

ROADSIDE PROBLEMS on the INTERSTATE SYSTEM: DRAINAGE and EROSION CONTROL ASPECTS

John G. Sutton, Drainage Engineer
Engineering Division
Soil Conservation Service

In consideration of how the new Interstate highway program will influence drainage and erosion control problems, it is evident that careful planning of drainage and erosion control structures and practices is essential to prevent damage and to provide opportunity for development of adjoining agricultural lands. The wider rights-of-way will intensify drainage and erosion control problems on the highway right-of-way and on adjacent lands. Highway, drainage, and conservation authorities in each state should agree on policies, standards, and specifications to meet drainage and erosion control problems incident to new highway construction.

For several years the Committee on Interrelationship of Highway and Agricultural Drainage of the American Society of Agricultural Engineering has been working on proposed policies and design criteria for interrelated highway and agricultural drainage, erosion control, and other conservation purposes. The American Society of Agricultural Engineers has issued a tentative standard covering such recommended policies and criteria.* These are based on general considerations and on specific experience gained on the Ohio Turnpike. The specific policies and design criteria which would apply to the conditions met in each state would, of course, vary greatly. It was the intention of the ASAE Committee that the material assembled would be of value to appropriate state highway officials and others in meeting similar problems and in developing similar policies, criteria, and standards to meet highway and agricultural needs in their own states. In suggesting material for this discussion, much material will be drawn from this report.

In stating the need and purpose of the recommended criteria, the committee pointed out that special care must be taken to prevent the creation of erosion, drainage, and/or water management problems when highways are built. The construction of a modern highway places a barrier across natural and artificial drainage systems. Fills are placed in the flood plains of streams and the flow over the flood plain is retarded. Where drains are cut by side ditches and cannot support the weight of fills, they must be relocated or replaced. Surface water collected by roadside ditches frequently must be carried parallel to the highway until it can be drained into a stream crossing the highway. Minor diversions are necessary and desirable to eliminate waterways or unnecessary culverts under the highway.

The loss of existing or potentially productive land adjoining highways due to inadequate drainage or erosion will cause serious harm to the community and nation. Existing waterways and surface and tile drainage systems should be crossed, relocated, or rebuilt in such a way that they continue to function effectively and can be maintained readily. Reasonable opportunity should be provided for the future development of agricultural drainage, erosion control, and local flood control systems in accordance with the capability and use of the lands they serve.

This is one of the most important principles stated in the report. Land

*Copies obtainable from the American Society of Agricultural Engineers, St. Joseph, Mich. Price, \$1.00.

capability maps furnish excellent aids to planning drainage and erosion control systems needed to serve the adjoining lands.

Reconstruction of drainage and erosion control systems and provisions for future improvements should be based on reasonable needs for both highway and adjacent communities. Highway departments, turnpike commissions, other highway authorities, and the affected property owners should be protected from unfair appraisal of drainage or erosion control damages in obtaining rights-of-way.

There has been some misunderstanding between highway authorities, adjacent property owners, and agricultural interests. Property owners frequently complain that culvert inverts are too high or improperly located for future drainage improvements, or that their land will be flooded and they will suffer serious damage because the culvert installed by the highway authority is too small. Owners of adjoining properties frequently try to collect damages during negotiations for rights-of-way on the basis of fancied or imaginary future damage to their property, due to alterations in drainage systems.

The increasing cooperation between highway and drainage authorities, based on sound judgment of impartial engineers who have specific training and experience in these fields of work, has been found superior to decisions reached by litigation and arbitrary compromise. Public welfare should not be injured by (a) failure to provide an opportunity to make drainage, erosion control, and flood control improvements for development of residential and industrial properties and of agricultural land needed to produce food, fiber, and timber, or (b) lack of highways or transportation facilities required to move these products from the farm or factory to the consumer.

