, in advance of shutdown of the West Shore Division of the New York Central Railroad and the ferry which transported its passengers across the Hudson River at Weehawkin into New York City and back, the Commissioner made suitable arrangements with bus lines serving the area so that when the shutdown occurred no commuters were inconvenienced.

**Abandoned Railroad  
Facility**



Spurred by this experience and other impending cutbacks in rail transportation, legislation creating a Division of Railroad Transportation within the State Highway Department was enacted on March 4, 1959. Since the formation of this Division extensive studies were conducted into all phases of the commuter problem. A program was submitted to the electorate on November 3, 1959. The source of revenue suggested to execute the program was defeated. The Division proceeded to develop another proposal and in April, 1960 released a report containing suggestions for immediate remedial action and long-range proposals. This met with wide public acclaim and the Commissioner negotiated contracts with all major commuter lines ensuring continuation of 96 per cent of the essential passenger service in the State. The cost of this program, amounting to between \$5 million and \$6 million a year, is less than the construction cost of one mile of modern freeway in an urban area, and stimulated the carriers to help their own situation.

After prolonged negotiations, in which the Highway Commissioner represented New Jersey, legislation was enacted directing the Port of New York Authority to acquire, rehabilitate and operate the Hudson

& Manhattan Railroad in conjunction with construction of a World Trade Center on the west side of Manhattan, in the area of the present H & M terminal. Largely as a result of the Highway Department's insistence, this program included provision for transfer stations in the Jersey Meadows to link up with New Jersey commuter railroads, a new bus terminal in Jersey City, and committed the Port Authority to spend up to an estimated \$10 million a year on mass transit, even as a deficit operation.

These are the major functions of the New Jersey State Highway Department. Naturally there occurs many other situations wherein the Department provides assistance to county and municipal officials and boards and to the individual private citizen.

*Speed Determination and Curve Designs*

In the design of modern highways the basic yardstick is speed. Modern New Jersey highways are designed for speeds of from 25 to 70 miles an hour—not so motorists may avail themselves of peak speeds, but to produce greater safety margins at normal speeds of travel. The department uses the “design speed” as the basic factor in figuring out sight distances and banking on curves. The higher the speed, the farther a driver must be able to see and the steeper a curve must be banked.



**Banked Curve**

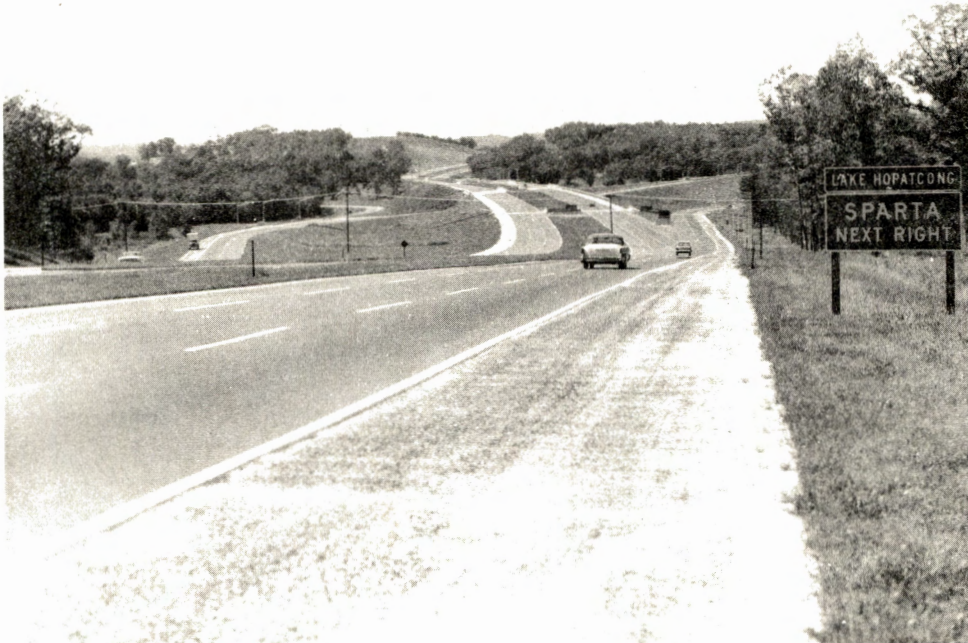
It used to be that the department would build curves as sharp as the arc around a circle with a 900 foot radius. Its present standards call for at least a 6,000-foot radius, where possible. Where design speeds indicate a need, one side of a curve on a 50-foot wide road may be banked as much as four feet higher than the other side. The department holds banking of curves down to two-and-a half feet in areas subject to winter icing, which means curves must be more gradual in such locations.

