

OFFICE OF STRUCTURES

**MANUAL FOR HYDROLOGIC AND
HYDRAULIC DESIGN**

CHAPTER 2

LAWS AND REGULATIONS

June 2020



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DISCLAIMER

Some of the references in this manual to Federal and State laws and regulations may be out of date. If an accurate and up-to-date reference is needed for such information, the user is encouraged to consult with the applicable governing agency. For environmental laws and regulations, contact the MDOT SHA Office of Environmental Design and the MDOT SHA Office of Planning and Preliminary Engineering, Environmental Planning Division.

CHAPTER 2 LAWS AND REGULATIONS

2.1 INTRODUCTION

This chapter provides an overview of federal and state laws and regulations that influence the hydrologic and hydraulic analyses procedures of the Office of Structures (OOS), Structure Hydrology and Hydraulics Division (SHHD). This chapter should not in any way be treated as a manual upon which to base legal advice or make legal decisions. The information herein is not a summary of all existing water related laws, nor is not intended as a substitute for legal counsel.

2.1.1 Related Publications

This chapter provides summary information about laws, regulations, and policies that directly impact the design guidance and procedures of the SHHD. There are numerous publications on the legal aspects of drainage and water laws, in addition to the federal and state publications referenced herein. The reader is referred to the following publications for general information on the laws and rules relevant to drainage and water issues for highway facilities:

- American Association of State Highway and Transportation Officials (AASHTO) Drainage Manual, prepared by the AASHTO Technical Committee on Hydrology and Hydraulics, specifically Volume 1, Chapter 2 Legal Aspects (AASHTO, 2014).
- National Cooperative Highway Research Program (NCHRP) Legal Research Digests, Transportation Research Board (NCHRP, 2020).

2.2 FEDERAL LAWS AND REGULATIONS

Federal law consists of the Constitution of the United States, Acts of Congress, regulations that governmental agencies issue to implement these acts, Executive Orders issued by the President, and case law. The federal laws and regulations which have implications for the design of OOS projects and the SHHD analysis requirements include laws concerning:

- Flood insurance and construction in flood hazard areas,
- Navigation and construction in navigable waters,
- Water pollution control,
- Environmental protection,
- Protection of fish and wildlife, and
- Coastal zone management.

Acts of Congress are published immediately upon issuance and are accumulated for each session of Congress and published in the United States Statutes At Large. Compilations of Federal Statutory Law, revised annually, are available in the *United States Code* (USC), which is available online (OLRC, 2020). Some key statutes in the United States Code which have relevance for OOS projects include:

- Title 16, Conservation (16 USC)

- Title 23, Highways (23 USC)
- Title 33, Navigation and Navigable Waters (33 USC)
- Title 42, The Public Health and Welfare (42 USC)
- Title 49, Transportation (49 USC)

The *Federal Register*, which is published daily, provides a uniform system for making regulations and legal notices available to the public. Compilations of Federal regulatory material, revised annually, are available online in the *Code of Federal Regulations* (CFR) (OFR, 2020). The following regulations impact the design methods and procedures of the SHHD:

- Title 23, Highways (23 CFR)
- Title 33, Navigation and Navigable Waters (33 CFR)
- Title 40, Protection of the Environment (40 CFR)
- Title 44, Emergency Management and Assistance (44 CFR)
- Title 49, Transportation (49 CFR)

Congress enacted the National Environmental Policy Act (NEPA) of 1970 (42 USC) to establish a national policy for the environment. NEPA is overseen by the Council on Environmental Quality (CEQ). CEQ is responsible for ensuring that Federal agencies meet their NEPA obligations. Each federal agency is required to develop NEPA procedures that are consistent with CEQ regulations.

Congress enacted the Clean Water Act of 1972 to establish the basic structure for regulation of quality standards for surface waters and for discharges of pollutants into the nation's surface waters, including lakes, rivers, streams, wetlands, and coastal areas. The Clean Water Act is administered by the U.S. Environmental Protection Agency (USEPA).

The federal government regulates Waters of the United States (WOTUS). The Congress of the United States is granted constitutional power to regulate "commerce among the several states". A part of that power is the right to legislate on matters concerning the instrumentalities of interstate commerce (e.g., navigable waters). Under the Clean Water Act, Congress has directed the Environmental Protection Agency (EPA) and the Department of the Army, Army Corps of Engineers (USACE) with protecting navigable waters. The current definition of WOTUS, listing the categories of jurisdictional waters, is provided in 33 CFR, Part 328 and 40 CFR (OFR, 2020).

