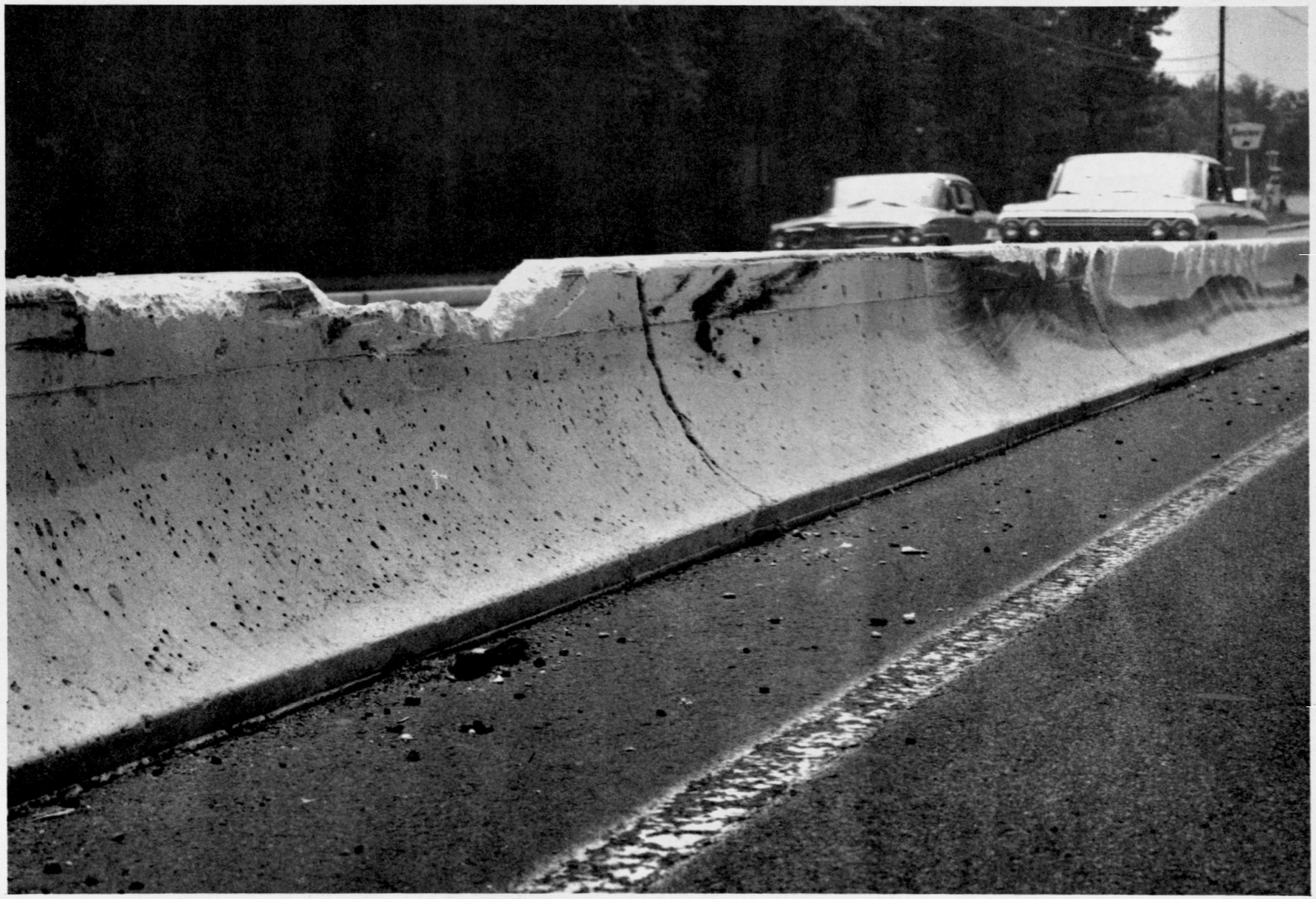
90
R628
1965b

R628
65b

Highway Spot Improvements



New Jersey State Library

NEW JERSEY STATE HIGHWAY DEPARTMENT

COVER PHOTO

The concrete center barrier on Route U.S. 1 between Trenton and New Brunswick prevented a tractor-trailer rig from crossing the highway into opposing traffic lanes. The tractor-trailer glanced off the barrier with minor damage to the truck. No injuries resulted.

REPORT

SPOT IMPROVEMENTS

NEW JERSEY STATE HIGHWAY DEPARTMENT

October, 1965

FORWARD

The position New Jersey holds as the most urbanized State of the Union, its ranking as a leading industrial State and its function as a corridor between the northeastern region and a large segment of the nation, prompted the State Highway Department to expand the definition of "spot improvements" to include entire metropolitan areas and strategic portions of corridor highways.

Urbanization brings with it concentrations of commercial activity along arterial highways and at major intersections, drastically altering their vehicle capacity. Land service highways constructed in earlier years were designed for 40 m.p.h. speeds and were, to the best of the technology then available, constructed to accommodate future traffic.

Population increases and mobility, abetted by the renowned American talent to mass-produce motor vehicles, rapidly filled these highways beyond their capacity. The over-load in New Jersey, compounded by commercial roadside development and large shopping centers, has created peak-hour traffic concentrations, literally inundating our highways and producing extensive "spot problems".

In several sections of the State long range "spot improvements" have been made. More than 150 miles of center barriers have been installed in metropolitan areas, providing protection for opposing direction traffic and safe cross-passage via jug handle construction.

Throughout our State and the nation, all exits and entrances to ramps from highways might be considered "risk locations". These points, obviously, cannot be eliminated. Adequate lighting and special signing installations provide all the possible safety provisions - the rest is the motorist's responsibility.

Since late 1954 our Engineering and Construction Divisions have, within the funds available, eliminated many dangerous locations. As traffic increases, new danger locations develop.

New Jersey State Highways carry five and one half times as much traffic as the average of all states of the Union.

Our State's fatality rate is 3.7 persons per one hundred million traveled miles - that of the nation, 5.3 persons.

New Jersey and the nation as a whole is carrying on a relentless campaign to eliminate these regrettable tragedies

Our responsibility is to correct or substitute for the out-moded highways of "yesterday", effective safety installations and to construct, as rapidly as budget allowances permit, safe travel arteries with capacity to meet the traffic volumes of the next twenty years.

Dwight R. G. Palmer
Highway Commissioner

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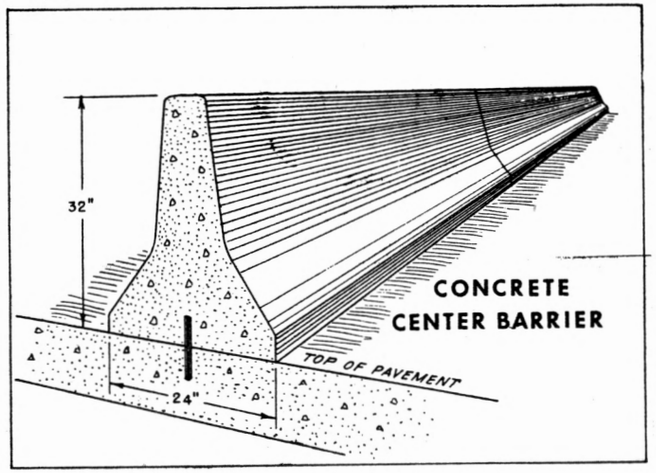
Center Barriers

The first concrete center barriers on New Jersey highways were 18 inches in height. On the basis of experience, the design was later increased to 24 inches, and still later to the present 32 inch height. This design is under continuous study looking toward further improvements as to design, strength and visibility, Further research has been carried on for the Highway Department in the laboratories of Stevens Institute of Technology.

The design of the barrier is such that if a vehicle drifts left to the barrier, the tires will come in contact with the base and the operator can retain control and adjust his steering. The curvature of the barrier prevents the vehicle's body from contacting the barrier with a possible result of the vehicle going out of control.

If the vehicle strikes the barrier with force, the wheels will climb above the base onto the curved riser, which will cradle the wheels and keep the vehicle in line, permitting the driver to regain control.