Then there is the problem of "ironing out the hills and hollows" on new roads. The Federal Public Roads Bureau's strictest standards allow grades of five percent in ordinary cases—which would mean a five-foot rise or fall within a distance of 100 feet—and seven percent in unusual circumstances. Where New Jersey once built roads with six percent grades, they now exceed  $3\frac{1}{2}$  percent only in exceptional cases.

Some new highways are built with acceleration and deceleration strips, which permit motorists to pick up speed before entering the main stream and leave the main roadway before slowing down. These strips average 600 to 800 feet in length.

The new interstate routes are being built as multi-lane, divided "freeways." That means they will have no conventional "at grade" intersections. Entrances and exits will be provided by overpass ramp

Long Curves





Traffic Conflict

systems and there will be no "marginal development." Traffic pulling on and off main highways near roadside business has always constituted a hazard. The freeway, or limited access road, is designed to eliminate this danger.

*Roadway Surface and Bases*

What are modern highways made of? There are two main types—reinforced portland cement concrete and bituminous concrete, or "blacktop". Which type is used depends mainly on local soil conditions and vehicle service needs.

Drainage is one of the main problems in designing a new highway. Water is ever-present and an "insidious enemy". It forms puddles and slicks the surfaces of roads, causing dangerous skids. It freezes and expands underneath a road, causing it to heave up and down and break up.

You can draw a line across New Jersey from Trenton to Perth Amboy. South of that line the department uses an eight-inch sub-base composed of sandy gravel. North of the line a 12-inch sub-surface is used. Soil in northern New Jersey contains more clay, making for poorer drainage.

Concrete roads are built nine inches thick directly on top of the sub-base. They are reinforced with steel mats two inches below the surface.

Bituminous concrete roads are built by laying down a seven-inch layer of broken stone—tamped down by vibrating devices—covered by two layers of 1½ inch bituminous concrete.

The department is continually studying improved surfacing material. Synthetic rock asphalt, including a sharp silica sand, has shown highly satisfactory skid resistance on the Pulaski Skyway.

#### *Road Signs Research*

There is not much point in building a fine modern network of roads and then cluttering it up with so many signs that the average motorist is confused. There are now 65,500 signs on the State's 1,930-mile highway system. The old style directional signs were made out of cast iron plates two feet by four feet and carried as many as 12 town names. The department found that the average driver could not read these signs from a distance of 100 feet. New signs are larger and contain only three town names. Tests have shown these can be read at a distance of 300 feet.

The question of permissible vehicular speeds is ever present. In carrying out its function of setting these limits, the department is now making speed limit surveys on the basis of geographical areas rather than municipal boundary lines.

New highways must have realistic speed limits. There is a very pronounced tendency on the part of drivers to ignore unrealistic speed



New and Old  
Highway Signs

limits. Realistic limits keep cars moving at the same rate of speed and thus cut the accident rate. The department is using a few large speed limit signs in place of the many small signs posted on highways in the past.

#### *Center Barriers*

The department also is conducting a "facelifting" operation on the State's road network in an effort to wipe out danger spots. The steady reduction in traffic deaths during the recent past bears out the contention that the highway department can do much towards the prevention of accidents.

On Route 4, prior to construction of center barriers in 1956, there were as many as 10 deaths a year. In the first 4 years of the 60's, in spite of constantly increasing traffic volumes, the highway fatality annual average was cut to 5.

Head-on collisions killed 11 persons on Route 22 in Hillside during the three years before center barriers were erected there in 1954. There has been no head-on accidents since the erection of the center barriers, although the area is traversed by up to 70,000 cars a day.

The highway department has built more than 134 miles of center barriers since 1954 and the program is expanding. The most common type is made of concrete, 30 inches wide at the base and 20 inches tall. Newer design calls for it to be 32 inches high, 9 inches wide at the top, with a 24 inch base width.



