STRATEGY FOR FLOODPLAIN MANAGEMENT FOR THE U.S. VIRGIN ISLANDS

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Background

The U.S. Virgin Islands is an unincorporated Territory of the United States located about 1,200 miles southeast of Miami, Florida. The Territory consists of three major islands plus about 50 smaller islands and cays. The islands have a total area of about 135 square miles and a population of approximately 100,000. The steep slopes, clayey soils, and intense rainstorms in the islands tend to create runoff with very high but short duration peak flows. Before major development occurred on the islands, these flows created few problems, since the runoff generally occurred in the cane fields, forests, or bush areas. Additionally, the towns and villages were heavily guttered or located on higher areas.

From 1960 to 1980, the Territory's population tripled. This population growth was accompanied by an era of extensive construction. Unfortunately, much of this construction occurred during droughty conditions in the 1960s, a time when runoff events were minimal and few regulations were in effect to control construction in the historic flood plains. Since about 1970, a number of major rainfall events have occurred in the Virgin Islands, causing flooding that has resulted in millions of dollars of damage to structures built in flood plains. In response, the Territorial Government instituted a long-term stormwater management and flood damage mitigation strategy that keys upon planning, regulation, construction, and education. This multi-phase approach to stormwater management should significantly reduce future flood damage.

Planning

Much of the initial direction for flood plain management came from the local office of the U.S. Soil Conservation Service (SCS) which established a strong Soil and Water Conservation District. The District encouraged: (1) the construction of dams; (2) the establishment of an earth change permit system; (3) the production of topographic maps; and (4) an engineering survey of the islands' major culverts.

In 1979, the Virgin Islands Disaster Programs Office (DPO) financed the production of a flood damage mitigation plan for the islands. This plan identified problems and solutions to the situation in the Territory, evaluated existing drainage problems, and provided guidance to avoid creating new ones. The plan outlined steps to be taken in the future, such as organization, construction, regulation, data collection, education, coordination, and budgeting. Since 1979, many of these steps have been taken by various governmental agencies.

Regulation

During the early 1960s, there were essentially no regulations that effectively regulated flood plain development. In 1971, an earth change permit system was instituted in the Territory. This required a special permit for any non-agricultural alterations to the land, including clearing, grading, and building. Some of the guidelines in the permit requirements concerned channel alteration and stabilization, detention storage, and land use in flood plain areas. The local SCS office was the major technical group in the enforcement of the rules, although the Virgin Islands Department of Public Works (DPW) was given authority.

In 1978, a coastal zone management act was passed to discourage further growth and development in flood-prone areas and assure that development in these areas is so designed as to minimize risks to life and property. The act re-emphasized and used many aspects of the earth change permit program. Its enforcement was divided between the DPW and the V.I. Department of Conservation and Cultural Affairs (DCCA).

In 1975, the Territory enacted legislation requiring demonstration that a

proposed structure was reasonably safe from flooding, before a building permit could be issued. The DPW and the V.I. Planning Office (PO) were given the responsibility to enforce this, using the 100-year flood elevation as a reference point. In addition to the above regulations, the PO continually updated draft subdivision regulations, which included provisions for regulating the construction of structures relative to the flood plain. Although not law, developers who were applying for subdivision permits were encouraged to fulfill the provisions.

The Territory has been involved with the national flood insurance program since 1975. In 1977, flood hazard boundary maps were issued to provide guidance for issuing flood insurance and for enforcing the flood hazard provisions of the building permit regulations. In 1980 the building code was modified to include and address standards necessary to permit the Flood Insurance Rate Maps (FIRM's) to go into effect. The initial studies were completed and the initial FIRM's were issued for the Territory. At the request of the V.I. Government, these were later modified to include topographic contours to facilitate their use.

Thus, in the past 10 years, the Territory has promulgated regulations necessary to manage flood plain development. However, the regulations have assigned responsibilities to a variety of agencies, and funding has been insufficient for thorough review and enforcement of the regulations. Moreover, the regulations are worded so that they unduly impose such rigorous engineering requirements on all applicants that they are often unenforceable.