ROUTE 22 ACCIDENT COMPARISONS

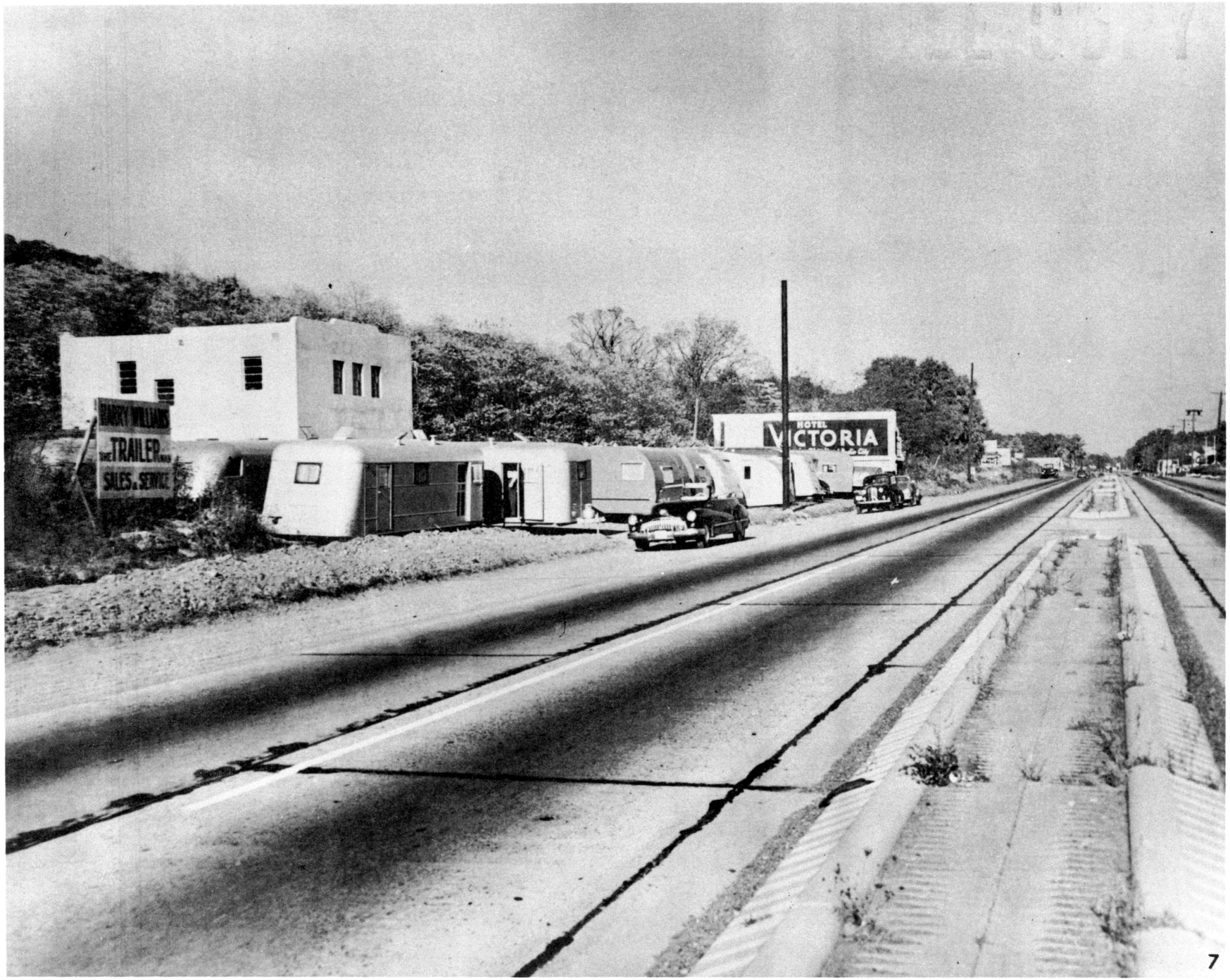
Accident records on this section of the highway in Newark, Hillside and Union before and after installation of the center barrier were studied. In Hillside alone, there were 11 head-on fatalities in the 36 months preceding installation of the barrier. During the 36 months after the barrier installation there were no fatalities.

The following two photographs illustrate the effectiveness of the center barrier preventing head-on collisions.

ROUTE 22 - LOW CENTER CURB REPLACED IN MOUNTAINSIDE

The original low center island barrier apparently was considered sufficient for traffic conditions through the 1940's and early 1950's. Post-war production of high speed motor vehicles, and resultant increased traffic volumes, rendered this type of median "barrier" wholly ineffective. Low profile barriers have no effectiveness to prevent head-on collisions and frequent openings for left turns create traffic slowdowns and rear-end collisions.

The following two photographs illustrate the low center "barrier" and the modern high center barrier which replaced it.


HARRY WILLIAMS
THE TRAILER MAN
SALES & SERVICE
HOTEL
VICTORIA

FOR RENT
SALE
LEASE
WILSON

ROUTE 4 - CENTER BARRIERS TESTED

In 1955 the section of this busy highway in Englewood and Teaneck, which daily carried traffic to and from the George Washington Bridge, was chosen as a test site for various types of center barrier. The criteria for choosing the best design and material consisted of three factors: which barrier would cause the least deceleration in order to prevent rear-end collisions; which design would cause the least "rebound" to adjacent vehicles; which design would prevent the colliding vehicle from striking the car ahead.

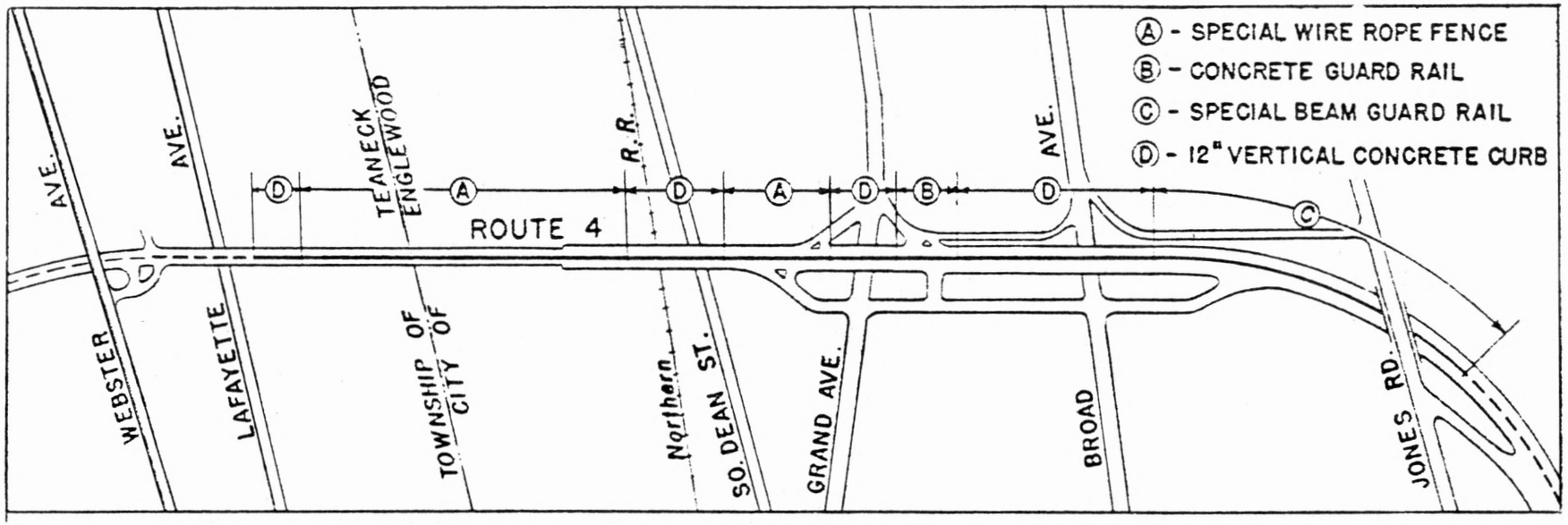
The concrete curved barrier adopted by the Department proved its superiority in these and other tests.

ACCIDENT COMPARISONS

Route 4 in Teaneck. In the 18-month period prior to installation of a center barrier there were 16 head-on accidents resulting in 28 injuries and two fatalities. In the four-year period following barrier installation there were eight head-on collisions resulting in only three injuries and one death. This is half as many accidents in more than twice the period of time.

This record emphasizes the need for the center barrier as a life saver and the need for continuing research and improvement of this important device.

Route 4 in Englewood - There were 25 head-on accidents resulting in 37 injuries and five fatalities in the three-year period preceding construction of a center barrier. Six head-on collisions resulting in five injuries and one death in the seven-year period following completion of the barrier. This is one-fifth as many fatalities in more than twice the period of time -- still far too many.



ROUTE 1 - ACCIDENTS REDUCED

Route U.S. 1 & 9 - Pulaski Skyway - There were 367 accidents resulting in 271 injuries and eight fatalities in the two-year period prior to installation of a center barrier. There were 172 accidents producing 106 injuries but no deaths in the two years after the barrier was completed. This is less than half as many accidents, with deaths eliminated. This is our goal throughout the State and we need the support of all drivers of motor vehicles as well as pedestrians to reach this goal.

The photo is evidence of how the center barrier on Route 1 in South Brunswick Township stopped a driverless truck which had drifted from a diner parking lot when its brakes failed.

ASSOCIATED
AT
TRANSPORT

ROUTE 1 - CENTER BARRIER CONSTRUCTION

Upper portion of the facing photograph shows center barrier construction completed and paving operations underway above the intersection during 1959. Below the intersection a portion of the old low center island and grass median is shown. Continuation of construction provided jug handle turns and traffic signals at this intersection.