Federal agencies formulate and promulgate rules and regulations to implement Federal laws. The agencies tasked with implementation of regulations related to WOTUS are the Federal Highway Administration (FHWA), the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (USEPA), and the U.S. Coast Guard (USCG). Other agencies which implement Federal laws relevant to the design and analysis of OOS structures include the U.S. Fish and Wildlife Service (USFWS), which is charged with protecting wildlife resources and the Federal Emergency Management Agency (FEMA), which manages the National Flood Insurance Program. Summary information regarding each of these listed agencies and the statute or code providing regulatory authority is provided following.

2.2.1 Federal Highway Administration (FHWA)

Highway related statutes are included in USC 23, Highways and USC 49, Transportation. Federal Highway Administration (FHWA) policies and procedures are prescribed in the Code of Federal Regulations Title 23, Highways and Title 49, Transportation. An inclusive list of FHWA related legislation, regulations, and guidance is provided on the FHWA website (FHWA, 2019).

The primary Federal directive that guides the Office of Structures in location and hydraulic design of structures in floodplains is the Code of Federal Regulations Title 23, Part 650 (23 CFR 650), Bridges, Structures, and Hydraulics, Subpart A, Location and Hydraulic Design of Encroachments on Flood Plains (OFR, 2020). This regulation prescribes FHWA “policies and procedures for the location and hydraulic design of highway encroachments on flood plains”. Some FHWA policies listed in Subpart A are the requirement to minimize impacts that adversely affect floodplains, to avoid significant encroachments, where practicable, and to be consistent with National Flood Insurance Program standards and criteria.

The Federal directive that establishes national standards for the inspection and evaluation of all highway bridges is Title 23, Part 650 (23 CFR 650), Subpart C, National Bridge Inspection Standards (OFR, 2020). This regulation is applicable to all structures defined as highway bridges located on public roads. The MDOT SHA OOS bridge inventory program is established according to this regulation, including the structure inventory and appraisal system.

The Federal directive that establishes national standard to ensure adequate vertical and horizontal clearance for navigation on navigable waterways is Title 23, Part 650 (23 CFR 650), Subpart H, Navigational Clearances for Bridges. Joint coordination with the United States Coast Guard (USCG) and the United States Army Corps of Engineers (USACE) is required under this regulation.

2.2.2 U.S. Army Corps of Engineers (USACE)

The USACE has authority to regulate activities in navigable waters under the River and Harbors Act of 1899, 33 USC, Chapter 9 Protection of Navigable Waters and of Harbor and River Improvements Generally (OFR, 2020). USACE has authority to regulate certain activities in the Nation’s waters under the Clean Water Act of 1972, 33 USC, Chapter 26 Water Pollution Prevention and Control (OFR, 2020). Section 404 of the *Clean Water Act*, 33 USC 1344, prohibits the unauthorized discharge of dredged or fill material into WOTUS. The term "discharges of fill material" is applicable to OOS structure design projects, in that it includes the addition of materials into WOTUS incidental to construction of any structure. Such activities, as well as any stream relocation activities, require authorization from the USACE.

2.2.3 U.S. Environmental Protection Agency (USEPA)

The USEPA is authorized under Section 404 of the Clean Water Act of 1972 to regulate the placement of dredge or fill material into wetlands, lakes, streams, rivers, estuaries, and certain other types of waters. Section 404 is jointly implemented by USEPA and the USACE. USEPA responsibilities include development and interpretation of policy, guidance, and environmental criteria used in the evaluation of permit applications. USACE responsibilities include program administration and the issuance of permits.

The USEPA is authorized under the Section 402 of the Clean Water Act, 33 USC to administer and issue a National Pollutant Discharge Elimination System (NPDES) Permit for point source discharges. Point sources are discrete conveyances (e.g., pipes, constructed ditches), including the discharge of stormwater runoff from highway surfaces. In Maryland, the NPDES permit program is administered by the Maryland Department of the Environment (MDE).

2.2.4 U.S. Coast Guard (USCG)

USCG has regulatory authority under the Rivers and Harbors Act of 1899, 33 USC to approve plans and issue permits for bridges and causeways across navigable rivers. USCG is responsible for determining whether a permit is required and for approving the bridge location, alignment, and appropriate navigational clearances (23 CFR 650 Subpart H).

2.2.5 U.S. Fish and Wildlife Service (USFWS)

The USFWS is authorized to review and comment on the effects of a proposed project on fish and wildlife resources under the Fish and Wildlife Act of 1956, 16 USC, the Migratory Game-Fish Act, 16 USC, and the Fish and Wildlife Coordination Act, 16 USC.

Congress passed the Endangered Species Act (ESA) in 1973 to protect and recover imperiled species and the ecosystems upon which they depend. The ESA is administered by the USFWS and the National Marine Fisheries Service of the Department of Commerce. Under the ESA, species may be listed as either endangered or threatened. The listed species are then protected by the prohibition of “take”, which is defined as “to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect or attempt to engage in any such conduct”. In the regulations, harm includes not only killing or injuring a listed species, but also “significant habitat modification or degradation”.

