

# Engineering

## Planning:

The planning function in Delaware's highway program has received more emphasis as a guiding element in the roadbuilding process. This new concept has expanded the scope of work and increased the responsibilities of the planning office. While retaining its research and fact-finding characteristics, planning has now assumed a major role in the formulation of recommended plans, schedules and controls for the guidance of the Department.

The primary responsibility of the planning office is to provide information necessary for the formulation and execution of a highway improvement program founded on sound principles of economics and engineering. To fulfill this responsibility, the following major planning activities are in continuous operation:

- 1: A comprehensive transportation planning process for both rural and urban areas considering present and anticipated community and area land development.
- 2: A study of the present physical and service adequacy of the highways, along with a forecast of future deficiencies.
- 3: A study of long-range highway needs and cost.
- 4: The development of a 6-Year Capital Improvement Program and in turn the recommendation of each year's Improvement Program for which funding is received.
- 5: The development of an effective scheduling and monitoring system to trace progress of projects from their initial conception to their construction.
- 6: The location studies of new routes and major upgrading of present routes considering such items as traffic demand, local impact, construction costs, engineering features and other pertinent factors.

To successfully carry out the planning function of the Department, this office was divided into the following sections:

- 1: Office Management
- 2: Mapping & Drafting
- 3: Planning Survey
- 4: Transportation Studies
- 5: Advance Planning

The description, condition, and use of the nearly 4,300 miles of State maintained streets and roads is continually revised to reflect current conditions. A road inventory, containing information about the physical characteristics of all roads and streets in the State, is maintained for the purpose of preparing the many different maps, compiling summaries on the extent of certain types of roads, the estimation of future highway

needs by type and extent, and answering questions about the extent of State maintenance responsibilities.

In conjunction with the Bridge Design section, a procedure was developed for inventorying and rating all bridges.

A program of counting the amount and type of traffic on all State maintained roads is conducted to obtain information necessary to evaluate route locations, geometric design, pavement thickness design, intersection design, traffic control measures, and project priorities.

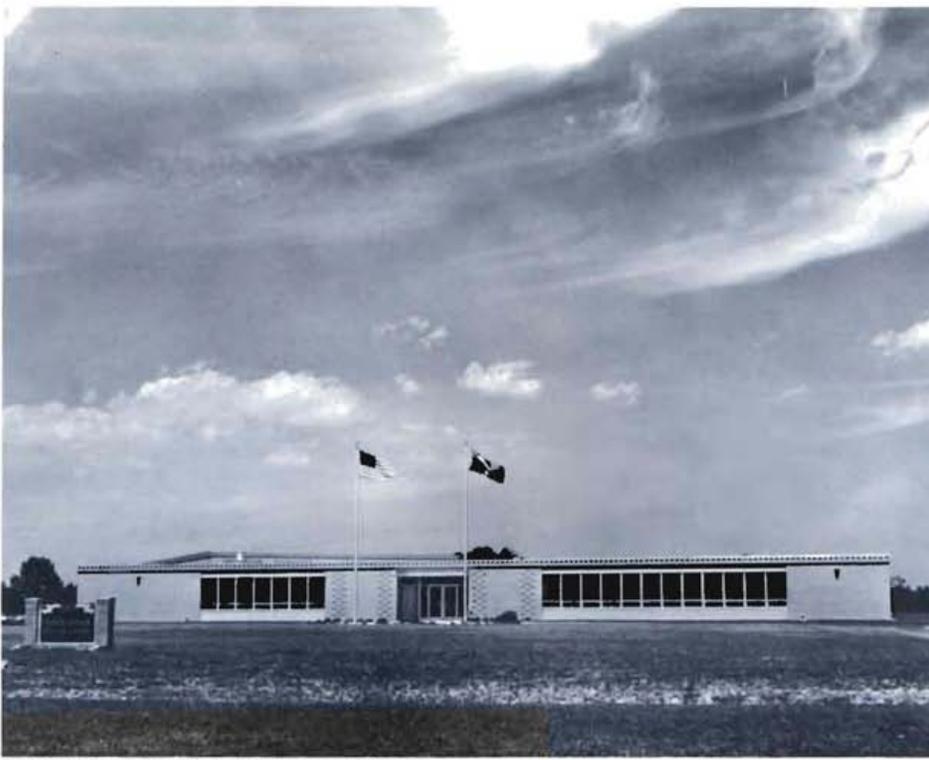
Traffic volume counts are made to determine the number of vehicles using every segment of the State Highway System.