Jughandles

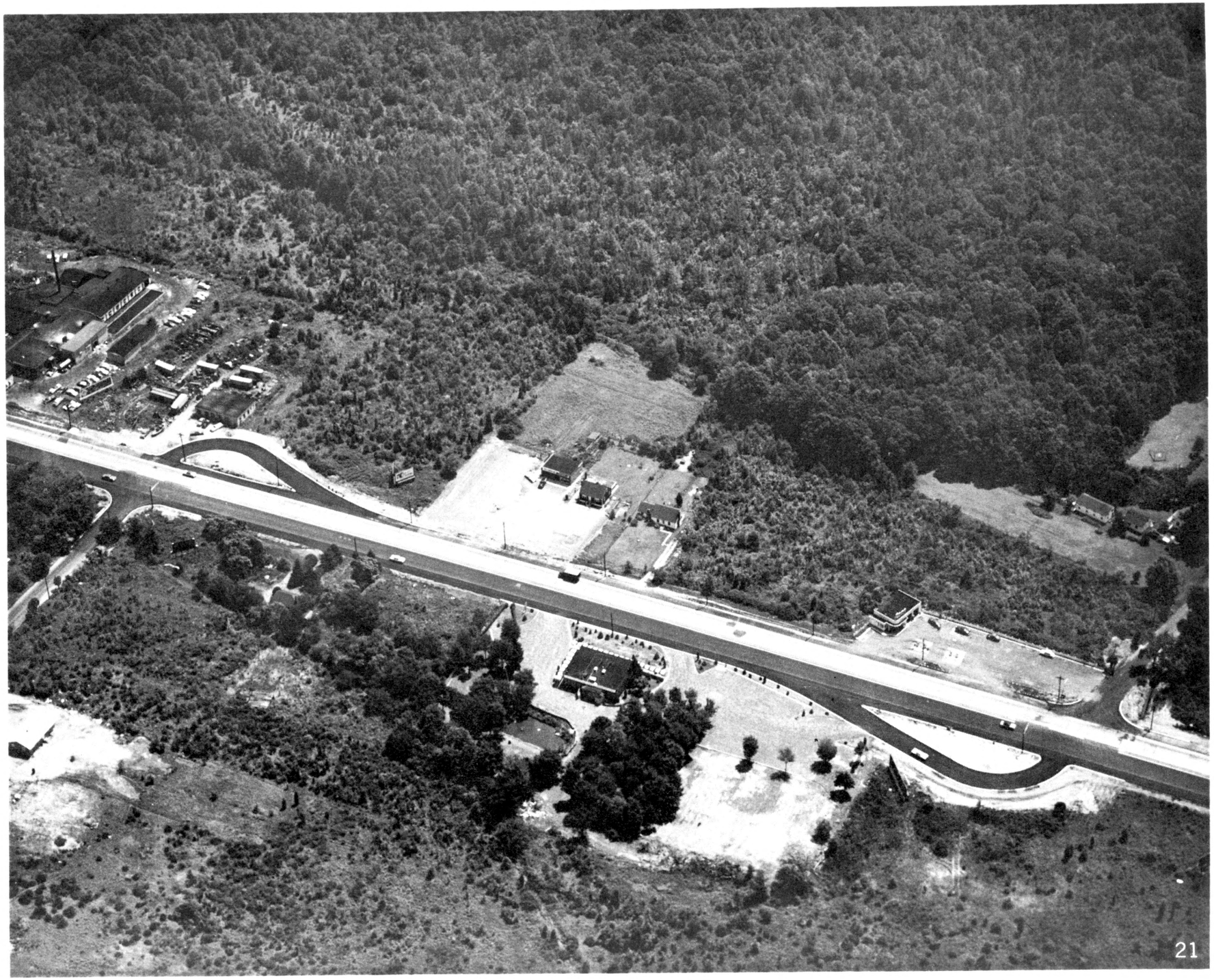
Experience with jug handle turns adapted to meet the conditions and configuration of the unprotected intersection, has proven that this facility eliminates blockage of the center traffic lane by left turn movements into opposing traffic and prevents multiple rear-end collisions, by channeling left turning vehicles off the highway so they can subsequently cross under traffic signal protection. Since 1953, 410 jug handles have been constructed and more of these are replacing traffic circles throughout the State.

ROUTE 1 -"TURNAROUND"JUG HANDLES BETWEEN WIDELY SEPARATED INTERSECTIONS

It has been found that where the volume of left turns is heavy enough to block traffic, a left turn jug handle is justified. A distance of one-half mile between intersections is normally sufficient for construction of a turnaround, however, the Department has installed jug handles within a distance of a quarter of a mile in order to serve densely populated or heavily commercialized areas.

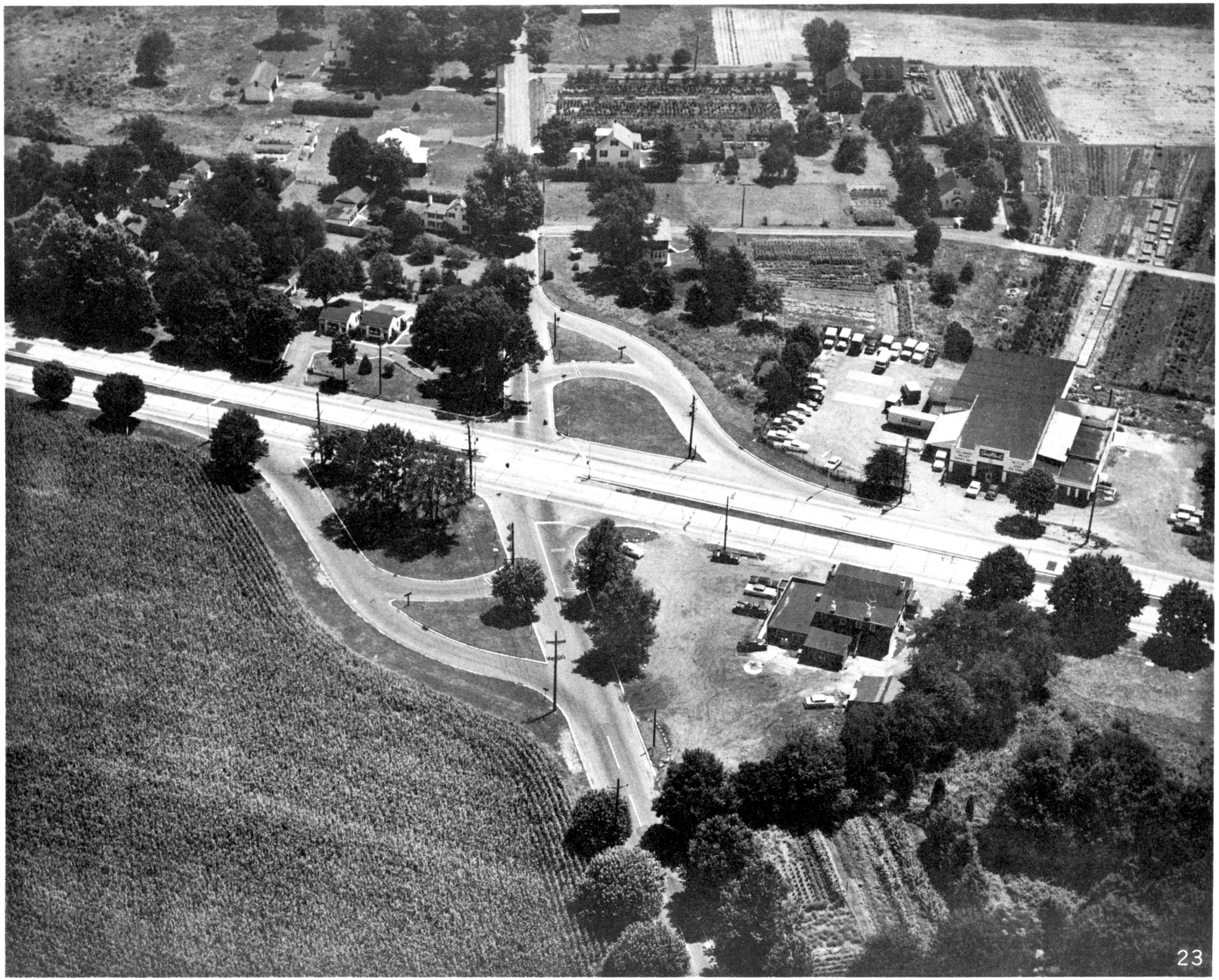
ROUTE 1 - JUNCTION JUG HANDLES

Where a minor road connects with a main highway but does not cross it, a single jug handle permits safe left turns into the minor road under traffic signal protection and prevents cars which stop to make left turns from blocking the center lane.



ROUTE 1 - FULL INTERSECTION JUG HANDLES

Where a minor road crosses the main highway, jug handle turns are provided to serve both directions of traffic on the main highway. Jug handles permit right turns into their slots in advance of the intersection providing turning safety and keeping the intersection clear of opposing traffic movements.