2.2.6 Federal Emergency Management Agency (FEMA)

OOS projects located in floodplains regulated by the Federal Emergency Management Agency (FEMA) must comply with floodplain regulations as per the Code of Federal Regulations Title 44 (44 CFR). The *National Flood Insurance Act of 1968*, which requires that communities adopt adequate land use and control measures to qualify for insurance, provides the authorization for FEMA policies. Federal criteria promulgated to implement this provision contain the following requirements which can affect certain highways.

- When the Administrator of the Federal Insurance Administration has identified 100-yr flood elevations within a flood prone area (i.e., zone AE areas), but has not identified a regulatory floodway, the community must require that, until a floodway has been designated, no new construction, substantial improvements, or other development (including land fill) be permitted within this floodplain, unless it is demonstrated that the cumulative effect of the proposed use, when combined with all other existing and reasonably anticipated uses, will not increase the water surface elevation of the 100-yr flood more than 1 ft at any point within the community.
- After the floodplain area having special flood hazards, the water surface elevation for the 100-yr flood, and floodway data have been provided, the community must designate a floodway which will convey the 100-yr flood without increasing the water surface

elevation of the flood more than 1 ft at any point and prohibit, within the designated floodway, fill, encroachments, and new construction and substantial improvements of existing structures which would result in any increase in flood heights within the community during the occurrence of the 100-yr flood discharge. Hydrologic and hydraulic analysis performed in accordance with standard engineering practices are required in order to demonstrate that any encroachment into the regulatory floodway will not result in an increase to 100-yr flood elevations.

- The participating cities or counties, or both, agree to regulate new development in the designated floodplain and floodway through regulations adopted in a floodplain ordinance. The ordinance requires that development in the designated floodplain be consistent with the intent, standards and criteria set by the National Flood Insurance Program (NFIP).

The *Flood Disaster Protection Act of 1973* denies Federal financial assistance to local communities that fail to qualify for flood insurance. Formula grants to states are excluded from the definition of financial assistance, and the definition of construction in the Act does not include highway construction; therefore, Federal aid for highways is not affected by the Act. The Act does require communities participating in the NFIP to adopt certain land use controls to qualify for flood insurance. These land use requirements could impose restrictions on the construction of highways in floodplains and floodways in communities which have qualified for flood insurance through the NFIP.

2.2.6.1 National Flood Insurance Program Maps and Revisions

Where NFIP maps are available, their use is mandatory in determining whether a highway location alternative will include an encroachment on the 100-yr floodplain. If a NFIP map is not available (i.e., the floodplain has not been mapped by FEMA), hydrologic and hydraulic analysis shall be otherwise conducted by the SHHD, as per FHWA regulation (23 CFR 650.111(a)), to determine whether a highway location will include an encroachment on the 100-yr floodplain.

In Maryland, all published NFIP map types are Flood Insurance Rate Map (FIRM). In other jurisdictions, flood map types include Flood Hazard Boundary Map (FHBM) and Flood Boundary and Floodway Map (FBFM).

A FIRM can be based on a detailed hydraulic study (i.e., Zone AE) or can show approximate floodplain boundaries (Zone A). FEMA maps are available as a digital product, referred to as a DFIRM (Digital Flood Insurance Rate Map), which are viewable online at the FEMA Map Service Center (FEMA, 2020). For Maryland, DFIRMs can be viewed and the associated hydraulic models obtained at from a flood risk map web application hosted by the Maryland Department of the Environment (MDE, 2020).

FEMA has established administrative procedures for changing or correcting effective FIRMs and Flood Insurance Study (FIS) reports based on new or revised technical data. Changes or corrections are made through application for a Letter of Map Change (LOMC), which reflects the official FEMA revision and/or amendment to an effective FIRM. Types of LOMCs include:

- Letters of Map Amendment (LOMAs)
- Conditional Letter of Map Amendment (CLOMA)

- Letters of Map Revision based on Fill (LOMR-F)
- Conditional Letter of Map Revision-Fill (CLOMR-F)
- Letters of Map Revision (LOMRs)
- Conditional Letter of Map Revision (CLOMR)

2.2.6.2 Local Community

The local community with land use jurisdiction, whether it is a city, county, State, or other incorporated community, has the responsibility for enforcing NFIP regulations in that community if the community is participating in the NFIP. Consistency with NFIP standards is a requirement for Federal-aid highway actions involving regulatory floodways. The community, by necessity, is the one responsible for ensuring that requests (i.e., LOMCs) are submitted to Federal Emergency Management Agency (FEMA) for changes to NFIP maps in that community. The requests can be submitted by MDOT SHA if required for highway projects, but such proposals must be coordinated with the community. MDOT SHA should work directly with the community and, through them, work with FEMA.