An inventory, beginning January 1, 1963, of all accidents occurring on state-maintained streets, except for the City of Wilmington, is maintained presenting the type of accident, location, surrounding roadway characteristics and many other details for each accident. Each accident was coded and punched on IBM cards and tabulations were made of the accidents. This information is used in locating and correcting hazardous locations. A four-year safety spot improvement program has been prepared from our accident data that will result in making improvements to 100 locations that have been found to be hazardous.

The New Castle County Program has completed the third year in its three-part program of a metropolitan area-wide land use and transportation planning program for New Castle County. The first year of Program activity included the gathering of massive amounts of data on existing land use, existing transportation facilities, and travel demands and patterns. The second year's requirements included the classification, evaluation and travel patterns, their relationship to land use, and the determining of the adequacy of the present transportation system to meet the existing travel demands.

The third year's schedule has included the projection of population and land use trends into terms of the planning year of 1985. From this planned development pattern, the Program determined forecasts of travel between sub-areas of the metropolitan area, as well as forecasts of through travel. Based on these travel forecasts, alternative plans for an economical and efficient highway system to serve the area were developed, technically tested and evaluated.

From the alternative plans evaluated, a single plan was selected and recommended for adoption. The major emphasis in this transportation system planning was in the development of a highway system that would



*Sussex County Division Headquarters*



*New Castle County Division Headquarters*



*Kent County Division Headquarters*

lie within the financial capability of the State.

The following reports were approved, published and issued to the public during the year:

*Summary Findings Report  
Travel demands and  
Transportation facilities:*

- 1: Inventory of Regional Activity
- 2: The Regional Development Setting
- 3: The Distribution of Activity
- 4: The Intensity of Activity
- 5: Magnitude of Travel Demand
- 6: Supply and Use of Highway Facilities
- 7: Supply and Use of Mass Transportation Service
- 8: Land Development 1954-1964
- 9: Railroad Travel Characteristics
- 10: Attitudes Toward Housing and Travel

*Kent and Sussex Study:*

In the Summer of 1966 Roadside Origin-Destination Interviews were conducted at the External Cordon Stations. These Stations were located at the External Boundary of the Study Area on enough of the principal roads to include 98% of the traffic entering or leaving Kent and Sussex Counties.

This external interviewing produced information on approximately 22,000 trips, which will be taken as statistically representative of total external travel.

All survey work is completed for the 1966-1967 fiscal year and some preliminary information released.

*Office Management:*

There is annually appropriated to the 51 Delaware Municipalities a sum equal to 1 cent per gallon of State Motor Fuel Tax collected on motor fuels sold within the State, but in no event shall a sum of \$2,000,000 be appropriated in any one fiscal year. The Municipalities use this money to make street improvements, maintain streets, provide traffic signals and signing, police regulations and other related items. The Highway Planning Office makes an annual inventory of streets in each municipality and prepares a listing for all eligible streets. A certification of the amount of money for each Municipality is made to the Treasurer of the State of Delaware.

*Performance Bonds:*

Since the inception of the bonding law (H. B. 256) in 1951, many miles of streets, constructed to Department standards have been included in the maintenance system.

Reflecting the governments tightening of monies, this past year has been light in comparison to several earlier years, for additional bonding. Table I tabulates the performance bonds received this year.

At present there are a total of 105 active bonds still outstanding, representing 43.38 miles of suburban streets in various stages of construction. Total value of this construction amounts to \$3,121,042.50.