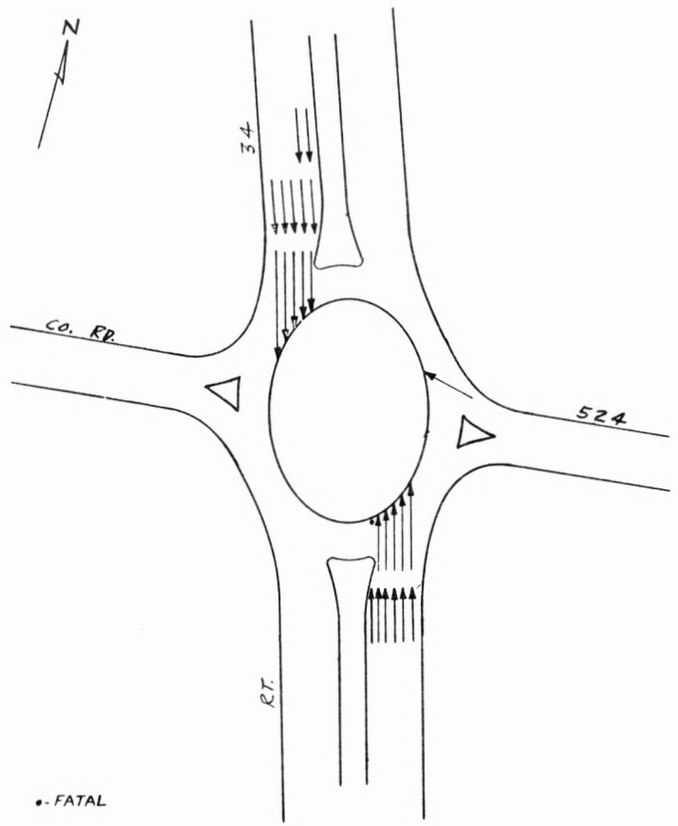
Traffic Circles & Interchanges

The achievement of building safety into old roads is made possible by the use of modern design in our travelers most dangerous location - the busy intersection. New Jersey endeavored to solve the problem 40 years ago gradually adding more and more traffic circles. The first circle was built in 1925 and the last of the State's 73 traffic circles was constructed in 1952. These are being modernized and replaced as rapidly as available funds permit.

ROUTE 34 - ALLENWOOD CIRCLE

Limited visibility here was a definite accident factor as Allenwood Circle is situated at the bottom of a rather long downhill approach for Route 34 traffic, traveling both north and south. Heavy fog often envelops this low spot, so that Route 34 vehicles moving even at the posted maximum speed of 50 m.p.h. approached the circle too rapidly to avoid hitting the vertical curbing of the circle. Directional signs (arrows) at the circle were ineffectual.

In the 18 months prior to improvement, 24 accidents, including one fatality were recorded, most of them at night.

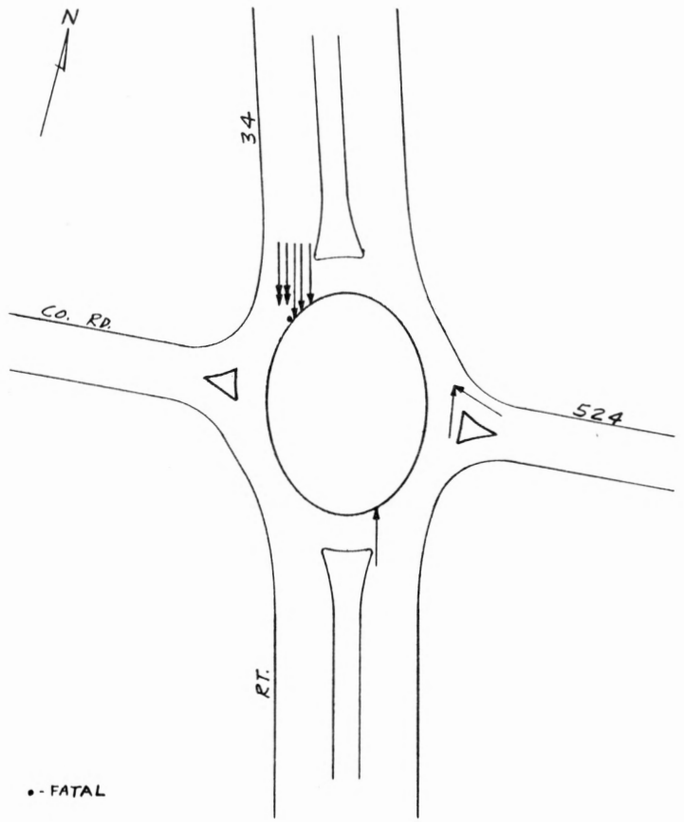


ROUTE 34 - ALLENWOOD CIRCLE - IMPROVEMENT

To warn motorists approaching the circle, large (12" dia.) overhead triple flasher lights were installed facing northbound and southbound traffic on Route 34.

Sections of the vertical curbing around the circle, facing Route 34 motorists traveling in both directions were lowered to minimize injury or vehicular damage should a driver fail to make the turn.

This spot improvement resulted in a reduction in the accident rate, from an average of 16 collisions yearly before the safety improvement to an annual rate of eight accidents after the change. Obviously, further improvements and refinements will be made as future traffic volumes dictate.

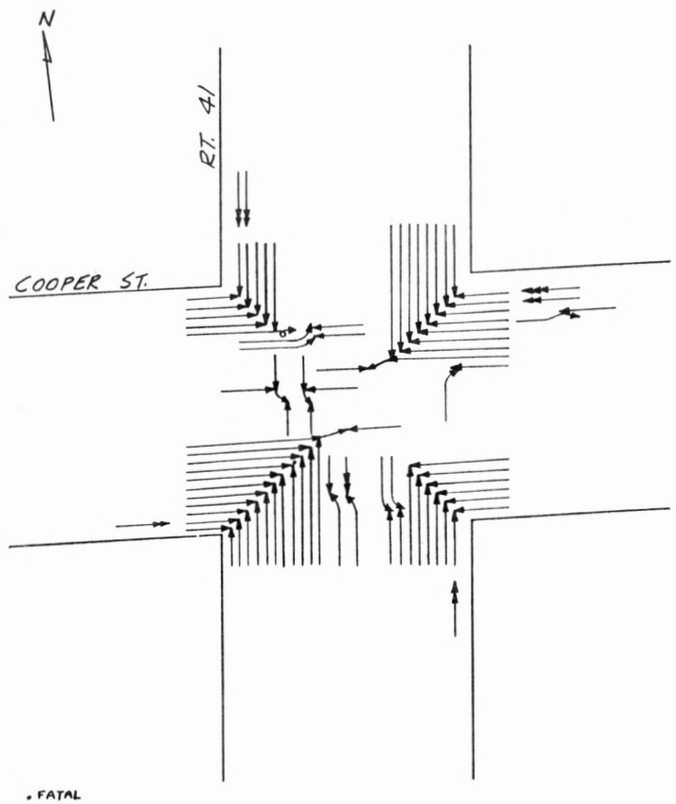


AMERICAN

ROUTE 41 - DEPTFORD TOWNSHIP

The intersection of State Route 41 and Cooper Street, Deptford Township, was the scene of 46 traffic accidents during the four-year period from January 1, 1959 to January 1, 1963 resulting in one motorist being killed in a right angle collision. An average of 11 accidents occurred each year, with ten persons injured.

Steep approaches to the intersection for northbound traffic on Route 41, and westbound traffic on Cooper Street were found to be major contributory causes of accidents.

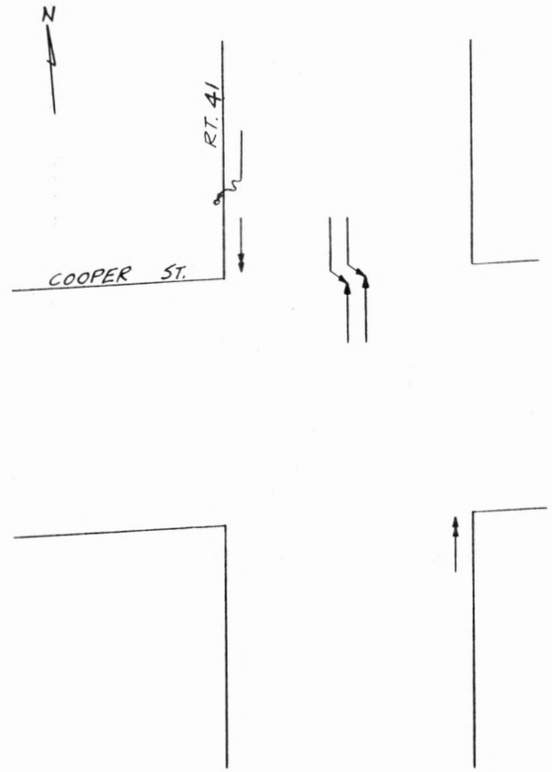


Sinclair
Mobil

ROUTE 41 - DEPTFORD TOWNSHIP IMPROVEMENT

To provide safety control and permit a reasonable flow of cross traffic, semi-actuated traffic signals with pedestrian push buttons were installed in mid-May 1963 and all "stop" signs on Cooper Street were removed.

In the one and one-half years immediately following the spot improvement, accidents were reduced to five at this intersection resulting in three injuries, no fatalities.



Mobil
PEPSI
SAVE-RITE
28 9
MOFFA'S Farm
TURN LEFT

ROUTE 1 - SPLIT TRAFFIC CIRCLE

When traffic density becomes too heavy for circles to function adequately, as a first step, the circle may be split to provide the main highway with a through-flowing pattern while the secondary road continues to use portions of the circle.