The committee suggested the following points as suitable policy considerations for meeting agricultural requirements of adjoining lands:

1. The highway authority would reconstruct affected portions of existing drainage systems to the approximate standard which existed prior to construction of the highway and provide opportunity for future drainage and flood control improvements on adjacent properties, to the standards agreed on in the state. The property owners and/or drainage authority would construct drainage or flood control systems required for improvement or protection of adjacent properties. It is recognized that highway construction may result in incidental improvement of drainage of adjacent properties, but it would not be the obligation of the highway authority to improve drainage of or to protect adjacent properties from existing flooding.
2. Payment of damages in lieu of reconstructing existing drainage systems or in lieu of providing the opportunity for future drainage improvements would be avoided wherever it is practical to do so.
3. The highway authority would construct and maintain bridges and culverts for surface drainage and all conduits under the roadway that are required for existing and future subsurface drainage.
4. All users of community drainage systems built under drainage laws would by mutual cooperation or special assessment pay for construction, reconstruction, and maintenance of the drainage system in accordance with benefits received.

One of the most difficult problems in providing adequate drainage structures is to determine improvements which will be needed for reasonable development of the affected land, and this will generally mean deeper and larger culverts than necessary to take care of existing drains. A large proportion of existing drainage systems will need to be improved in capacity and depth when they are rehabilitated.

Open-ditch systems during their life normally lose about 25 to 30 percent of their capacities and 1 to 2 feet in depth. Highway culverts should be adequate in size and depth to meet initial requirements of good design. The recommendations of the ASAE Committee are designed to accomplish this objective and those previously outlined. Emphasis is given throughout the report to planning and designing to meet future needs based on land capability in addition to meeting current needs.

The report also contains recommendations for handling borrow pits by draining them or leaving them for ponds.

Other factors of primary importance in considering this subject are the land use changes that will occur along the expressways to be built under this program. Everyone is familiar with the irregular types of suburban and industrial developments which occur, particularly along major highways. Such developments contribute to higher rates of runoff and intensify drainage and erosion control problems. Where such changes in land use are likely to affect structural design, they should be considered fully in planning structural improvements for the highways.

The wide rights-of-way required for this new highway system will necessitate the consideration of numerous factors associated with drainage and erosion control problems. The expense of mowing, spraying, and maintaining grass strips which are not easily reached from the pavement suggests the advisability of utilizing natural vegetation to control a larger proportion of the right-of-way areas. The use of land capability maps and erosion control techniques applicable to farm lands would appear to have wider use in the development of the rights-of-way.

In many cases it is possible to impound water behind highway fills to produce flood control benefits or provide ponds for agricultural or recreational uses. Such storage involves problems in construction, in handling of excess construction costs, and in obtaining easements. States may desire to give close study to the feasibility of such structures.

The large areas of pavement and improved rights-of-way will discharge increased volumes of runoff onto adjoining lands. Under many conditions the existing waterways will not handle increased flow and serious erosion or flooding will result. Many drainage and erosion control systems now serving private land will need to be enlarged or improved to handle increased volumes or runoff. Similarly, suitable waterways and structural measures off the right-of-way will, in many cases, be required to avoid serious erosion.

It is believed that each state highway authority should develop specific policies, criteria, and technical standards in cooperation with appropriate agencies relative to handling such problems.

W. H. Simonson:

It would seem as though we are in the middle of some great extremes. On the one hand, there is in the West what has been known as the "dust bowl," in which the wind erosion and watershed problems are very vital to the sound economy of the whole nation. On the other hand, there are the urbanization problems involved in this new Interstate Highway program. These great changes in land use are coming so rapidly that engineers must look forward. These rapid changes in land use in these fast-changing times, as Mr. Haskell has pointed out, are far-reaching—for possibly a 40- to 50-mile radius around our cities. This means that fine farm lands, wooded areas, lovely streams, and beauty spots are likely to be reduced to a much smaller

dimension and replaced by housing developments or put to other intensive uses. The highway engineer really has a great responsibility to make sure that all his plans are adequate for the "long pull" of a decade or two in the future.

As Mr. Sutton has pointed out, one of the greatest needs today is for coordinated operations between different agencies. This is particularly a mutual problem between the highway field and adjacent property owners, whether the ownership be private or public.

The final member of the panel is likewise interested in these mutual problems and will continue the discussion with particular emphasis on the forest and conservation aspects of the Interstate program.