### *Voluntary Completion:*

Voluntary completion bonds, initially started in 1957, enabled developers of housing projects to procure settlement on certain homes when construction was unable to proceed and having streets meeting certain requirements. Since 1957, 185 voluntary completion bonds have been received and accepted. This year 10 were received and found acceptable to the Department. At this time, in addition to the aforementioned number, 10 additional bonds are still outstanding which need only minor street repairs for acceptance.

### *Road Design:*

Design on 16 projects with a combined estimated construction cost of \$4.2 million dollars was completed by the Road Design Section this year. The work ranged from sidewalk studies to major highway reconstruction projects.

Responsibility for the review of consultants' plans came into the Section last year. We reviewed and accepted 7 projects for a total of 8.7 billion dollars worth of construction.

### *Right of Way Division:*

In the field of Right-of-Way, changes seem unending. The Right-of-Way Division must conform to revised Federal and State statutes and policies, court decisions, public opinion, legal opinions, changing conditions, philosophies and revised decision concepts. Along with these continuing changes, the Right-of-Way Division's work is primarily concerned with people and public funds.

Every possible effort is made to maintain equitable balance between fair treatment of the property owners and protection of the State. The successful acquisition of 1,650 parcels of land required for highway construction this year reflects not only the fair work of 12 negotiators assigned to this phase of right-of-way activities but the cooperation of property owners who are aware of the State's fair approach to value

and damages. Only 11 of the total acquisitions reached the condemnation stage.

### *Utilities:*

The complications of Road Design and Construction include the relocation of such utilities as gas, water, telephone, sanitary sewer and electric services as well as railroad grade crossings and safety installations.

Utility relocations and adjustments on road projects requires the careful advance planning of the Utility Division and its coordination not only with the various utility organization but on an inter-departmental basis as well.

Throughout the life of a project, the Division reviews and approves all changes, prepares cost figures, processes preliminary and final estimates, and arranges for payment.

To stress the significance of the Division's responsibilities, 127 miles of mains, sewers, underground conduits and power lines were adjusted or relocated during the fiscal year. As work on Interstate 95 progressed toward completion, utility adjustments continued to keep ahead of construction and are approximately 80% complete. With the development of plans for Interstate 495, original estimate of utility adjustments has been updated to a new total cost of 4.5



million dollars.

### Materials and Research:

Thousands of tests are performed each year by the Materials and Research Division to determine the most efficient and effective materials for highway use, and to maintain quality control of the materials as they are used in construction.

The laboratory takes advantage of the most advanced techniques and equipment to facilitate testing procedures. One example is the nuclear moisture-density equipment which has performed 240 tests during the year accumulating experimental data which will eventually eliminate time-consuming conventional testing procedures.

With many new specifications, requirements, equipment and machinery, this Division feels it is very fortunate to have five employees with more than 20 years experience, twenty-two with 10 years or more; and in addition, twelve with 5 or more years experience. This has enabled the Division to perform the tasks of inspection, testing, and giving technical assistance plus plans and specification work to all engineering and maintenance divisions.

In addition to the testing and approval of all materials used in Highway Construction and Maintenance, the Division is always

busy with borings and surveys on preliminary engineering, checking specifications, writing specifications and research of new products and trying to improve those materials and practices in existence.

### Construction

Maintaining a state-wide quality control both on Departmental construction work and contract projects is the chief function of the Construction Division.

Division personnel assist in the review of all preliminary data and attend preconstruction meetings held with the contractor and utility representatives. From the time the "Notice to Proceed with the Work" is issued until completion of the project, division engineers review and audit all reimbursements to the contractor, coordinate contract changes, inspect work progress and act as construction consultants if help is requested. When the final field inspection is complete, a recommendation for acceptance or rejection is issued by the division.

Fifty-eight contracts were completed and accepted for a total of 77.355 miles (excluding the Turnpike Division) during the past fiscal year.

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*Map making is an important function of Planning Operations.*





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### *Annual Construction Report:*

Annual highway construction in Delaware during fiscal 1967 consisted of a program in which 446 projects were actively under construction. Of these projects 58 were completed and accepted at a total cost of \$21,849,720.90, covering 77.2355 miles.