**Center Barriers**

**Save Lives**

*The Dangerous Intersection Problem*

The strategy of building safety into old roads uses the weapon of modern design against one of the most dangerous highway enemies—the busy intersection.

New Jersey tried to beat the intersection problem more than 30 years ago with a then new design—called the “traffic circle”. The first one was built near Camden in 1925 and the last of the State’s 73 circles was constructed on the Trenton Freeway in 1952.

Increased traffic volume and higher speeds have made this design obsolete. Circles in many places are being “revised”—cut through to permit swifter movement of traffic and still retaining the safe turning features.

New Jersey’s First  
Traffic Circle  
Camden 1925



Camden Traffic Circle

1963

30



Conventional highway intersections also are being modernized. Sometimes only a left turn "slot" is put in to give three or more cars protection from the rear. Sometimes the entire intersection is redesigned by providing "channels" for the various turning movements and installing traffic lights to control them. It costs from \$25,000 to \$1,000,000 to cut out the confusion generated by an old-fashioned wide open intersection.

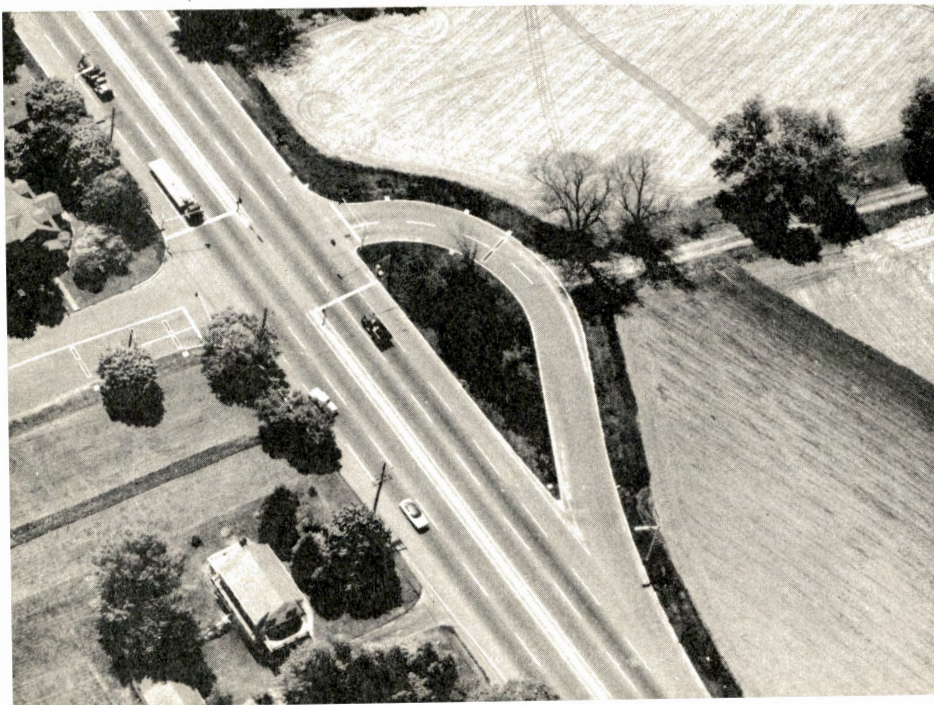
#### *Overpasses*

The Department's engineers believe there is only one certain answer to the problem of preventing accidents at the intersections—the overpass. The department has built 363 overpasses since 1954 at a total cost of more than 55 million dollars. There are many areas where overpasses are desirable, however, sufficient funds are not available to provide all needed locations with overpasses.