2.2.6.3 Levee Systems

Generally, MDOT SHA does not construct or own any levee systems. In the rare case that a levee is constructed or owned by the MDOT SHA, FEMA criteria for design and analysis must be followed. For purposes of the NFIP, FEMA will only recognize those levee systems that meet, and continue to meet, minimum design operation, and maintenance standards that are consistent with the level of protection sought through the comprehensive floodplain management criteria as outlined in the NFIP.

Most highway embankments are not designed and constructed to perform as a levee system or other flood control structure. However, historically this has either inadvertently or incorrectly occurred. A 2008 memo published by FHWA provides guidance on the distinction between highway embankments, levees, and other flood control structures, as well as background information regarding the importance of the distinction and recommendations for issues in this area (FHWA, 2008). Currently, the flood hazard on the landside of most highway embankments is analyzed and mapped as not providing base flood hazard reduction. If an entity seeks accreditation for a highway embankment, that entity must demonstrate that the embankment meets the requirements of 44 CFR 65.10.

2.3 STATE REGULATIONS AND POLICIES

2.3.1 Code of Maryland Regulations (COMAR)

The Code of Maryland Regulations (COMAR) is the official compilation of all administrative regulations issued by agencies in the state of Maryland. COMAR contains 36 titles and is available online (DSD, 2020). The state agency regulations which primarily have implications for the design of OOS projects and the SHHD analysis requirements include:

- Title 08, Department of Natural Resources
- Title 11, Department of Transportation

- Title 26, Department of Environment
- Title 27, Critical Area Commission for the Chesapeake and Atlantic Coastal Bays

2.3.2 Maryland Department of the Environment (MDE)

Title 26 of COMAR provides all agency regulations of the Maryland Department of the Environment (MDE). Title 26 includes 27 Subtitles. The subtitle regulations that impact the analysis completed by the SHHD include:

- Subtitle 08, Water Pollution
- Subtitle 17, Water Management
- Subtitle 23, Nontidal Wetlands
- Subtitle 24, Tidal Wetlands

Regulations related to “Construction on Nontidal Waters and Floodplains” is provided in Chapter 4 of Subtitle 17 (COMAR 26.17.04). These regulations govern the construction, reconstruction, repair, or alteration of any waterway obstruction (i.e., bridge or culvert) or any change to the course, current, or cross section of a stream. COMAR 26.17.04.03 establishes the requirement to obtain a permit from MDE in order to conduct any of the listed activities. SHHD analysis procedures and design criteria have been developed to ensure compliance with these regulations. MDE representatives review, comment, and approve of SHHD project analyses for compliance with COMAR as part of the permit application process. Some key requirements listed in COMAR 26.17.04 that impact SHHD analysis and procedures include:

- The regulation scope includes governance of free-flowing waters of the state and the associated 100-year floodplain but excludes areas subject to tidal flooding (26.17.04.01).
- "Waters of the State" is defined as “both surface and underground waters within the boundaries of the State subject to its jurisdiction, including that portion of the Atlantic Ocean within the boundaries of the State, the Chesapeake Bay and its tributaries, and all ponds, lakes, rivers, streams, public ditches, tax ditches, and public drainage systems within the State, other than those designed and used to collect, convey, or dispose of sanitary sewage. The floodplain of free-flowing waters determined by the Department on the basis of the 100-year flood frequency is included as waters of the State” (26.17.04.02).
- Permit applications must provide MDE with the hydrologic and hydraulic computations used to establish the 100-year flood event elevation. The latest FEMA FIS shall “serve to delineate, at a minimum, the extent of the 100-year floodplain” (26.17.04.03).
- “Hydrologic calculations shall be based on the ultimate development of the watershed, assuming existing zoning” (26.17.04.04).
- “Hydrologic and hydraulic computations shall use methods in the public domain which are verifiable” (26.17.04.04).
- Culvert length shall be a maximum of 150 feet, unless demonstrated that “adverse impacts will be adequately mitigated” (26.17.04.06).
- Culverts shall include at least one cell set 1 foot below the stream invert (26.17.04.06).

- Bridges shall completely span stream channels which have a width at top of bank of 80 feet or less (26.17.04.06).
- Permit applications for bridge and culvert projects must provide listed information which includes, but is not limited to: maintenance of stream flow plan; map and measurement of the upstream drainage area; plan of the proposed project showing location, land ownership, and 100-year flood area; discharge frequency curve and stage-discharge curve for the 2, 10, and 100-year frequency flood events; and slope, cross section, and capacity of the stream channel and average bankfull velocity (26.17.04.06).
- If changes to the stream channel or floodplain are proposed, the permit application must also include, but is not limited to: water surface profiles computed using an energy balance method showing elevation and velocity for the 2, 10, and 100-year frequency flood events; cross section plots showing stream and floodplain elevations, any proposed modifications, and water surface elevations; analysis showing that proposed floodplain encroachments do not increase tractive force by more than 10% during the 2 and 10-year floods, unless it can be shown that the channel will remain stable (26.17.04.07).