These projects consisted of new location, reconstruction of existing highways, bridges, drainage structures, and mosquito control. The completed projects are described as follows:

#### **New Castle**

*Contract No. 64-01-004*  
Cranston Heights Viaduct Repairs

*Contract No. 64-01-010*  
North Star Road

*Contract No. 64-01-013*  
Noxontown Road

*Contract No. 64-01-028*  
River Road

*Contract No. 64-01-030*  
Foulk Road

*Contract No. 64-05-013*  
Drainage—Gordon Heights & Bellefonte Streets

*Contract No. 65-03-012*  
Dragon Creek Impoundment

*Contract No. 65-06-003*  
Hot Mix Patching Program 1965-66

*Contract No. 65-06-004*  
Concrete Patching Program 1965-66

*Contract No. 65-09-006*  
Drainage—Silview Streets

*Contract No. 65-10-010*  
Garden of Eden Road #226

*Contract No. 66-01-005*  
Augustine Bridge Cut-off Protection Fence

*Contract No. 66-05-006*  
Brandywine Hundred Improvements

*Contract No. 66-05-007*  
Christiana Hundred Improvements

*Contract No. 66-05-008*  
Mill Creek Hundred Improvements

*Contract No. 66-05-009*  
New Castle Hundred Improvements

*Contract No. 66-05-010*  
White Clay Creek & Peneader Hundred Improvements

*Contract No. 66-06-001*  
New Castle Avenue Sidewalks

*Contract No. 66-06-003*  
Newport Bridge Repairs

*Contract No. 66-08-002*  
Concrete Patching Program 1966-67

*Contract No. 66-09-001*  
Christiana Yard Chain Link Fence

#### **Kent**

*Contract No. 64-01-007*  
Road 65—Smyrna North

*Contract No. 64-01-019*  
Bishops Corner Leipsic

*Contract No. 64-01-033*  
North Little Creek Road

*Contract No. 64-05-007*  
Route 12—Md. Line towards Felton

*Contract No. 64-10-003*  
Nixon Lane—Dover (S.D. #94)

*Contract No. 65-02-013/014*  
Smyrna Intersection Improvements

*Contract No. 65-04-006*  
Bridge Replacement #398B

*Contract No. 65-06-006*  
Hot Mix Patching Program 1965-66

*Contract No. 65-07-003*  
Port Mahon Improvement

*Contract No. 65-12-007*  
Kitts Hummock Impoundment

*Contract No. 66-01-003*  
Marsh Ditching

*Contract No. 66-05-012*  
Resurfacing Program 1966-67

#### **Sussex**

*Contract No. 64-01-034*  
Route 5—Route 24 to Harbeson

*Contract No. 64-01-035*  
Georgetown to Cokesbury Church

*Contract No. 64-06-003*  
Main Street—Selbyville

*Contract No. 65-01-001*  
Nassau Bypass

*Contract No. 65-01-002*  
Route 14—Nassau to Route 16

*Contract No. 65-03-003*  
Route 113—Maryland Line to Dagsboro

*Contract No. 65-06-008*  
Hot Mix Patching Program 1965-66

*Contract No. 65-07-010*  
Dirt Roads

*Contract No. 65-10-006*  
Dirt Roads

*Contract No. 65-10-007/02-001*  
Dirt Roads and Virginia Avenue—Seaford

*Contract No. 65-11-004*  
Broadkill Beach Road

*Contract No. 66-02-001*  
Bethel Bridge Borings

*Contract No. 66-02-900*  
(Mosquito Control) Airplane Spraying

*Contract No. 66-02-901*  
(Mosquito Control) Helicopter Spraying

*Contract No. 66-03-002*  
Marsh Ditching

*Contract No. 66-03-008*  
Route 113—Intersection Improvements

*Contract No. 66-04-002*  
Aerial Fertilization of Dune Grass

*Contract No. 66-08-004*  
Cripple Creek Drainage

*Contract No. 66-10-001*  
Road 60—West of Selbyville

## Freeways

*Contract No. 64-03-004*  
South Wilmington Viaduct—Section II

*Contract No. 65-04-009*  
Right-of-Way Fencing

*Contract No. 65-05-004*  
Demolition—Addicks Estates

*Contract No. 65-01-007/005*  
Bridges 6-9 and 6-10

*Contract No. 66-05-018*  
Demolition—West Minquadale

*Contract No. 66-08-003*  
Demolition—Seton and Bellevue Manor

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## Uncompleted Contracts

### Hot-Mix Patching Program

*Contract No. 66-05-016*  
Placing approximately 25,000 tons of hot-mix asphaltic concrete at various locations throughout Kent County.