#### *Jug Handles*

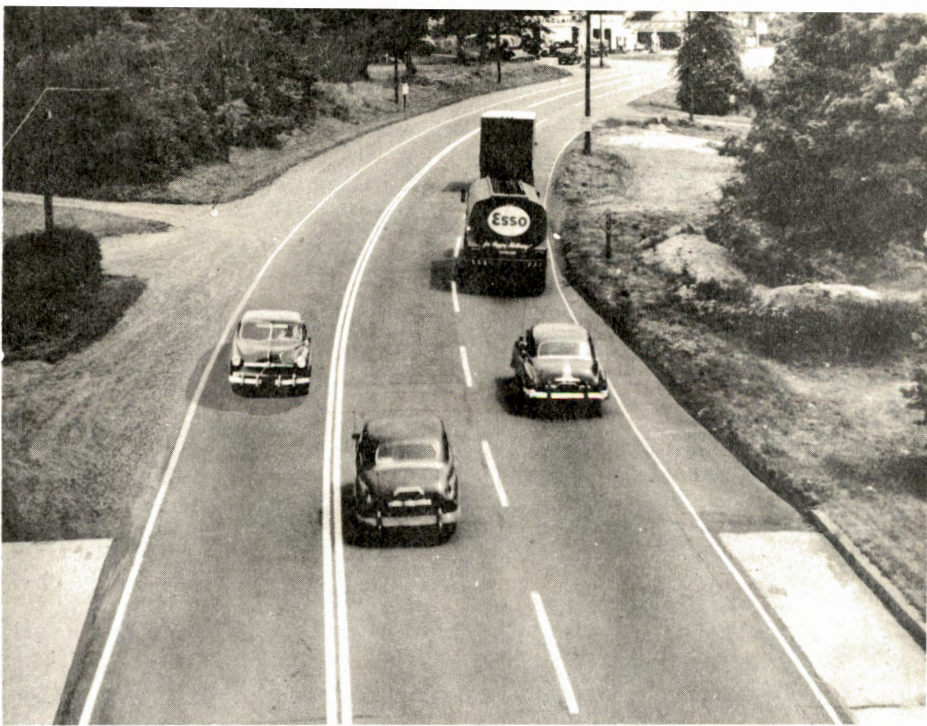
A new design to provide safe left turns at extremely busy intersections is the jug handle. It provides a right turn lane on which traffic can leave the main highway in advance of the intersection, make a left turn onto the less congested cross road, and get back across the main highway under traffic signal control.

The design not only eliminates the dangerous necessity of making sharp left turns into the face of heavy opposing traffic, it cuts down delay at intersections. The department has built 404 jug handles since 1954 at a cost of about \$50,000 each.



**Jug Handle**

Creeper Lane



#### *Creeper Lanes*

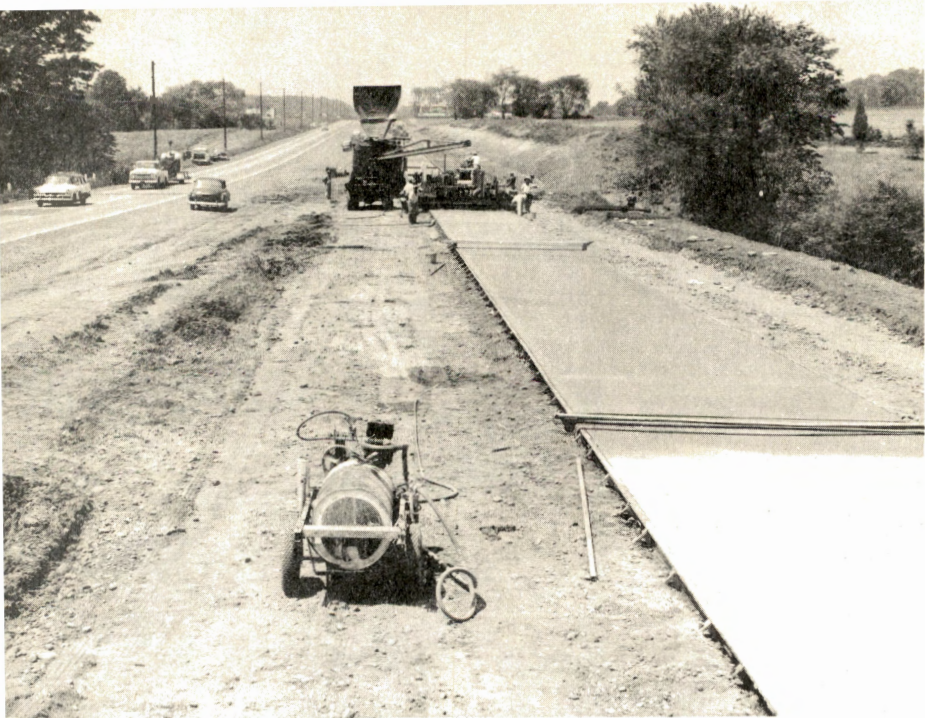
Another new design is the "creeper lane" intended to promote safety on two-lane roads running through hilly terrain. It is simply an extra uphill lane for use by slow moving vehicles so that other drivers need not take chances in passing. It is reasonable to assume a considerable number of lives have been saved by creeper lanes. The state has built 40 of them since 1954 at a cost of about \$70,000 each.