The purpose of subtitle 08, water pollution, is to protect surface water quality. Water quality standards adopted by these regulations include the designated use classification of all state waters. Four use classifications are defined (COMAR 26.08.02.02), with each classification having specific water quality criteria (26.08.02.08). Each use classification is also assigned closure periods, when in-stream construction shall be prohibited (26.08.02.11). The use classification for all streams in Maryland and the associated in-stream construction closure periods are provided by MDE via publicly available online mapping tools (MDE, 2019).

The design and construction of highway facilities affecting dams or reservoirs must comply with the provisions of COMAR 26.17.04.05. For such projects, coordination should be initiated early in the project development process with the Dam Safety Division of the Water and Science Administration, Maryland Department of the Environment, to ensure that the project is designed and constructed in a manner that is consistent with these regulations. In addition, if a road embankment either temporarily or permanently impounds a significant amount of water, as defined in Maryland Pond-378 code, review and approval shall be coordinated with the Dam Safety Division (NRCS, 2000). In the rare case that MDOT SHA proposed to use highway fill as a dam to permanently impound water, compliance with FHWA regulations in 23 CFR 650.115(c) would be required.

2.3.3 In-Kind Replacement Policy

The Maryland Department of the Environment (MDE) Water and Science Administration has adopted a Maryland Department of Natural Resources (DNR) operational policy allowing for reduced impact analysis requirements associated with MDE review approvals for structure replacement projects classified as in-kind. The policy, titled In-Kind Replacement of Bridges and Culverts, was made effective on July 1, 1993 by the DNR Water Resources Administration. The purpose of the policy was “to avoid complicated, expensive and time-consuming engineering analyses that may not be necessary.” A copy of the policy document is provided as Appendix A to this Manual. The policy defines four replacement categories, as summarized here.

- **Exact Replacement:** Projects in this category include a proposed structure (bridge or culvert) “that is exact in all respects to the existing structure and does not alter any characteristics of the area. If existing conditions indicate active scour or erosion, additional erosion protection may be included while retaining the “exact replacement” designation. Methods of installation and limits of erosion protection must be consistent with Best Management Practices” (DNR, 1993).
- **Structurally In-Kind Replacement:** Projects in this category include structures that are “not replaced exactly, but minor changes may be made to the size, shape and location. Roadway profile and type of structure are unchanged. Active scour or erosion may be addressed as indicated under Exact Replacement” (DNR, 1993).
- **Hydraulically In-Kind Replacement:** Projects in this category include structures that are “replaced with a different kind of structure, and other minor alterations may also be made. However, under flood conditions, the new structure may perform in the same or similar manner. Therefore, there is no significant change in the floodplain” (DNR, 1993).
- **Structurally or Hydraulically Out-of-Kind Replacement:** These are replacement structures that are “sufficiently different from existing structures that they must be considered as new bridge and culverts” (DNR, 1993). This includes the removal and replacement of a structure with a different facility type or size, as well as the modification (extension or widening) of a bridge or culvert.

2.3.4 Scenic and Wild Rivers System

The Scenic and Wild Rivers System was established by an act of the Maryland General Assembly in 1968. This system mandates the preservation and protection of rivers designated as Scenic and/or Wild. A Wild River is a “free-flowing river whose shoreline and related land are undeveloped, inaccessible except by trail, or predominantly primitive in a natural state for a least 4 miles of the river length.” A scenic river is defined as a “free-flowing river whose shoreline and related land are predominantly forested, agricultural, grassland, marshland, or swampland with a minimum of development for at least 2 miles of the river length” (DNR, 2019). Per the 1968 Act, “each individually designated river also has its own Scenic and Wild River Advisory Board. These Boards are responsible for reviewing inventories, plans, studies, and regulations applicable to their jurisdictions and for making recommendations on such matters to the Scenic and Wild Rivers Review Board” (DNR, 2019). Nine rivers have been designated as “Scenic” by the Maryland General Assembly: Anacostia, Deer Creek, Monocacy, Patuxent, Pocomoke, Potomac (Frederick and Montgomery Counties), Severn, Wicomico-Zekiah, and Youghiogheny. The Youghiogheny River between Millers Run and the southern corporate limits of Friendsville has been officially designated as a “Wild” river.

2.4 LOCAL LAWS

OOS projects are generally not legally required to comply with local ordinances, except where compliance is required by specific state or federal statute. New or replacement structure projects of local municipalities must comply with local government (e.g., cities, counties, improvement districts) ordinances and codes. A FEMA local community can enforce more restrictive standards than the minimum required under the NFIP. In this case, the OOS project must comply with the local FEMA standards.

