CHAPTER 19
NEW DEVELOPMENT AND REDEVELOPMENT PROGRAM
APPENDIX I - PLANNING PROCEDURES

TABLE OF CONTENTS

19.I.1 INTRODUCTION

19.I.1.1 Purpose

The purpose of the New Development and Redevelopment Planning Procedure (Planning Procedure) is to ensure that permanent BMPs for the protection of water quality, are included in all appropriate highway construction projects. This Planning Procedure applies to new and significant highway redevelopment construction. This includes those projects performed by CDOT in-house maintenance crews related to highway expansion as well as new highway design projects. The Planning Procedure does not apply to designs and activities related to stormwater management controls that improve the quality of runoff from construction sites. Rather, it addresses the incorporation of permanent BMPs.

19.I.1.2 Background

A permit to discharge stormwater (generally referred to as a Phase I Permit) was issued by the Colorado Department of Public Health and Environment (CDPHE) to CDOT under the Colorado Discharge Permit System (CDPS) on December 15, 2000. This permit became effective on January 15, 2001, and applies to CDOT activities within the city limits of Aurora, Colorado Springs, Denver, and Lakewood. One requirement of the Phase I Permit is that CDOT establish and implement a New Development and Redevelopment Planning Procedure.

On or before March 10, 2003, CDOT will need to obtain permit coverage for those areas that fall under the Phase II Stormwater Discharge Regulations. This will include approximately another 50 to 60 urban areas throughout Colorado. The Phase II Permit will have requirements similar, if not identical to, the Phase I Permit. Therefore, this Planning Procedure has been designed to include anticipated Phase II Permit requirements and will become effective in the Phase II Permit areas as soon as the Phase II Permit becomes effective.

19.I.1.3 Permit Requirements

The Phase I Permit requires that CDOT:

"*Develop and implement a program that ensures that new highway projects and significant highway modifications are reviewed for the need to include permanent stormwater best management practices (BMPs).*"

Section K of the Permit defines BMPs as "schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters of the State. BMPs also include treatment, operating procedures, and practices to control site runoff, spillage or leaks, waste disposal, or drainage from material storage. BMPs include structural and nonstructural controls."

19.I.1.4 Overview of the Planning Procedure

The intent of this Planning Procedure is to provide direction, criteria, and procedures to ensure that permanent BMPs are incorporated, as appropriate, into all new development and significant redevelopment highway projects within CDOT right of way. The Planning Procedure does not replace other CDOT manuals and directives, but direction, criteria, and procedures established in the Planning Procedure need to be incorporated into other manuals and directives.

19.I.2 DEFINITIONS

19.I.2.1 Definition of Significant Highway Modifications

The definition of "significant highway modifications" for determining which highway modification projects should comply with this Planning Procedure is as follows:

Any project that requires an Environmental Impact Statement (EIS).

Any project that requires an Environmental Assessment (EA).

Highway modification projects in Phase I and Phase II municipalities where the project will disturb more than 1 acre. Figure 2 through Figure 2-15 show the different Phase I and II municipalities within the state.

Other highway modification projects that result in a water quality impact.

A water quality impact is defined as any alteration of the chemical, physical or biological characteristics of any state water.

In general, maintenance activities/projects shall be excluded from the permanent BMP process. Maintenance projects are defined as construction activity/work to maintain original line and grade, hydraulic capacity, or original purpose of the facility. Projects that add improvements to existing highway facilities, even if constructed by maintenance crews, may need to comply with permanent BMP requirements. Projects that will fall under CDOT authority, but are initially constructed by others, such as private developers and local governmental entities, must also comply with BMP requirements, regardless of the funding mechanism.

19.I.2.2 Sensitive Waters

In addition to standard requirements for water quality, in some locations additional measures may be necessary because the receiving water is considered "sensitive".

Sensitive Waters Criteria

Criteria were developed to determine what waters would be considered sensitive. CDOT's CDPS Phase I MS4 Permit defines these criteria. These criteria were then applied to receiving waters within the CDOT Phase I Permit area. Criteria used to identify sensitive waters include:

Listing on the 303(d) List (Waters where water quality standards are being exceeded.)