Eventually, we plan to eliminate all traffic circles.

ROUTE 1 - TRAFFIC CIRCLE EVOLVES TO INTERCHANGE

The traffic circle serving Routes 1 and 18 (New Brunswick) was a major "bottleneck" due to tremendous residential and commercial development east of Route 1 (Right Side of Photo).

An earlier project had split the circle, which relieved the circle for a short period, However, signal operation during peak hours was backing up Route 1 traffic north of the Raritan River Bridge.

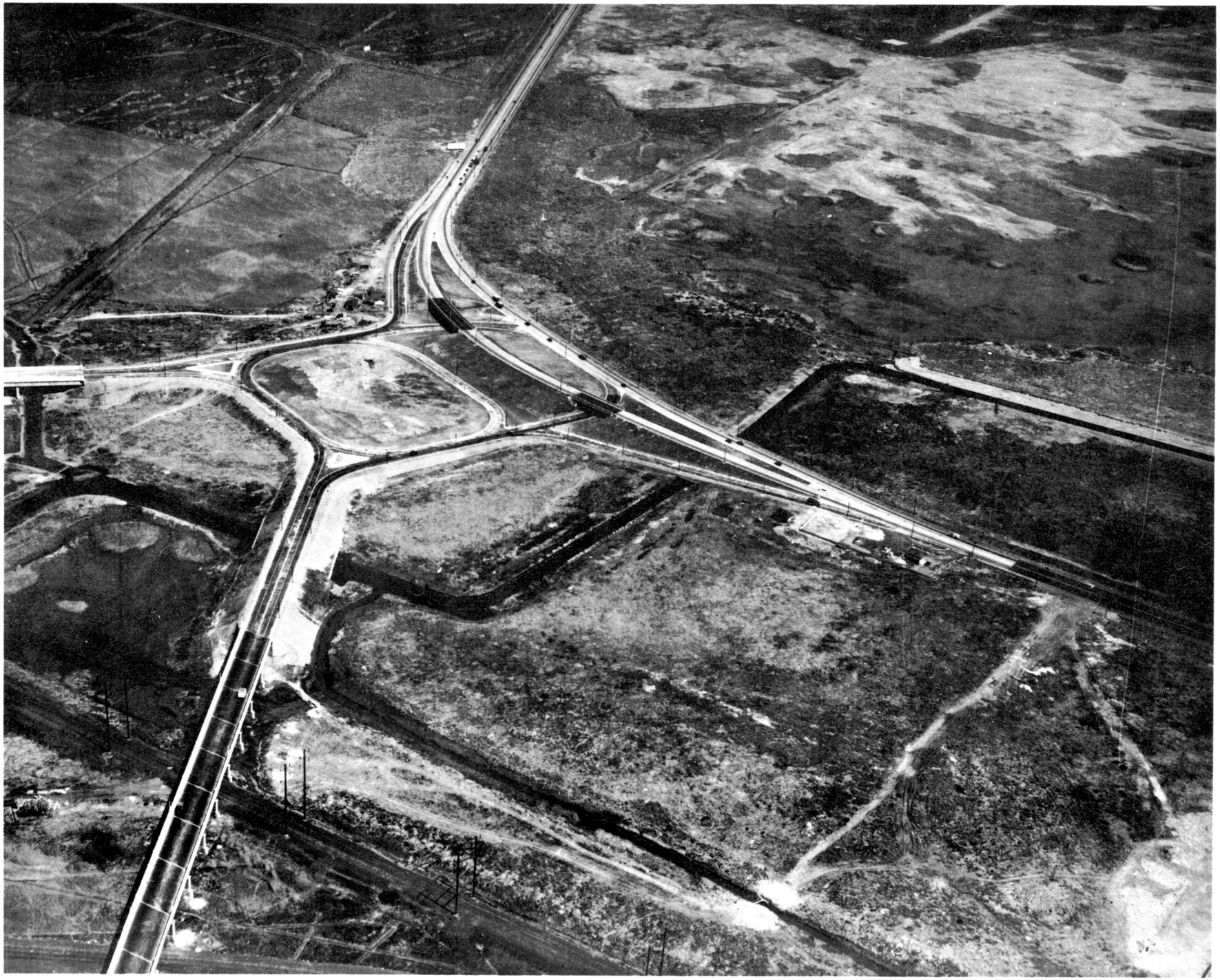
This photo shows absorption of traffic circle by interchange construction. Next photo shows completed interchange.

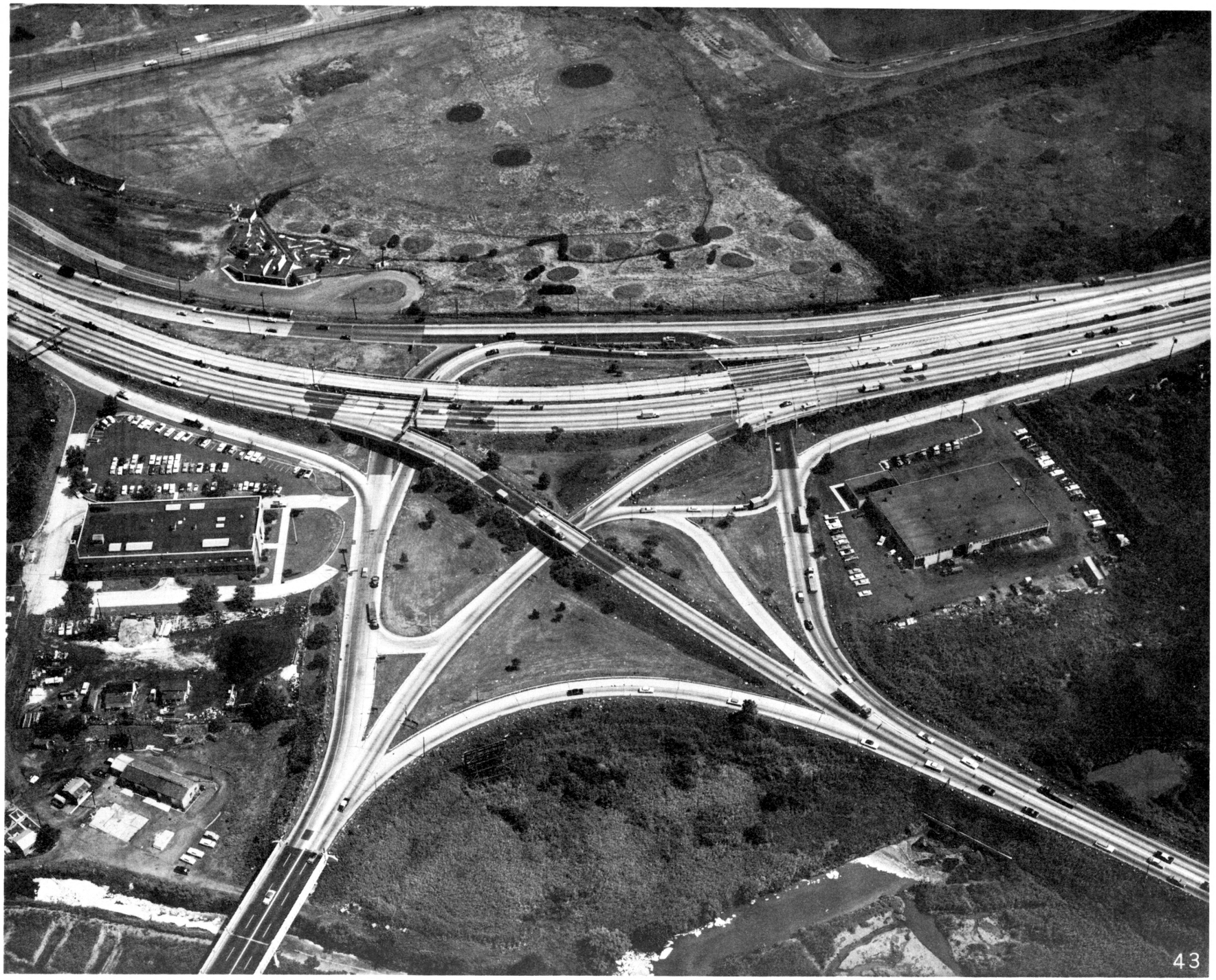
ROUTES 1, 9, 21 and 22 - NEWARK

One of the oldest traffic circles in the nation serves the congested intersection of four of the State's major highways in the northern metropolitan area, distributing an average daily traffic volume in excess of 186,000 vehicles.

Between 1932 and today the circle has been through several stages of growth. It was enlarged to better serve the highways. Later overpasses and connecting ramps were constructed.

The first photograph shows the circle enlarged to handle increased traffic volumes. The second photograph reveals the addition of overpasses and connecting ramps providing a modernized facility which handles the increased traffic volumes.





Intersections

There are thousands of intersections on the State Highway System, ranging from the rural farm-to-market road to an interchange of more than 40 lane miles of ramps and roadways. When traffic volumes demand and finances are available, the Department constructs the overpass or underpass design. In some urban areas, where space is not available or due to convergence of several highways, the Department installs special signs and lighting arrangements in an effort to achieve safety and free traffic flow.