REFERENCES

- AASHTO (2014). American Association of State Highway and Transportation Officials. AASHTO Drainage Manual.
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APPENDIX A

**GUIDELINES FOR IN-KIND
REPLACEMENT OF CULVERTS AND
BRIDGES**

June 2020



APPENDIX A GUIDELINES FOR IN-KIND REPLACEMENT OF CULVERTS AND BRIDGES

The attached guidelines, prepared by the Maryland Department of Natural Resources (DNR), are provided for use when considering an in-kind replacement of a bridge or structure. These guidelines, prepared in 1993, represent current Maryland Department of the Environment (MDE) policy on this topic.

The user needs to make sure that a replacement-in-kind project meets the needs of the MDOT SHA, as discussed in Chapter 4, as well as the requirements of the DNR/MDE as set forth in this appendix.

Please note that MDOT SHA and MDE have agreed on the method of determining design discharges as discussed in Chapter 8, Hydrology, of this Manual.



Liam Donald Schaefer
Governor

Maryland Department of Natural Resources

Water Resources Administration
Tawes State Office Building
Annapolis, Maryland 21401

Torrey C. Brown, M.D.
Secretary

Robert D. Miller
Director

July 7, 1993

Mr. Hal Kassoff
Administrator
State Highway Administration
707 North Calvert Street
Baltimore, Maryland 21201

RE: In-Kind Replacement of Bridges & Culverts

Dear Mr. Kassoff:

Enclosed please find a detailed DNR-WRA Operational Policy explaining how the State's statutory and regulatory standards pertaining to waterway crossings can be met when such crossings are "in-kind" replacements of existing bridges and culverts. This policy was reviewed by the State Highway Administration and staff from ten county departments of public works and transportation.

This policy does not establish any new standards. It simply clarifies certain terms and explains the documentation necessary to demonstrate the "in-kind" nature of replacement structures. One of our objectives is to streamline WRA's review process for certain types of activities so that our staff can focus attention on proposed projects that are most likely to have significant waterway, floodplain and nontidal wetlands impacts.

Please note that authorization from WRA is still required for replacement bridges and culverts. In addition, temporary and permanent impacts to nontidal wetlands must be addressed. This policy should help SHA determine which projects do not require detailed hydrologic and hydraulic modeling, although in some instances rating curves may be necessary to demonstrate comparable hydraulic performance.

DEPARTMENT OF NATURAL RESOURCES
WATER RESOURCES ADMINISTRATION

OPERATIONAL POLICY

SUBJECT: In-Kind Replacement of Bridges and Culverts

DIVISION: Nontidal Wetlands & Waterways

POLICY NO.: 93-1

EFFECTIVE DATE: July 1, 1993

APPROVED: Robert D. Miller
Robert D. Miller, Esquire
Director

DATE: 6/22/93

I. BACKGROUND

Throughout Maryland, local governments and the State Highway Administration* are responsible for the safety of public roads, bridges and culverts. These agencies routinely inspect structures to assure that proper maintenance and repair are undertaken. Frequently, older structures are found to be unsafe or below required design standards and must be replaced.

II. PURPOSE

The purpose of this policy on replacement of existing bridges and culverts is to avoid complicated, expensive and time-consuming engineering analyses that may not be necessary. Having clear definition of the qualifying parameters will make it easier for applicants to certify compliance. Just as important, this policy will expedite WRA's review of floodplain impacts.

III. REVIEW BY THE DEPARTMENT OF NATURAL RESOURCES

The Department of Natural Resources (DNR), Water Resources Administration (WRA) administers the State's regulatory programs for activities that impact water resources, including nontidal wetlands, wetlands buffers, and the 100-year floodplains along nontidal waters of the State. The primary purposes of a flood impact review are to assure that: (1) flood hazards are not increased; (2) activities are constructed to withstand the passage of the 100-year flood; (3) aquatic resources are adequately protected; and (4) stream degradation is minimized and scenic, wildlife and recreational functions are preserved.

* structure replacements by others may be handled in accordance with this policy with prior approval by the WRA.

- (1) ASSURE THAT FLOOD HAZARDS ARE NOT INCREASED. WRA typically requires applicants to submit evidence that activities do not change the predicted frequency and magnitude of flooding. Of greatest concern are sensitive floodplains where existing buildings are subject to flooding under current conditions. Activities in those floodplains are scrutinized very carefully, and detailed engineering analyses typically are required. Activities that increase flooding of existing structures are not permitted.

WRA also is charged with assuring that currently vacant or undeveloped land within the 100-year floodplain is not adversely impacted by proposed activities. Relatively small increases in predicted flood levels may be considered if all affected property owners accept the increase or if the additionally inundated area is purchased or placed in flood easement. Permits are issued if all other WRA issues have been addressed.