### Webb's Lane, SU-228(1)

*Contract No. 64-01-008*  
Improvements consist of constructing hot-mix asphaltic concrete pavement on select borrow subbase and other incidental construction.

### Felton to Frederica, S-22(3)

*Contract No. 64-06-005*  
Widen existing pavement with portland cement concrete base course and surfacing entire travelway with hot-mix asphaltic concrete on plant mix asphalt base course.

### Moore's Lake Spillway & Facilities

*Contract No. 66-02-004*  
Improvements consist of the removal of the existing concrete spillway. Constructing a reinforced-concrete spillway, raising the earth dike bordering the west end of the lake, and placing rip-rap on the dike's front slopes.

### Little Creek Streets

*Contract No. 65-10-011*  
Improvements consist of placing 6" crusher-run base course, widening and surfacing travelway with hot-mix asphaltic concrete.

### Kent Conuty Dirt Roads

*Contract No. 66-09-002*  
Construction consists of 8" of soil-cement base course with surfacing treated travelway. Two roads will have asphalt stabilized base course.

### Queen Street Extension, SU-44(2)

*Contract No. 64-01-075*  
Construction consists of new roadway with 6½" hot-mix asphaltic concrete on 6" select borrow and resurface existing roadway with 2" hot-mix concrete.

## Bridges:

The Bridge Division's primary responsibilities are design of highway bridges, sign and pedestrian bridges, culverts, retaining walls, water control structures, impoundments, and other related installations. The Division also serves as construction and maintenance advisor on these facilities.

Bridge Division designs were included in 14 of the projects for which bids were taken during the fiscal year including 18 new bridges and culverts, widening or repairs to 6 existing bridges and one mosquito control impoundment.

Although a percentage of the design work is performed by consultants, conformity to highway standards is maintained with Divisional personnel acting as construction and maintenance advisors on these facilities.

*A: Pouring a new concrete pavement.*

*B: Draftsmen are important members of the Highway Department's new highway construction team.*



B



A

## Maintenance and Equipment:

Once a highway has been committed to public use, the type of service it performs depends largely on how well it is maintained.

The never ending job of the maintenance forces includes patching the roadway, preparing shoulders for resurfacing, spreading calcium chloride for dust control, spraying chemicals for roadside weed control, correcting drainage problems, surface treating roads, repairing bridges, removing litter from highways and beaches, and maintaining rest areas. The summer mowing program is replaced in winter with snow fence erection and maintenance as well as sanding and plowing during snow storms. Each year this Section sends out Emergency Equipment Rental Rate Agreements to approximately 75 contractors throughout the State for execution. Last year we had 40 contractors execute the 1966-67 Agreement. The 1967-68 Equipment Rental Rate Agreements should be sent out the first part of October.

An annual snow removal equipment inspection is held in each County. Snow removal cost reports are submitted for each major snow storm.

Each year this Section prepares proposals for hot-mix and resurfacing work, statewide.

Aside from these routine tasks, maintenance personnel have the responsibility of planting and caring for trees and shrubbery along the highways and in rest areas.

In Sussex County, sand dune restoration continues to require maintenance division time. Since the 1962 storm, these dunes have been restored to a height of 18 feet above mean sea level through the use of a series of fences, grading operations and dikes built with earth-moving equipment.

Vegetation is planted and encouraged to further stabilize the dunes.