#### *White Reflecting Line*

One of the simplest safety designs put into use and yet one of the most effective, is the white reflecting line painted on the outer edge of every state highway. The program was started in the late Spring of 1954 and completed in less than two years. At first the reflecting stripes were used only on blacktop roads, but public reaction was favorable and the program was expanded to concrete highways.

#### *Road Shoulder Widening*

In an effort to promote greater safety for persons who must stop along the highway, shoulders are being widened by two feet. Modern standards call for 10-foot shoulders on regular highways and 12-foot shoulders on truck routes.



**Road Dualization**

On a larger scale are plans to dualize and divide existing two-lane and eliminate the unsafe three-lane highways. The fatality rate on three-lane highways has been nearly double that on divided highways.

It often takes years to complete modernization of an entire length of a route. The doing includes a host of small items, like closing center island openings, and usually requires construction of "jug handles" and overpasses. And there is always the headache of poor drainage. Individual cost is small, but there are hundreds of spots where poor drainage causes slippery puddles or ice to form in bad weather. Ice is the great enemy of highways, often causing them to break up into dangerous pot holes, in addition to making driving hazardous when it forms on highway surfaces.

*Traffic Volumes*

Today our state routes carry one-third of all New Jersey traffic—an average of 13,672 cars per mile each day, or more than 9 billion miles a year. This is five times the national average, three times Pennsylvania's and three and three-quarters times New York's state highway average volume.

Route 22  
Traffic Congestion



It is only through constant employment of all the facilities available to the Highway Department and the utmost effort of its trained personnel that New Jersey can best serve the interests of its citizens and discharge its responsibility with respect to highways in their relationship to the economy of the nation.

*N. J. Plans for the Future*

As for the future, New Jersey must improve and expand its present highway system. Motor vehicle registrations in New Jersey have increased from 765,000 in 1928 to 2.9 million in 1964. Today there is one motor vehicle in the state for every 2.3 persons, and we are rapidly approaching the theoretical limit of ownership of one car for every two people in some areas. In three counties the present ratio is already one car for every two persons.

Plotting the curves of population increase and motor vehicle registrations and miles traveled, predicts with relative accuracy many of the factors that must be dealt with and provided for in the future to insure adequate highways for "tomorrow".

This is just what the State Highway Department did six years ago in developing its master plan for the state. Motor vehicle and population



Route 1

Traffic Congestion

trends in the 21 counties, together with industrial trends throughout the state, were balanced off against existing highway facilities. The result showed an anticipated deficit based upon 1975 traffic projections amounting to  $2\frac{3}{4}$  billion to 3 billion dollars at the price level then. Despite the production of recent years the deficit is still \$2 billion.

It was determined that registrations will increase from 2,200,000 in 1955 to 3,680,000 by 1975. Also that travel in New Jersey will increase from 22 billion to 47 billion miles a year—or about 135 percent in the same period.

To accommodate this upsurge in traffic, here is what will be necessary in the way of additions and improvements to the existing 1,930-mile state highway system.

1. A total of 821 miles of freeways extending into every county of the state.
2. More than 900 miles of the present system widened or converted into dual highways.
3. Other improvements such as grade separations and resurfacings must be undertaken on otherwise adequate roads.

None of these projected needs includes improvements at either the county or municipal levels—and in many instances their problems of

the future may equal, if not exceed those of the state. Typical examples of the inadequacy of present facilities can be seen throughout urban and industrial areas.