Activities that do not alter the frequency or magnitude of flooding are permitted if all other WRA issues have been addressed.

- (2) WITHSTAND PASSAGE OF 100-YEAR FLOOD. WRA's floodplain regulations require that applicants assure that their own activities are not subject to flood damage or that all practicable measures to reduce damage have been included. For public roads, bridges and culverts, standard designs typically take this into consideration since State and local governments wish to minimize loss of structures during floods. In practice, protection includes such measures as erosion protection and road profile design to minimize damage due to weir flow.
- (3) PROTECTION OF AQUATIC RESOURCES. With respect to public roads, bridges and culverts, three factors are critical for protection of aquatic resources. As a function of water use, instream construction is limited during certain times of the year in order to minimize adverse effects of sediment loading on aquatic species. At least one cell of all culverts is required to be installed 1 foot below the invert of the natural stream to assure adequate fish passage, to maintain the natural stream width, and to encourage deposition of sediment within the cell. Alternate fish passage measures may be acceptable with DNR-WRA's approval. Instream erosion protection (riprap, gabions, grout bags, etc.) must be designed and constructed to concentrate low flows. Methods of stream diversion used during construction must meet standards.

- (4) PRESERVATION OF FUNCTIONS: Projects must incorporate measures to prevent stream channel erosion and instability. Areas of active erosion may be protected within limits set forth in Best Management Practices. Temporary impacts to adjacent nontidal wetlands must be minimized, conducted, and restored in accordance with Best Management Practices. For new roads, bridges and culverts, alternatives that have fewer adverse environmental impacts may have to be considered.

IV. REPLACEMENT OF EXISTING STRUCTURES

Existing bridge and culvert structures may be replaced in a number of ways:

- (1) EXACT REPLACEMENT. These projects produce a new bridge or culvert that is exact in all respects to the existing structure, and does not alter any characteristics of the area. If existing conditions indicate active scour or erosion, additional erosion protection may be included while retaining the "exact replacement" designation. Methods of installation and limits of erosion protection must be consistent with Best Management Practices.
- (2) STRUCTURALLY IN-KIND REPLACEMENT. Frequently, an existing structure is not replaced exactly, but minor changes may be made to the size, shape and location. Roadway profile and type of structure are unchanged. Active scour or erosion may be addressed as indicated under Exact Replacement.
- (3) HYDRAULICALLY IN-KIND REPLACEMENT. In many instances, an existing structure is replaced with a different type of structure, and other minor alterations may also be made. However, under flood conditions the new structure may perform in the same or similar manner. Therefore, there is no significant change in the floodplain.
- (4) STRUCTURALLY OR HYDRAULICALLY OUT-OF-KIND REPLACEMENT. Many factors may result in replacement structures that are sufficiently different from existing structures that they must be considered as new bridges and culverts.

V. STREAMLINING WRA'S FLOODPLAIN IMPACT REVIEW

Under certain circumstances and with certification by the applicant, WRA's floodplain impact review of replacement structures can be expedited. In general, replacements that, through simplified analyses, are shown not to increase flood hazards need not be subjected to rigorous individual review.

Specific criteria for the categories of replacement have been defined:

- (1) EXACT REPLACEMENT. Application made through Regional Letter of Authorization (if appropriate) or separate submittal to WRA. Applicant commits to construction best management practices (BMPs) and other conditions necessary to minimize impacts on the waterway and aquatic resources, including minimization and restoration of temporarily disturbed nontidal wetlands. Applicant certifies replacement structure is exact in all respects, does not alter characteristics of the waterway, and retains or improves capability to assure passage of fish. Hydrologic and hydraulic analyses and floodplain impact review are not required.
- (2) STRUCTURALLY IN-KIND REPLACEMENT. Application made through Regional Letter of Authorization (if appropriate) or separate submittal to WRA. Applicant commits to construction BMPs and other conditions necessary to minimize impacts on the waterway and aquatic resources, including minimization and restoration of temporarily disturbed nontidal wetlands. Applicant certifies replacement structure is structurally in-kind, does not alter characteristics of the waterway, and retains or improves capability to assure passage of fish. Hydraulic analyses and floodplain impact review not required if applicant certifies the following:
 - (a) Roadway profile unchanged (unless demonstrated to be above the 100-year water surface elevation).
 - (b) Structure type effectively unchanged.
 - (c) Structure size and shape essentially unchanged; up to 10% change in waterway opening allowed if floodplain immediately upstream and downstream contains unimproved property, and if previous replacement did not entail reduction in opening.
 - (d) Proposed structure meets fish passage requirements.
 - (e) Location essentially unchanged; as a function of waterway size, slight shifts in location to improvement alignment may be allowed if floodplain immediately upstream and downstream contains unimproved property.
 - (f) If the floodplain immediately upstream or downstream contains improved property, changes in structure size, shape or location must be assessed to determine if the proposed structure is hydraulically in-kind.