High quality water classification, which includes the following criteria:

Domestic Water Supplies

Recreation Class 1a or 1b,

Cold Water Aquatic Life Class 1

Outstanding Waters

Existence of threatened or endangered species or sensitive wildlife habitat

The 303(d) List is a list of the known impaired waters not meeting water quality standards. The List is updated every four years by the CDPHE and this List needs to be checked for each project. Refer to the following section to reference this information.

Waters are classified according to the uses for which they are presently suitable or intended to become suitable. These uses include potable water supplies, recreational activities, sustaining a wide variety of cold water biota, and sustaining the highest level of water quality protection for waters designated as a national resource. The high quality water classification refers to receiving waters that fit within the stated criteria. These criteria are of sufficient importance that they automatically identify sensitive waters. The CDPHE maintains and regularly updates stream classifications and standards. Stream classifications and standards need to be checked for each project.

Significant wetland areas that warrant concern and/or protection may also be considered sensitive waters. Significant wetlands would not include areas such as temporary low points created during grading operations, flat slope road side ditches with limited water inflow, and other areas, which would not normally support wetland types of vegetation and wildlife. These would be determined on a project specific basis.

The U.S. Army Corps of Engineers (Federal Register 1982) and the EPA (Federal Register 1980) jointly define wetlands as: Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas.

Current information regarding threatened and endangered species (TES) may be obtained from the CDOT TES program manager and or the CDOT liaison at the U.S. Fish and Wildlife agency.

Current Water Quality Information

The Water Quality Control Commission (WQCC) has the authority to upgrade segments when it is appropriate to do so. Current water quality regulations can be obtained from the CDPHE website and should be checked for each project to ensure it is the most current regulation. CDOT will obtain verification from the CDPHE on the classification of receiving waters during the project conceptual design. This initial classification will remain consistent throughout the entire project through construction, even if the CDPHE updates the classifications during that time resulting in a change in classification.

The most current 303(d) List can be obtained from the main CDPHE website.

Step 1: Log onto the CDPHE website at: http://www.cdphe.state.co.us.

Step 2: Follow the link to “Divisions and Programs.”

Step 3: Follow the link to “Department Boards and Commissions.”

Step 4: Follow the link to “Water Quality Control Commission.”

Step 5: Under the section for Other Resources follow the link to “Colorado Water Resource Documents” where a link to latest 303(d) List is contained.

The links should take you to the following web address: http://www.cdphe.state.co.us/op/wqcc/wqresdoc.html

The most current stream classifications and standards can be obtained from the main CDPHE website:

Step 1: Log onto the CDPHE website at: http://www.cdphe.state.co.us.

Step 2: Follow the link to “Divisions and Programs.”

Step 3: Follow the link to “Department Boards and Commissions.”

Step 4: Follow the link to “Water Quality Control Commission.”

Step 5: Under the section for Other Resources follow the link to “Colorado Water Control Division.”

Step 6: Follow the link to “Water Quality Regulations”, which should be located at the following web address: http://www.cdphe.state.co.us/op/regs/waterqualityregs.asp

Step 7: Under the Surface Classifications and Standards Section, the beneficial use categories and basic standards to maintain and attain such beneficial uses are summarizes in regulations for each

river basin in Colorado. Each regulation has a separate convenient link to the tables summarizing the classification and standards needed for the determination of sensitive waters.