Continued emphasis has been placed on safety during the year. In addition to regularly scheduled safety meetings, literature, safety displays and equipment are supplied to maintenance personnel. Safety manuals are now available to all personnel in addition of a Maintenance Manual.

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*A: Signs are a major maintenance problem.*

*B: Snow is another factor which contributes to highway maintenance costs.*

*C: Good looking roadways and shoulders are the product of efficient maintenance operations conducted at the County Division level.*



B



C

## Traffic:

The Traffic Division is basically operational, but there is also a direct need for engineering. This, however, is not engineering in the generally accepted sense of the word, but rather involves making a functional unit out of the highway, a cold engineering product, and the driver, an emotional human being.

The Traffic Division provides a great deal of information which is used in improving highway design. The information has been used recently to implement the Department's Intersection Improvement Program, and in the review of all construction projects.

A general effort to improve signing is underway. While the Department has complied with the Manual of Uniform Traffic Control Devices for Streets and Highways over the years, new types of signing have been installed for testing in the hope that several may find their way into the new manual. One of the most important and difficult tasks lies in keeping standards alive and growing so that they do not retard the development of highway safety, but rather complement it.

## Traffic Signals:

Aside from the usual number of new signal installations, the signal group of the Traffic Division has instituted some new projects. The first thing is the use of 12" oversized signal indications. In the past, the use of the 12" face was limited to the red signal, with green and yellow of the standard 8" size. It was felt that at critical locations there is a definite need for more prominent display of all signal indications to better attract the attention of motorists. Oversized signal heads have been installed at some of the most accident-prone intersections, such as at U. S. Route 113 and Delaware Route 16 near Ellendale. Even though there has not been enough time to properly evaluate the effectiveness of oversized signal heads, evidence seems to indicate that they are doing a better job in attracting motorists attention. The Traffic Division is phasing out pressure type vehicle detectors, because of their high maintenance cost and low level of reliability. Many of the old signalized intersections still have the pressure type detectors in use. The Traffic Division is attempting to replace them with new induction loop vehicle detectors whenever the old detectors break down, or at the heavily traveled intersections. This program will take some time to complete.

At some signalized intersections on the Kirkwood Highway, dual left turns have

been installed after reconstruction. At present, these intersections are controlled by actuated signal controllers, but these local controllers will be incorporated into a coordinated system in the near future. This will represent a completely new step in signal coordination.

Over the past several years the Department has reviewed all available solid state signal controllers, but has not placed any into service due to design shortcomings. Several auxiliary devices, such as detector relays, have been used to replace vacuum tube types. These solid state devices have proved very satisfactory, and this year the Department purchased its first all solid state controllers. These devices use solid state circuits to provide all timing and switch functions except the actual signal lamp load.

The use of solid state devices eliminates vacuum tubes which have a relatively short electrical life and relays and contacts which have a relatively short mechanical life.

The removal of these devices from the control system increases its reliability and decreases maintenance costs.

The solid state devices are incorporated on printed circuit boards which can be removed for rapid service. The use of printed circuit boards permits the serviceman to leave the main body of the controller in service and to remove and replace the specific components which are causing problems. Thus inventory costs may be reduced since standby equipment will be reduced from the entire control units to printed circuit plug-in panels. The printed circuit board can then be tested and repaired in the shop. The features of the solid state equipment are such that failure to start the transfer from the vacuum tube relay system to the solid state system would cause the transition to be more expensive each year.

## Traffic Innovations for Improved Safety and Capacity on Kirkwood Highway:

The continual increase in traffic and accidents on our important high-speed, high-volume highways makes it imperative to find new ways to increase their safety and capacity. Kirkwood Highway is one of the most important arteries in Upper New Castle County. It was recently improved as a six lane facility between Delaware Route 41 and St. James Church Road in an attempt to provide additional capacity. However, in addition to the extra travel lanes, other traffic improvements were also essential in order to provide the utmost in safety and capacity.

