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Suggested Revisions to WSDOT Manuals for
**Implementing Washington
State Highway Runoff
Water Quality Research Results**

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Final Report
August 1985



Washington State Department of Transportation
Planning, Research and Public Transportation Division
In Cooperation with
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<p>The Washington State Department of Transportation (WSDOT)/University of Washington Highway Runoff Water Quality research project, conducted from 1977 to 1982, produced a number of results of potential use to WSDOT. An effort was required to implement these results in the Department's procedures. One phase of implementation completed previously involved preparation of a guide for assessing the impacts of operating highways on aquatic ecosystems and training WSDOT personnel in its use. The present phase involved formulating decision criteria in a number of problem areas of concern to WSDOT and determining the need for revisions to departmental documents for consistency with the research results and the new criteria. The results of this phase are presented in a two volume implementation manual and this document listing the suggested modifications to the WSDOT Design Manual, Highway Hydraulic Manual, Quality Standards for Highway Maintenance, and Maintenance Manual to reflect the results of the research and criteria development.</p>				
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for Implementing Washington State
Highway Runoff Water Quality Research Results

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FOREWARD

This document lists suggested revisions to existing Washington State Department of Transportation (WSDOT) manuals for implementing the results of the WSDOT/University of Washington Highway Runoff Water Quality research project completed in 1982. Companion documents are the Washington State Highway Runoff Water Quality Research Implementation Manual, Volumes 1 and 2. Volume 1 presents criteria to protect water resources in nine potential problem areas associated with operating highways, and Volume 2 provides the basis for those criteria.

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INTRODUCTION

This document suggests revisions to the various Washington State Department of Transportation (WSDOT) manuals regulating highway design, construction, and maintenance for consistency with the water quality criteria presented in the Washington State Highway Runoff Water Quality Research Implementation Manual. The manuals reviewed to determine needed modifications were:

Design Manual

Highway Hydraulic Manual

Quality Standards for Highway Maintenance

Maintenance Manual

Standard Specifications for Road, Bridge,
and Municipal Construction

Highway Maintenance Operation List

The final three manuals in the list required no changes for consistency. The following sections present the recommended revisions in the remaining manuals. These recommendations were formulated on the basis of retaining the original scope and general level of detail of each manual. Therefore, if a topic is not appropriate to the manual in its present form, it was not introduced in the recommendations. As a result, certain topics that may be considered a part of the general subject matter of a given manual (e.g., highway sweeping in the Maintenance Manual) are not represented. Such topics are covered in Volumes 1 and 2 of the implementation manual and, in some cases, in another existing manual.

SUGGESTED CHANGES TO DESIGN MANUAL

Section 323.01 -- The following paragraph should be inserted after the final paragraph in subsection (1) at the top of the second column:

In locations where vegetated filter areas or detention facilities will be established to improve highway runoff water quality, provide appropriate slope, adequate area, and the necessary soil conditions for that purpose. Refer to the Environmental Criteria Manual, Volume 1, for criteria and specifications for design of vegetated filter areas and detention facilities.

Section 327.02 (2) -- The following consideration should be added to the list:

- (e) The use of a culvert design retaining the original stream bed.

Section 327.02 (3) -- The section should be revised to read as follows:

- (3) **Channel Changes.** It is desirable to minimize the use of channel changes, as an everlasting liability is incurred with their use. All possible alternatives should be explored thoroughly, and the channel change should be undertaken only if no feasible alternative exists. When used, consideration should be given to:
 - (a) Restoration of the original stream characteristics as near as practical. This includes:
 - Meandering the channel change to retain its sinuosity and length.
 - Retention of the stream gradient and geometry to maintain the approximate current velocity distribution of the undisturbed stream reach.
 - Excavation and selection and placement of bed material to promote the formation of a natural alternating pool and riffle pattern and prevent bed erosion.
 - Retention of the stream bank slopes.
 - Retention or replacement of stream-side vegetation.
 - (b) The ability to pass the design flood.
 - (c) The effects on adjacent property.
 - (d) The effects on the stream upstream and downstream from the channel change.

- (e) Erosion protection for the channel change, especially on the outside of meanders and under bank-full conditions.
- (f) Producing a natural, pleasing appearance.

Section 327.02 (4) -- Subpart (C) should be revised to read as follows:

- (C) Environmental considerations regarding water quality and peak quantity. These considerations include:
 - The use of grass-lined ditches or broad vegetated surfaces, whenever possible.
 - Outfalling into vegetated filter areas prior to entering a water course.
 - The use of detention facilities.
 - The use of groundwater recharge.

Section 327.03 -- The following reference should be added to the list (after WSDOT Directive D 25-60 (HB)):

- WSDOT "Environmental Criteria Manual", Volumes 1 and 2.

Section 327.04 (3) -- Subpart (f) should be revised and subpart (g) should be added, as follows:

- (f) The design of vegetated filter areas, detention facilities, and groundwater recharge facilities.
- (g) The design of woodwaste fills.