ROUTE 30 - MODERN INTERSECTION

Here is a grade crossing serving Interstate Route 295 ramps, a major cross-state highway to seashore resort area, (Route 30) and a county road.

The design illustrates safety benefits which can be derived from adaptation of modern traffic-circle and jug handle designs, and strategic lighting and signing.

Overpasses & Underpasses

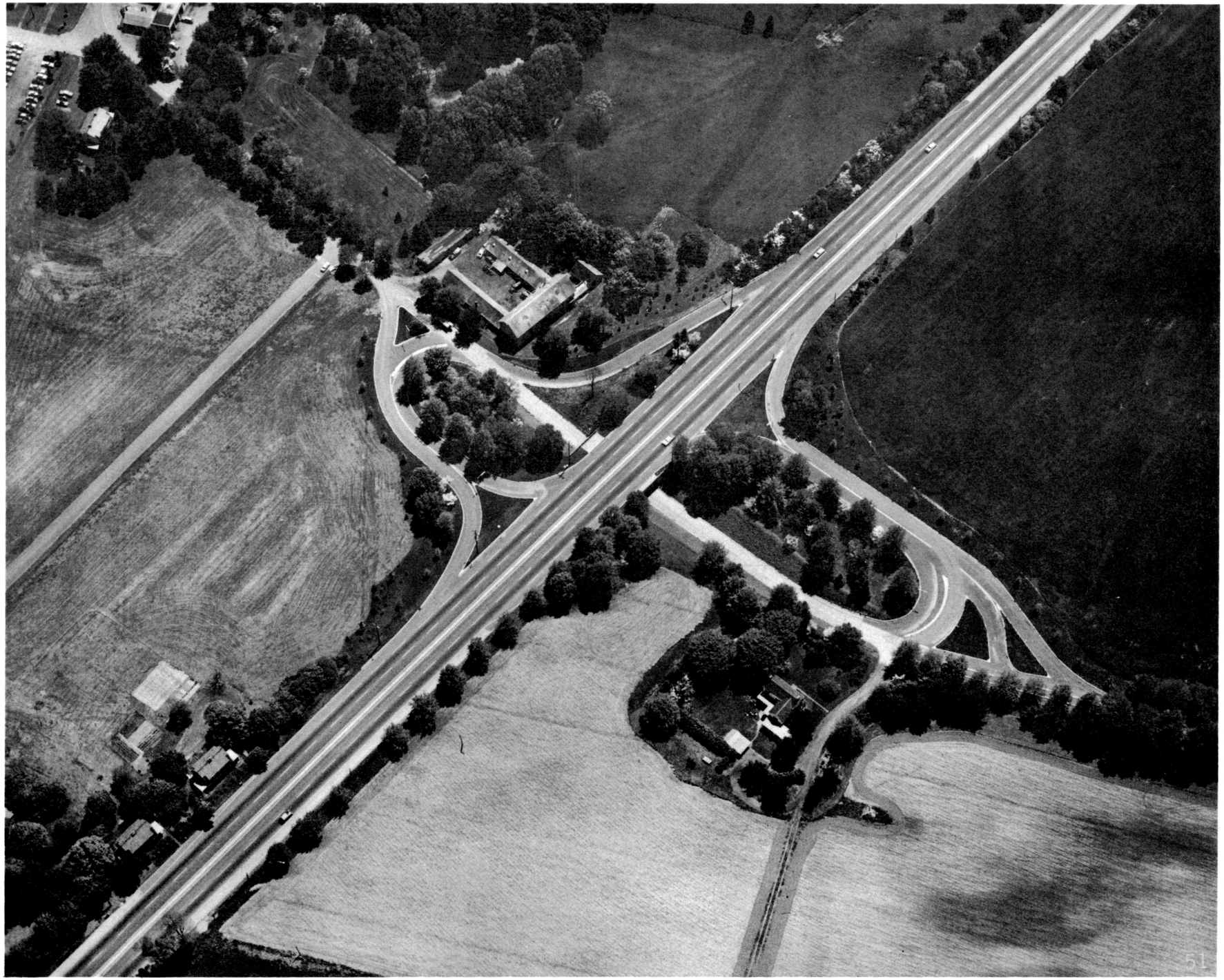
The preferred solution to the elimination of accidents at intersections is the overpass or underpass. These are designed for vehicular as well as for pedestrian traffic. They facilitate the flow of traffic on the major route while permitting crossing traffic to proceed without interruption.

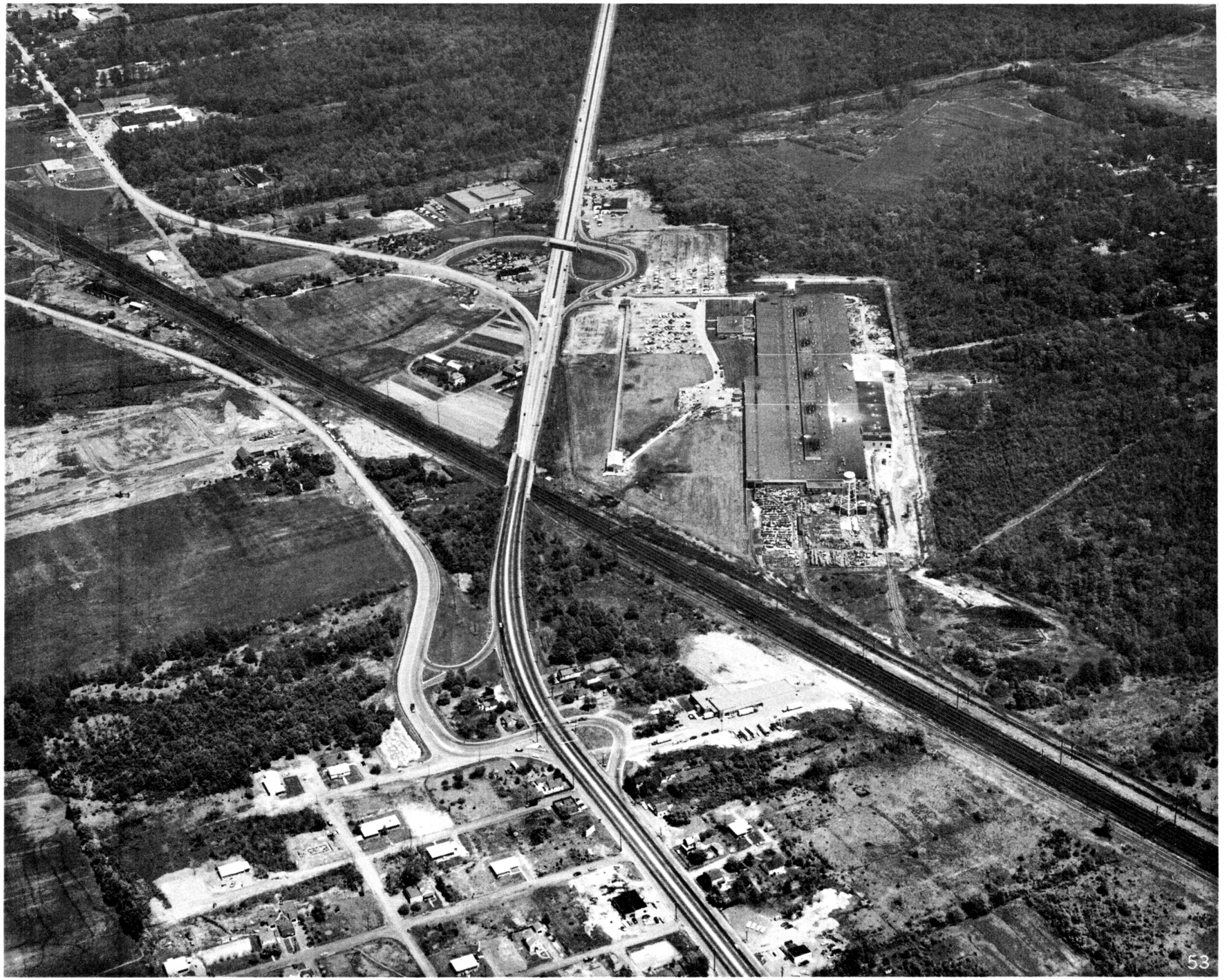
The first photograph illustrates a vehicular underpass at Route 1 between Trenton and New Brunswick.