*The accident identification pins locate the major accident areas for the safety engineers to concentrate on in future development.*





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## *Pavement Marking Group:*

The striping crew has begun painting centerlines statewide. A new striping machine using plastic materials was recently purchased. A plastic powder is melted into a hot liquid form in this machine. Thus, when sprayed on the roadway, it only requires seconds to dry. Therefore, no protection, such as ropes or barriers, is required for this material. This material is used for crosswalks, stop bars, and railroad markings.

## *Freeways Division:*

Although sixteen projects with a total bid value in excess of thirty-five million dollars were active during the fiscal year 1966-67, no additional Interstate Route mileage within the State was opened to traffic. With the award of seven contracts during the current period, ranging in contract value from a two thousand five hundred dollar demolition job to the 2.3 million dollar Shipley-Talley Roads project, all remaining major contracts required for the completion of Delaware's portion of Interstate Route I-95 are under agreement. Various stages of construction—mainline roadway, access ramps, interchanges, bridges and drainage—were in progress from the Pennsylvania State Line, Delaware's northern terminus of I-95, to the South Wilmington Viaduct, a distance of approximately eight and one-quarter miles.

(For tabulation of active contracts see appendix)

To perform the necessary layout and inspection of projects, the Freeways Division operated with an average of fifty-seven employees. A total of ninety estimates with a value of 8.2 million dollars were processed for payment of construction completed during the fiscal year. Approximately 1200 contractor's payrolls were reviewed and checked for correct labor classifications, hourly rates, gross and net pay.

It is anticipated that the entire I-95 Route will be completed and in service by the close of the 1968 construction season.

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*A: The introduction of a new highway to the affected residents.*

*B: Part of the realization of a new highway and its relationship to adjacent property owners.*



B



## Roadside Development:

As of December 1, 1966 the Roadside Development Section of the State Highway Department was officially established as a Section and as an integral part of the Departments' operations. The primary purpose of this Section is to coordinate with all other divisions and agencies concerned in the planning, construction, maintenance and administration of the State's highways to insure that the plant material is preserved, enhanced and displayed in a manner contributing to the realization of an economical, safe, well engineered, designed and aesthetically pleasing highway.

Our appropriation of funds for landscaping and scenic enhancement, made available as the result of the "Highway Beautification Act of 1965", amounted to \$166,672 for fiscal year 1967. These funds are 100% Federal and require no matching by the State. The Sum of \$8,850 was authorized for landscaping U. S. Route 113 between the southern city limits of Milford northerly to the Murderkill River Bridge. A contract for completing the Smyrna Safety Rest Area is planned and will require \$130,172. This project will include the construction of picnic tables, charcoal grills, lighting of the area, landscaping, and the rest area building heated for all year usage with flush toilet facilities. The balance of the \$166,672 was allocated for preliminary engineering.

In addition to allocating the Fiscal 1967 "Federal Beautification Funds", work has been completed on landscaping U. S. Route 13 from Delmar to Harrington.

The construction of deceleration and acceleration lanes, paved parking areas with curbing, fencing, the selective removal of trees, and clearing and grubbing of the Smyrna Safety Rest Area were nearly completed by June 30, 1967.

All three of these contracts were funded with "Beautification" monies available during Fiscal 1966.

Plans have been prepared for a large landscaping contract of the Christina Interchange. There are nearly 30,000 individual shrubs or trees on the project. Special inspector training sessions and the hiring of a landscape technician to work out of this Section was required to properly staff and supervise this and many other projects.

The Section has become involved in many other areas of roadside development activities during the past year, some of which are as follows: Continuation of our experimental program with MH-30T (grass

growth retardant), Casaron (selective weed killer—kills weeds but not shrubs and trees), and Crownvetch (very hardy, vigorous, no maintenance, attractive flowering, erosion control ground cover); the marking for removal by our maintenance forces of dead and diseased trees adjacent to our roadways; coordination with the County Division Offices regarding the use of herbicides, and liming and fertilizing of our parkways; revision of our standard specifications for seeding, mulching, and planting; landscaping the New Castle Division administration building; conducting maintenance and inspectors schools for landscaping; working with civic associations and service clubs regarding plantings and/or presenting talks on roadside development; attended the 25th Annual Short Course for Roadside Development at Columbus, Ohio; and continued planning projects to improve safety and maintenance as related to plantings.