Construction

The 1976 survey of 200 major culverts in the Territory indicated that many of the conveyance structures in the flood plains were not appropriate for the flows that were occurring. The Government embarked on a long-term construction program to alleviate some of the problems. In 1979, and again in 1982, selected drainage basins were studied to produce a series of drainage master plans to provide guidance in upgrading the structures within specific basins. This allowed the Government to upgrade individual structures anywhere within a basin, as monies were available, in a manner harmonious with the overall plan for the basin. This ongoing construction

program has helped to mitigate flood damage.

Educational Program

The educational program of the Territory's flood damage mitigation strategy is concerned with public awareness and technical education. As a part of public awareness program the DPO wrote and published annual editions of "Surviving the Storm" for the past five years. This brochure outlines specific steps the public can take to prevent and recover from flood damage due to tropical storms and hurricanes.

The technical education program focuses on three areas for flood damage mitigation: design, regulation, and construction. Two types of design considerations are important in the program: the design of structures that are meant to convey flood flows, and the location of structures relative to the historic flood plains. The key element of the technical educational program for the design phase is a technical procedures manual entitled, Drainage and Flood Plain Management Technical Procedures for the U.S. Virgin Islands. This manual identifies basic data on the rainfall, land use, soil types, and topography that should be used in making the calculations for design and presents available procedures that could be used for performing relevant hydrologic and hydraulic calculations. These procedures cover such items as hydrographs; runoff rates; channel routing; and designs for culverts, channels, gutters, and storage basins.

The manual is intended for use by the local design professionals as a tool in locating and designing stormwater-related structures and that the government regulatory personnel use the manual to review the procedures involved in design. Sample problems and solutions based on local examples and data are included in the text. A series of workshops was held for Government engineering and regulatory personnel to review the material. This proved to be useful, since most of the regulatory personnel reviewing permits do not have a background in engineering or hydrology.

Regulatory functions relating to flood plain management are fragmented throughout the local Government due to the manner in which the regulations were passed and inserted in the statutes. Thus, various aspects of flood plain

management are often handled by different agencies without full awareness of the overall action that should be taken. To mitigate this problem, an educational program was initiated, which consisted of producing a regulatory handbook and holding a series of training workshops. The handbook, entitled, Regulatory Handbook for Flood Damage Mitigation in the U.S. Virgin Islands is a compilation of most of the applicable regulations. In addition, it discusses the problems and objectives of flood plain management in the Territory and explains the legal liability of Government personnel in reviewing and approving permits.

A continuing series of workshops have been undertaken to: (1) review the existing regulations; (2) explore ways in which they could be implemented and/or strengthened and (3) improve the technical skills of regulatory personnel. These workshops brought together, for the first time, all the personnel who review permit applications throughout the Territory. This helped to clear up some misunderstandings of jurisdictional responsibilities and technical interpretation.

A number of structures that convey stormwater in the Territory have suffered considerable flood damage. Many of these, especially culverts, are built in the field by DPW road crews. These crews are often furnished with only the basic materials at the site and very little in the way of formal plans. They tend to use techniques and concepts that they have used in the past, some of which are better than others. However, with some minor modifications in the "field design," these structures could transport flood waters more efficiently, at little or no additional cost, and reduce damage to both the structures and surrounding property.

To this end, a booklet was written for the road crews, which illustrates some hydrologic and hydraulic principles that could assist them in their work. The booklet, entitled, "Culverts Count," was made in the form of a cartooned story illustrating the essential points in a graphical fashion that could be quickly read. The story is about local people and illustrates island situations and problems.

Summary and Conclusions

The Territory's flood damage mitigation strategy, although meant to be a

long-term program, is already having positive effects. A major emphasis of the program has been to focus on upgrading the awareness and technical skills of the regulatory personnel who review the plans and building permits for compliance with stormwater management regulations. As their confidence in their own understanding of the regulations and technical procedures has increased, their reviews have become more efficient and effective. This in turn is encouraging the local design professionals, other Government personnel, and developers to become better acquainted with the applicable regulations and procedures. This is beginning to result in designs and plans that are more appropriate for construction in and near the historic flood plains.

In general, the plan to attack the problem on multiple levels of regulation, construction, and education has been very effective in carrying out the Territory's overall flood damage mitigation strategy.

References

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PART FOUR
ON LOCATION