### *Expanded Construction*

This pattern differs little from what will be found throughout our nation in similar areas. We feel the department has already proven both from an engineering and production standpoint that it is qualified to face any traffic emergency given the tools—money with which to meet our citizen's needs. Mainly through increased federal aid it has been given the opportunity of expanding its annual construction programs.

Where prior to 1955 the State Highway Department average annual construction program totaled \$25 million, its present programs average \$140 million a year. This represents a dramatic increase over a relatively short period of time. Even more important is the fact that the Department's production plans and conversion of these plans into actual construction contracts have more than kept pace with available funds.

### *The Interstate System*

Since 1956 the major portion of highway plan drafting and construction in New Jersey, from a dollar and cents viewpoint, has been

Present Day

Construction

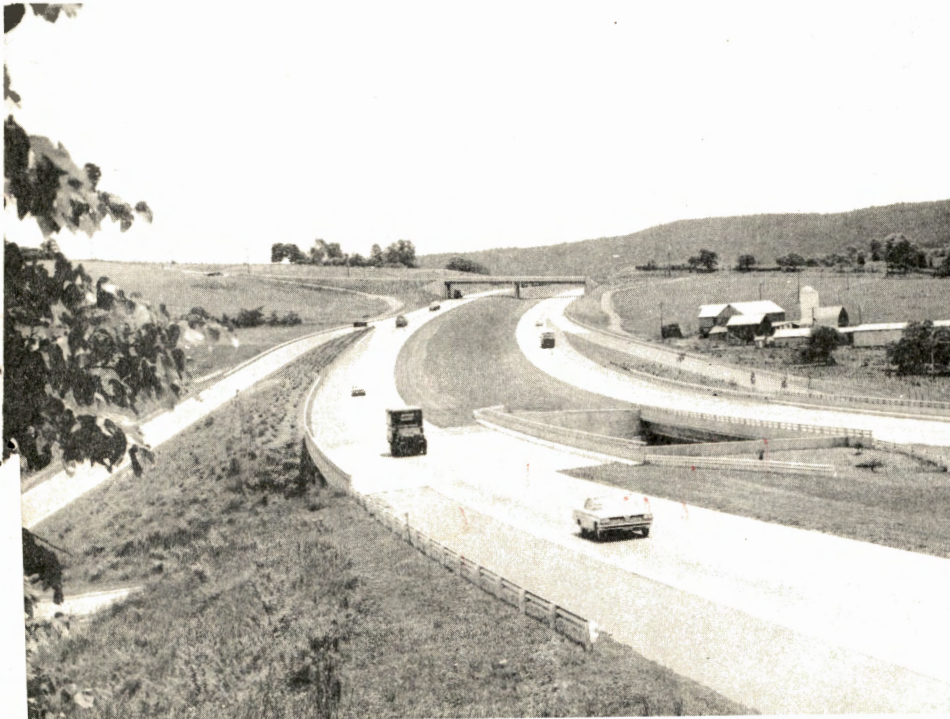


devoted to bringing to reality the 373 miles of new freeways that will comprise New Jersey sections of the National System of Interstate and Defense Highways. Ninety percent of all costs of this construction is being financed by the Federal government through its Bureau of Public Roads.

As presently envisioned, construction of the Interstate system will be completed in late 1972. In order that each mile of the eight major Interstate freeway segments to be built in New Jersey will meet an immediate need of both the State and Federal road systems, the Department has placed emphasis on construction of relatively short sections of these Freeways rather than completion of any single one from end to end.