- (3) HYDRAULICALLY IN-KIND REPLACEMENT. Application made through Regional Letter of Authorization or separate submittal to WRA (if mitigation of permanent nontidal wetlands loss required). Applicant commits to construction BMPs and other conditions necessary to minimize impacts on the waterway and aquatic resources. Replacement structure may not alter the characteristics of the waterway, and retains or improves capability to assure passage of fish. Increase in overall footprint may require mitigation of permanent nontidal wetland losses. Detailed hydrology not required. Hydraulic analyses required to demonstrate closeness of hydraulic performance (rating curves) for existing and replacement structures. Adequate range of discharges required to assess performance under low flow, pressure flow, weir flow, etc. Applicant certifies the following:
- (a) Roadway profile essentially unchanged (unless demonstrated to be above 100-year water surface elevation). Changes must be adequately reflected in hydraulic analysis.
 - (b) Location essentially unchanged.
 - (c) Proposed structure meets fish passage requirements.
 - (d) Increase in footprint, type and areal extent of nontidal wetlands impacted, if applicable.
 - (e) Compliance with mitigation requirements, if applicable.
 - (f) If the floodplain immediately upstream and downstream contains only unimproved property and rating curve for replacement structure indicates no more than 0.5' increase in water surface elevation for range of discharges, no hydrology required.
 - (g) If the floodplain immediately upstream and downstream contains only unimproved property and rating curve for replacement structure indicates more than 0.5' but less than 1.0' increase in water surface elevation for range of discharges, no hydrology required. Affected property owners must be notified of increase by certified mail.
 - (h) If the floodplain immediately upstream contains improved property and rating curve for replacement structure indicates no more than 0.1' increase in water surface elevation for range of discharges, no hydrology required.

VI. CONDITIONS REQUIRING FULL ANALYSIS:

(1) STRUCTURALLY OR HYDRAULICALLY OUT-OF-KIND REPLACEMENT

Any bridge or culvert replacement that fails to meet the in-kind replacement criteria may be subject to complete analysis. Complete analysis refers to determination of discharges for the 2-, 10- and 100-year frequency flood events, and preparation of hydraulic modeling to determine the impact of the proposed structure. In limited circumstances, WRA may concur with selection of a range of discharges.

(2) IN-KIND REPLACEMENT DOES NOT APPLY UNDER CERTAIN CIRCUMSTANCES

This policy may be applied only in situations where unusual conditions or circumstances are not present. It shall not be used for replacement of structures that are: (1) part of a dam embankment; (2) designed for stormwater management purposes; or (3) functioning as a dam, whether by design or unintentionally. Applicants are urged to consult with WRA if any unusual conditions exist to determine if application of this policy is acceptable.

VII. SELECTION OF AN APPROPRIATE RANGE OF DISCHARGES

The range of discharges to be included in a hydraulic performance evaluation should include low flow, pressure flow, inlet and outlet control, and weir flow. However, it is also important to avoid using extraordinarily high values simply to include weir flow. For example, it may be unreasonable to evaluate weir flow for a culvert with high road profile, if the drainage area is relatively small.

Applicants must explain the rationale for selection of the upper limit of the range discharges. Where available, discharges from FEMA's Flood Insurance Rate studies may be acceptable for existing watershed development conditions. Under other circumstances, it may be reasonable to use USGS Regression Equations to estimate the 100-year discharge. To address regulatory requirements pertaining to ultimate development and to be conservative, an adjustment factor of up to 50% of the estimated 100-year discharge will be required. Alternatively, the USGS 100-year discharge plus 2 standard deviations may be acceptable.

VIII. DEFINITION OF "IMMEDIATELY UPSTREAM OR DOWNSTREAM"

The reach of stream that is potentially impacted by floodplain obstructions cannot be defined readily without sophisticated analysis. Parameters that may be important include channel slope, waterway opening, velocity, channel and overbank roughness, and magnitude of the encroachment.

This policy does not establish rigid standards for determining the length of reach up or downstream of a replacement structure that must be evaluated for potential impact on adjacent properties. It is incumbent on the applicant's prudent exercise of engineering judgement to ensure and demonstrate that an adequate reach has been considered.

IX. DEFINITION OF "UNIMPROVED PROPERTY" AND "IMPROVED PROPERTY"

For the purposes of this policy, "unimproved property" refers to property, or portions thereof, on which there are no structures or buildings. Lands that have been altered or enhanced without buildings, for example by landscaping, retaining walls, minor sheds, livestock feeding sheds, etc., are considered to be unimproved property.

For the purposes of this policy, "improved property" refers to property, or portions thereof, on which there are walled and roofed buildings and structures. The term "structures" refers to improvements other than buildings, such as storage tanks.

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