SUGGESTED CHANGES TO HIGHWAY HYDRAULIC MANUAL

Section 4 -- A new subsection should be added, as follows:

4.04.02 ENVIRONMENTAL DESIGN

The WSDOT "Environmental Criteria Manual," Volume 1, presents criteria and specifications for the design of vegetated filter areas for highway runoff water pollution mitigation (Section 2) and stream channel changes (Section 9).

SUGGESTED CHANGES TO QUALITY STANDARDS
FOR HIGHWAY MAINTENANCE

Section 2.121 -- The first paragraph was deleted in the Errata List issued in May 1968. The second paragraph should be revised to read as follows:

All sod shoulders shall be lightly bladed every year to prevent the shoulder from building up from dirt held in the grass and sod, except in the case of vegetated shoulders used to improve highway runoff water quality. In this case the need for sediment removal shall be determined through observations and analysis of the hydraulic performance of the slope. If sediment removal is required, it shall be performed following heavy winter and spring runoff, early in the summer to allow regrowth of vegetation before the onset of fall precipitation. If necessary, restoration of vegetation shall be enhanced by reseeding and fertilization.

Section 3.120 -- The second sentence of the first paragraph should be revised to read:

Properly controlled, grass, shrubbery, and trees can enhance the beauty of the roadway, point out possible traffic hazards, guide the road user along the roadway, control erosion, improve highway runoff water quality, and minimize fire hazards.

Section 3.140 -- The first sentence should be revised to read:

The primary purposes for establishing a vegetation cover on roadside areas are erosion control, improvement of highway runoff water quality, and landscape development.

Section 3.210 -- The following sentence should be added to the end of the second paragraph:

Grasses such as rye grass, fescue species, reed canary grass, Bermuda grass, Kentucky blue grass, orchard grass, and clover improve the water quality of highway runoff flowing over vegetated surfaces or channels.

Section 3.260 -- The following paragraph should be added after the existing fourth paragraph:

Trees and other woody growth should be cut from vegetated drainage courses established to improve highway runoff water quality. Replacement of grass by woody species reduces the performance of vegetated drainage courses in treating highway runoff.

Section 4.11 -- Items 4 and 6 should be revised to read as follows:

4. Observations of hydraulic performance of open ditches shall be performed at least annually to determine the need to remove sediment accumulations and to control tall weeds, brush, and grass. Sediment removal and selection of the type and timing of vegetation control measures shall depend on a demonstrated need to maintain hydraulic performance. In vegetated ditches used to improve highway runoff water quality, sediment removal and vegetation control should not be needed every year. If required, it shall be performed following heavy winter and spring runoff, early in the summer to allow regrowth of vegetation before the onset of fall precipitation. If necessary, restoration of vegetation shall be enhanced by reseeding and fertilization. Chemicals used for brush and grass control must be carefully applied so as not to contaminate water or be transported to adjacent areas where they may concentrate and cause damage.
6. Surplus material resulting from ditch cleaning should be disposed of in a manner that avoids introduction of contaminants contained in the material to either surface water or groundwater. The disposal site should have the following characteristics: (1) minimal slope; (2) Not in a drainage channel from upslope areas toward a water body; (3) at least 200 ft from a water body, preferably having vegetation between the disposal site and the water body; (4) not overlying a potentially sensitive groundwater aquifer. Placement of the material should not obstruct or impair other roadside drainage areas nor overload existing embankments. In addition to the above requirements, disposal of surplus material removed from the top two inches and the first 30 ft of mud ditches, or the first 150 ft of vegetated ditches, serving more than 10,000 ADT should be further protected by one of the following measures: (1) dispose in an area normally not accessible to the public and isolate by spreading and vegetating, plowing into the soil and vegetating, or burying and covering; or (2) place in an approved landfill as a last resort.

Section 4.180 -- A new section, number 4.180, should be added, as follows:

4.180 DETENTION FACILITIES

Detention facilities shall be inspected at least annually to determine the need for cleaning and repair. Sediments shall be removed when capacity is less than needed or when sediment resuspension and loss in the outflow may occur. Surplus material resulting from the cleaning operation shall be handled in the same manner as specified for ditch cleaning in Section 4.111.

Section VI (Snow and Ice Control) -- This section was deleted in entirety by the Errata List issued in May 1968, and Directive D 54-42 (MR) was issued to govern snow and ice control. The following statement should be added to this directive:

When runoff from a highway receiving sand applications can enter a potentially sensitive surface water body, use relatively large and/or dense particles to reduce the ability of runoff to transport the sand and associated pollutants.

SUGGESTED CHANGES TO MAINTENANCE MANUAL

Section 6.01E -- The second sentence in the second paragraph should be revised to read as follows:

Many plants that are not noxious weeds are useful from the standpoint of erosion control on slopes, improvement of highway runoff water quality, and providing protection from sun and wind.