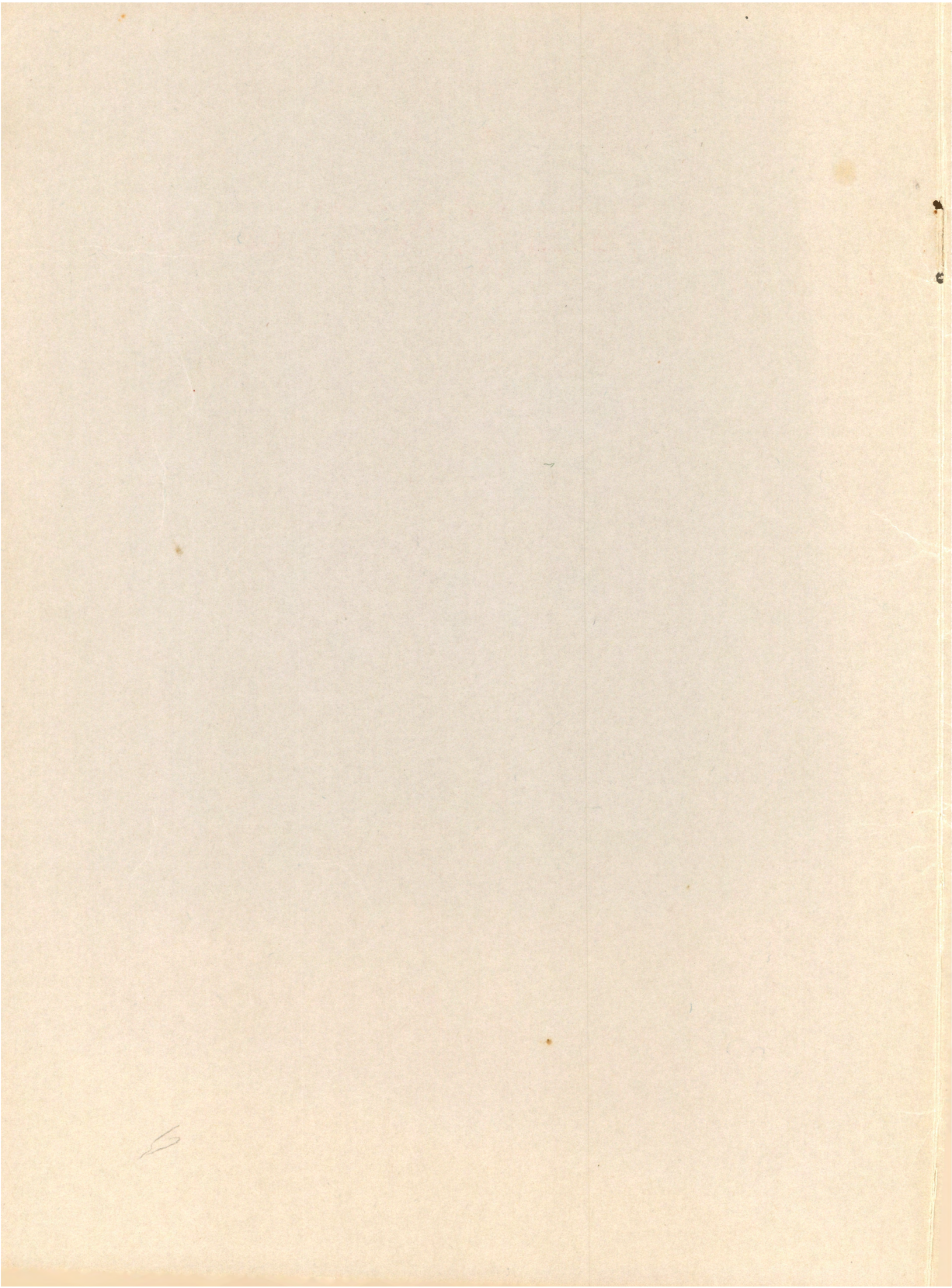
*The Effects*

Because of the size of the overall New Jersey system rehabilitation and expansion program, the full effects of our stepped up production have not yet been assimilated by the public. Substantial extensions and improvements to the highway system require, mainly for financial reasons, several years to complete. It will be a few more years before results of the multi-million dollar statewide program are obvious to all. However, we plan to stick to our course at a pace that is bound to change the face of our highway system.



New Interstate  
Highway

MAY 1965



ian Footpaths • Overland Routes • Traveler On Horseback • Covered Bridges • Pass  
re Than A Century • Early Construction • Paterson Plank Road • Formalizing Roads •  
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de Open Intersections • Banked Curves • Hand Labor • Multi-Lane • Pedestrian Bridge  
isting Highway Facilities • New Signs Are Larger • Jug Handles • Traffic Circles • Exist  
Registrations Will Increase • The Basic Yardstick Is Speed • Signs • Newer Designs •  
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a • The Science of Road Building • Workable Road • Road Service • Creeper Lanes  
Drainage • Highway Widening • Stricter Standards • Program Is Expanding • Multi-L

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