There is much yet to be accomplished in placing proper roadside development practices into our highway operations; however, we have established a point of beginning from which we can move forward. Proper planting to improve beauty and safety, while not significantly increasing maintenance requirements; and the use of chemicals such as Casaron (to control weeds in woody plant beds); 24-D (to control weeds in our parkways), soil sterilants (to eradicate vegetation under guard rails and around sign posts), and MH-30T (to reduce by up to 50% of our mowing requirements), appear to be the items of outstanding promise in our future endeavors.

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*Roadside Development plantings contribute to erosion control, crash barriers and aesthetics as evidenced by these contrasting photos.*

## *Mosquito Control:*

During the fiscal year 1967 the Mosquito Control Division contributed most of its men and equipment to the completion of the projects undertaken through the Capital Improvement Fund Program, financed by a 2 million dollar appropriation from the Divestiture Fund. This, of course, applies only to permanent type abatement, since airspraying was continued in the normal manner.

The actual ditching achieved from the Division's appropriation amounted to only 120,000 lineal feet of cleaning and ditching, a very small figure in comparison to other results during the past decade. However, significant contribution to overall control effort in Delaware were made in the form of small ditching projects and clean-up operations following work financed by the 2 million Fund, both chargeable however to that Fund.



Airspraying was likewise significantly reduced from what had been performed in previous years. This was largely attributable to the vast amount of work achieved under the field of permanent control, which eliminated many large marsh breeding sites. Moreover, extreme drought conditions and normal tide fluctuations reduced breeding development to very minimum level. Total spraying by both fixed wing aircraft and helicopter amounted to 150,000 acres.

The most significant factor in this program was the introduction in June 1967 of a new chemical known as Abate. This product represented the first effective and economical larvicide available as a weapon since resistance eliminated the use of BHC and DDT for this purpose in 1960. It is believed, for the future, Abate holds great promise, although it will be necessary over heavily vegetated areas to employ it in a granular rather than liquid form, which will regrettably increase the total application cost more than four-fold. In addition to these aerial sprayings, a greatly increased amount of ground application of chemicals was experienced. This was chiefly done in New Castle County where small isolated and inaccessible breeding areas preclude aerial applications. Nearly 3,000 gallons of insecticide were dispersed in this manner. Fogging operations, solely in the two lower Counties, consumed 204 gallons of material.

Significant additions were made during the year in the field of capital improvements. A new tank wagon truck for hauling insecticides was acquired on a trade-in-basis and a pick-up truck for New Castle organization was also purchased as a replacement item. Two items of surplus equipment, one a pick-up and the other a fork-lift truck, were also obtained. The most significant item in this field was the award of a contract to construct a new building to house the sub-division in New Castle County. This was necessitated by the fact that the old site, near the former New Castle Ferry slip, was acquired by the New Castle Commons in exchange for a parcel of surplus right-of-way from the State Highway Department. The location of a new structure is the Christina headquarters of the New Castle County Division of the Department. The contract for this work was awarded on June 23, 1967 and actual construction began on September 11, 1967 with a completion deadline of 60 working days from the latter date.

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*Mosquito Control impoundments are an important means of population reduction of this pest.*



## Controller's Office

The Controller's Office with the assistance of other divisions of the Department, has proceeded with the installation of the I.B.M. 360 Model 30 as planned. The completion of the original phases of this program is anticipated with no measurable delays. We are already being contacted by other agencies expressing an interest in the possible use of our system; however, our primary dedication to Highway use is being retained. We cannot, in good conscience, neglect to undertake work for other agencies even to the extent of upgrading our current configuration at the expense of the agencies desirous of participation.

During the ensuing year, much of our attention will be devoted to further sophistication of our machine installation and development of the Internal Audit Program. We are planning for the institution of a new budget request procedure and additional functions in the financial management area.

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*The modern computer center located in the Controller's Office.*

*This computer serves the needs of many outside agencies of the State of Delaware in addition to its highway duties.*