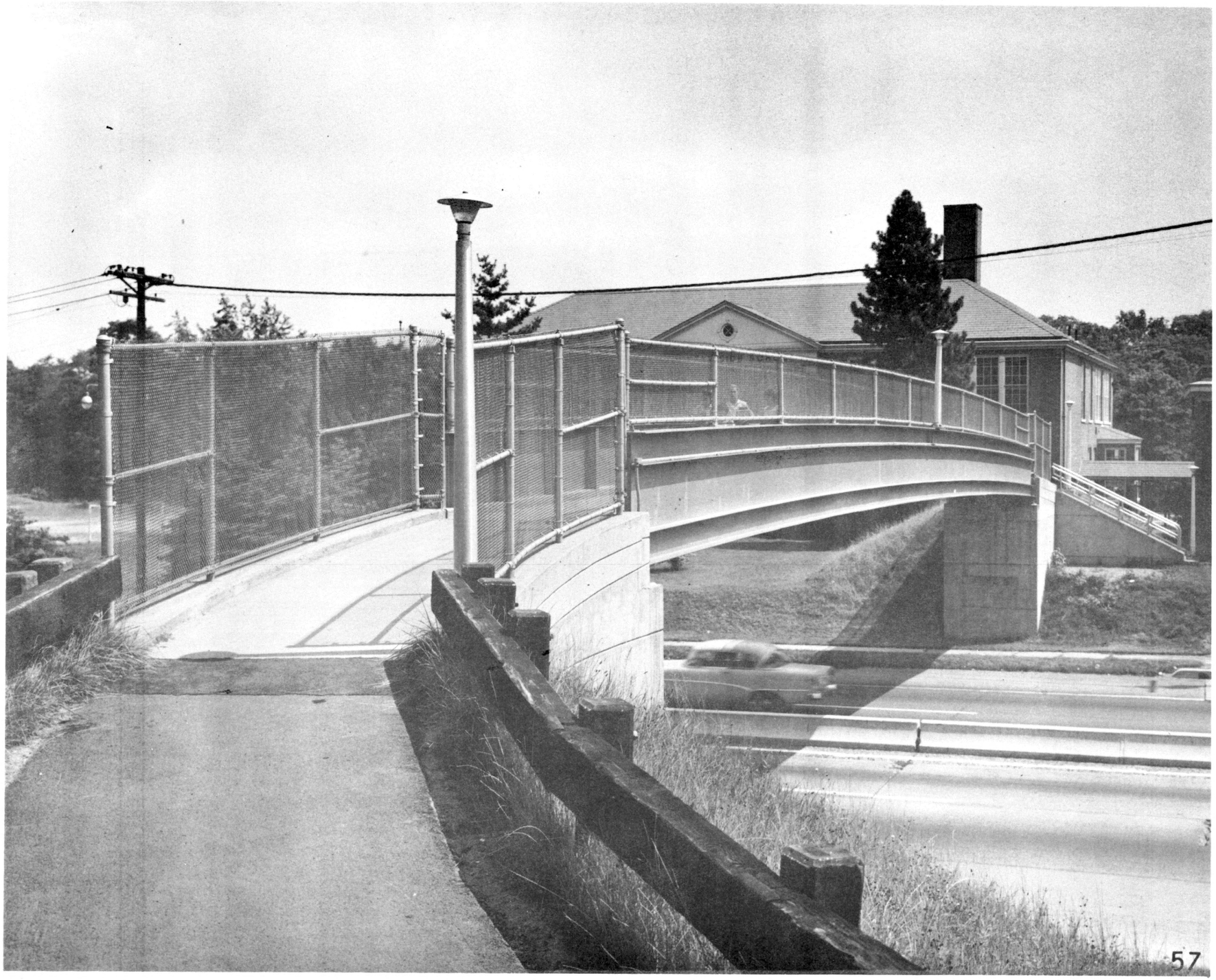
The second photograph illustrates a vehicular overpass for Route 1 combined with a jug handle, designed to fit a compound need; the jug handle serves the industrial highway, while the overpass serves industrial plants and the highway leading to New Brunswick.

The third photograph illustrates a pedestrian overpass for Route 29 Freeway, Trenton, constructed to make a scenic river park accessible to residents of the area.

The fourth photograph illustrates a pedestrian overpass over Route 22, Mountainside, which provides safe crossing for pedestrians walking to and from the residential area.







PEDESTRIAN OVERPASSES AND UNDERPASSES PRESENTLY IN SERVICE

ROUTE	TYPE	LOCATION
3	2 Overpasses	Secaucus
4	2 Overpasses	Paramus
	Overpass	River Edge
	Overpass	Teaneck
	Overpass	Englewood
U.S. 9	Tunnel	South Amboy
U.S. 9 W	Overpass	Rockleigh
1 & 9 Truck	2 Underpasses	Jersey City
21	Tunnel	Newark
	3 Underpasses	Belleville
22	Overpass	Phillipsburg
29	2 Overpasses	Trenton
30	2 Overpasses	Camden
46	Tunnel	Caldwell
	Underpass	Clifton
	Overpass	East Paterson
	Overpass	Lodi
	Overpass	Hasbrouck Heights
	Overpass	Fort Lee
69	Underpass	Stanton Station
I-80	Overpass	Denville
U.S. 130	3 Overpasses	Pennsauken
169-170	Overpass	Bayonne
206	2 Overpasses	Culvers Lake
208	Overpass	Hawthorne
444 (Parkway)	Overpass	Kenilworth
I-495	Overpass	North Bergen

Creeper Lanes

The "creeper" lane was developed to promote safety on two-lane highways in rolling or hilly terrain. The creeper lane is an outside lane added to the pavement on the uphill side. It provides travel way for slow moving vehicles, thus avoiding having faster moving vehicles risk head-on collisions with opposing traffic. A total of 40 creeper lanes have been installed on the State Highway System since 1954.

The following photograph illustrates a creeper lane in use on Route 69 southbound, near Ringoes.

Shoulder Service Areas

Wide shoulders are provided on busy highways especially where services are available, such as public telephone booths. The wider shoulder permits vehicles to pull completely off the traveled portions of the highway and park safely while using the public facility. The following photograph illustrates the shoulder service area in use on Route U.S. 1 and 9, Newark.

LINCOLN TUNNEL to Midtown New York
HOLLAND TUNNEL to Downtown
New York & Brooklyn
GEORGE
WASHINGTON BRIDGE

Heated Highway Surface

The Department has for some time experimented with electrically heated paving during the winter months to prevent accumulation of snow and ice formations. The object being to melt the snow as it falls and prevent ice forming, rather than having to resort to the conventional snow plow operation.

The first photo shows an electrically heated pavement section installed in the entrance ramp leading to an overpass on Routes 17 and 46 in Teterboro. The installation, completed in 1964, resulted from the successful experimental installation in 1961 at the Route 1 and 9 bridge over the Passaic River.

The second photo shows the electrically heated eastbound roadway leading to the Route 1 and 9 bridge over the Passaic River. Note the westbound roadway is snow covered.

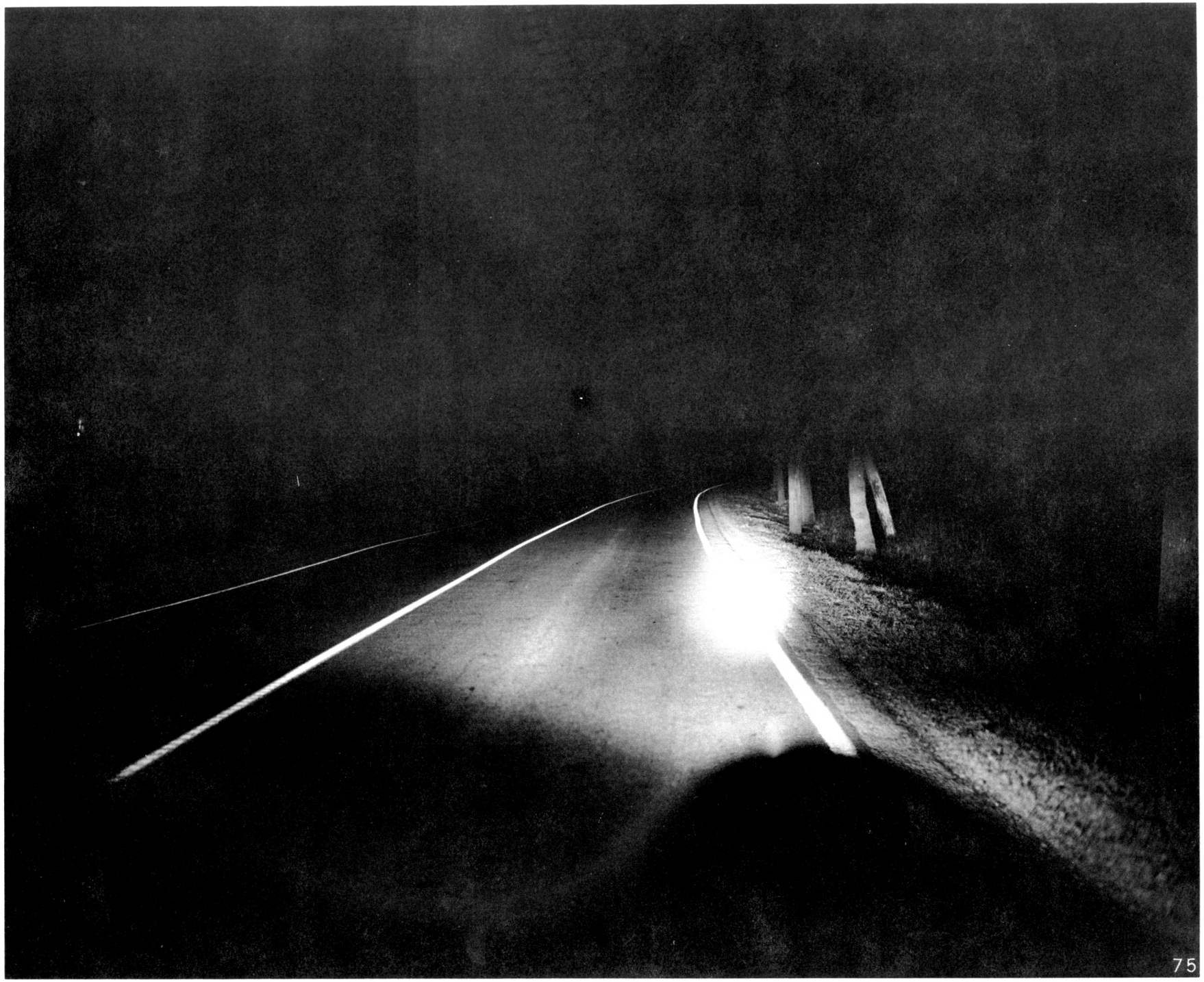
PEPSI COLA
SEA-LAND

Reflective Lines

One of the most simple safety programs, yet one of the most effective, is the white reflective line applied to the outer edge of the highway.

New Jersey was the first State (back in 1954), to utilize this safety measure. At first, white stripes were painted on blacktop highways; public reaction was so strongly in favor of this advance that the program was expanded to include all State highways regardless of type of surface. All new State highways are white lined before being opened to traffic.

White reflective lines on the outer edge of highway pavement are a guide for normal night driving and in foggy weather make the difference between safe driving and possible unfortunate experiences.



Spot Improvement Record

On the following pages are listed spot improvements completed during the current fiscal year - the result of the Department's Traffic Safety Coordinators and Inspection Teams field operations. Also listed are spot improvements under construction. In the ten-year period prior to fiscal 1965 more than 335 spot improvements were completed.

Additional projects are constantly under investigation, planning and design, moving steadily toward construction. As an example of the Department's continuing attention to spot improvement locations, it has also installed in excess of a thousand traffic signals at highway intersections and in school areas.

SAFETY CONSTRUCTION COMPLETED FROM JULY 1964 TO SEPT. 1965

ROUTE	LOCATION	DESCRIPTION
1 & 9	Stiles St., Linden Union County	Left turn slot
1 & 9	Wood Ave., Linden Union County	Left turn slot
1 & 9	Woodlawn Ave., Linden Union County	Left turn slot
1 & 9	Park Ave., Linden Union County	Left turn slot
1 & 9	Port St. connection to S.B. Local, Newark Essex County	Pavement widening
1 & 9	Broad & Grand Avenues Boro of Ridgefield Bergen County	Channelization & resurfacing
1 Business	Jersey Ave., Jersey City Hudson County	Curb construction
1 & 130	Georges Rd. Traffic Circle New Brunswick Middlesex County (continued)	Curb revision

SAFETY CONSTRUCTION COMPLETED FROM JULY 1964 TO SEPT. 1965

ROUTE	LOCATION	DESCRIPTION
10	Mill Brook Rd. Randolph Township Morris County	Intersection revision Traffic signal Installation
15	Township of Sparta Sussex County	Creeper lane construction
17	Race Track Rd. Circle Bergen County	Sloping curb construction
18	School Yard to Ramps Madison Township Middlesex County	Steps & sidewalk construction
22	Country Club Rd. Bridgewater Township Somerset County	Intersection revision Traffic signal installation
23	Stevens Ave. Cedar Grove Township Essex County	Intersection revision Traffic signal installation
34	County Road 524 Wall Township Monmouth County	Sloping curb and flashing arrows
46	Main St. to Lee Ave. Rockaway Township Morris County	Resurfacing

(continued)

SAFETY CONSTRUCTION COMPLETED FROM JULY 1964 TO SEPT. 1965

ROUTE	LOCATION	DESCRIPTION
69	Changewater & New Hampton Rds. Boro of Hampton Hunterdon County	Slope construction
70	Grove St. & Ellisburg Circle Delaware Township Camden County	Sloping curb
71	Main St. Boro of Manasquan Monmouth County	Intersection revision
73	Fellowship Rd. Mt. Laurel Township Burlington County	Left turn slot and traffic signal
88	Bay Ave. Boro of Point Pleasant Ocean County	Intersection revision
206	Skillman Rd. Montgomery Township Somerset County	Resurfacing & curb construction
295	Rt. 42 (Freeway) Boro of Bellmawr Camden County	Resurfacing

SAFETY CONSTRUCTION RECENTLY COMPLETED

ROUTE	LOCATION	REMEDIAL ACTION
U.S.30	Franklin Avenue	Traffic signal installed.
U.S.40	Co. Rd. 555	Flashing signal installed.
69	Lebanon Township Bethlehem Township Glen Gardner	Engineering study completed, all no passing zones are proper.
U.S.22	White House	Speed check made. Local State Police content with existing speed limit.
69	Co. Rd. 523	Timing of signals checked.
U.S.202-69	Reaville Rd.	Signal changed from fixed time to semi-actuated.
69	Eartle's Corner	Flashing signal installed.
23	Fairfield Rd.	Traffic signal re-timed
U.S.46	Wayne Township	Eastbound inside shoulder paved.
U.S.46	New Rd.	Jug handles and signalization installed.
U.S.46	Mt. Olive Township	Four-lane highway constructed.
23	Wantage Township	Curve signs erected.
24	Port Murray Rd.	Flashing signal installed.
37	Mathis Bridge	Lane control installed.
U.S.1	Edison Township & Woodbridge Township	Center barrier constructed.

Continuing Safety Programs

The State Highway Department has a continuing program for traffic safety, embracing areas of research, effective design, engineering and utilization of traffic accident location and severity records.

DIVISION OF RESEARCH

A Bureau in the Division of Research is devoted exclusively to Traffic Safety Research. The Work Program for Federal Aid Project HPR-1 (1) includes the following projects aimed solely to provide traffic safety.

1.	Center Barrier Accident Analysis	$84,000
2.	Accident Decision Relationship	23,000
3.	Skid Resistance Study	20,000
4.	Emergency Call System	40,000
5.	Audio Signs	40,000
6.	Vehicle Detection	40,000

The Center Barrier Accident Analysis study is being conducted by Stevens Institute of Technology and has been underway for several years. Stevens Institute has very close liaison with the Cornell Aeronautical Laboratory which has conducted vehicular impact studies.

Also, the work on Skid Resistance of traveled highway surface has been assigned to Stevens Institute of Technology.

One of the important and "hoped for" attainments is a project classified as the "Fog Broom". The State has had underway an ambitious research project aiming towards minimizing the effect of fog on driver safety.

The Federal Bureau of Public Roads requested the Department to make a literature search in an effort to compile all known approaches to this study, the object being to provide a detailed work plan that would not duplicate the effort of others.

The review of available research which may provide "fallout" studies that will be of value to the Department's program is proceeding. This program will be energetically pursued.

ENGINEERING
AND
TRAFFIC ACCIDENT RECORDS

For every reported accident, a "punch card" is prepared containing approximately 30 characteristics pertinent to the accident. These "punch cards" are prepared by the Division of Motor Vehicles and duplicates forwarded to the State Highway Department.

A number of computer programs have been adopted for analyzing this data. Through these programs, the Department determines the number and severity of accidents on sections of State highways and also obtains a breakdown as to type, time and conditions of the accident. Any unusual type of accident requires a more detailed on-the-spot investigation of the section of the highway to determine if the condition or the design of the highway may have been a major contributing factor and every fatal accident on the State Highway System is investigated immediately by Department Safety Engineers to determine if the highway design was at fault. With this information, the Design Engineers are able to take corrective action in future designs and immediate remedial action for the section of highway involved.

Close liaison is maintained with both the State Police and the Division of Motor Vehicles. The Department has Traffic Safety Coordinators for all twenty-one of our counties. These Coordinators advise Headquarters of all accident-prone locations that are brought to their attention by local officials and the police. Within the past year, Traffic Safety Coordinators have provided a list of locations in each county considered the most hazardous.

Conclusion

The present, continuing and ultimate goal of the New Jersey State Highway Department is to provide safe and efficient movement of people and of goods. This policy is being aggressively pursued to the limit of fiscal and departmental manpower resources available.

The Department is acutely aware of injuries and fatalities occurring on State highways which, in many cases, have been virtually inundated by a flood of traffic not envisioned when the bulk of New Jersey highways were built decades ago.

The desire and determination to eliminate such threats to New Jersey motorists far outstrips the facilities the Department has with which to do the job. The question is not "Shall we eliminate risk locations?" but, "Which locations are the first and most hazardous and do we have funds with which to eliminate them?"

The Department's basic answer to this question is "We give equal consideration both to the rural intersections and the gigantic metropolitan interchanges when human lives are in the balance."

The Department is fully aware of its obligation to the people, to discharge its responsibilities in a manner that will provide the greatest benefits to the greatest number of New Jersey citizens and to its' visitors with a minimum of inconvenience.

BUREAU OF PUBLIC INFORMATION

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