Example

A project is located along I-25 in Colorado Springs near the Cimmaron interchange where Fountain and Monument Creek meet. Using "Regulation No 32: Classification and Numeric Standards for Arkansas River Basin" (last update effective 1/20/03), locate the stream segments that may be impacted from a potential project in this area by checking the classification and standard tables for the Arkansas River Basin in the Fountain Creek sub-basin. The two adjacent segments are: the mainstem of Monument Creek above the confluence point with Fountain Creek (Segment 6) and the mainstem of Fountain Creek below the confluence point (Segment 2a). Corresponding classifications for Segment 6 are: Aquatic Life Warm 2, Recreation 1a, Water Supply, and Agriculture; and for Segment 2a: Aquatic Life Warm 2, Recreation 1a, Water Supply, and Agriculture. In conjunction, searching the 303(d) List (published 9/10/02) does not show that Segment 6 and 2a of the Fountain Creek sub-basins are impaired. However, the List shows that these two Segments are listed for monitoring and evaluation where information suggests impairment, but supporting documentation does not meet the standards for credible evidence.

19.I.3 CDOT PROJECT DEVELOPMENT PROCESS

19.I.3.1 General

The CDOT BMP planning and implementation process is shown in Figure 3-1. This process includes decision points early in the process to determine if permanent BMPs are required. The process shown in Figure 3-1 is the project development process with only those major elements and decision points that are critical to ensure that permanent BMPs are appropriately included in future projects.

19.I.3.2 Transportation Improvement Program (TIP)/Statewide Transportation Improvement Program (STIP)

The first step for all new highways or highway expansions is to be placed on the Transportation Improvement Program (TIP)/Statewide Transportation Improvement Program (STIP) list. All projects must first be put on the TIP/STIP list to be considered for funding. The inclusion of a project on this list typically is based on limited conceptual data and cost estimates. This conceptual cost estimate will need to contain an estimate for the cost of the design, land acquisition, and construction of permanent BMPs. As historical records of routine maintenance costs are developed, operation and maintenance costs should also be included in the conceptual cost estimate.

Since the estimate is only conceptual at this point, it may be necessary, after completion of the Design Scoping Review (DSR), to amend the data and request modification to the scope and funding in the TIP/STIP. As an example, after examination of the BMP needs, more right-of-way may be required to provide room for an anticipated detention pond. The added cost of the land acquisition and the design and construction of the pond would be included in the overall project budget for the TIP/STIP. Also, maintenance needs for a selected BMP can be better evaluated to determine if the necessary maintenance equipment and personnel to perform the required routine maintenance are available. BMP maintenance costs can vary significantly depending on the BMP selected and the project maintenance resources available. The overall project budget should be amended to reflect any additional operation and maintenance costs.

19.I.3.3 Early Decisions – Coverage of Project Under the Procedures

As shown in Figure 3-1, there are a number of basic questions that need to be answered before a project is included in the TIP/STIP. These are:

Is the project solely related to maintenance activities and does it result in no enlargement of the highway? If the answer is "yes," then this procedure does not apply.

Is the project located within CDOT right of way and will it disturb 1 acre or more? If the answer is "yes," then this procedure applies.

Are there water quality impacts that warrant inclusion of BMPs? If the answer is "yes," then this procedure applies.

As previously stated, it is important to identify the potential need for inclusion of BMPs in a project as early as possible. Therefore, the potential right-of-way needs, design efforts, and construction costs related to permanent BMPs shall be estimated and included in the overall scope and cost estimate prior to including a project in the TIP/STIP.

19.I.3.4 Design Scoping Review

The next step in the planning procedure is to perform a Design Scoping Review. The purpose of this review is to better define the project. This includes a review of the construction costs, environmental concerns, and the highway alignment alternatives. In some instances this review is broken into two phases.

Except in special cases, the Design Scoping Review (DSR) normally is started after a project is included in the TIP/STIP and funding is available. However, if more precise information is necessary for the TIP/STIP listing and project approval, a Phase I DSR, which includes safety, pavement, environmental, and cost analyses, may be completed prior to project inclusion in the TIP/STIP. If a plan is developed, it will include conceptual costs for the permanent BMPs that will be considered. While working through CDOT Form 1048a, Project Scoping/Clearance Record, Section 7, item 7.12 briefly touches on the need to discuss erosion control and stormwater quality management. Figure 3-

2, CDOT Permanent BMP Checklist, is a tool to use during the more detailed review to ensure appropriate consideration of BMPs.

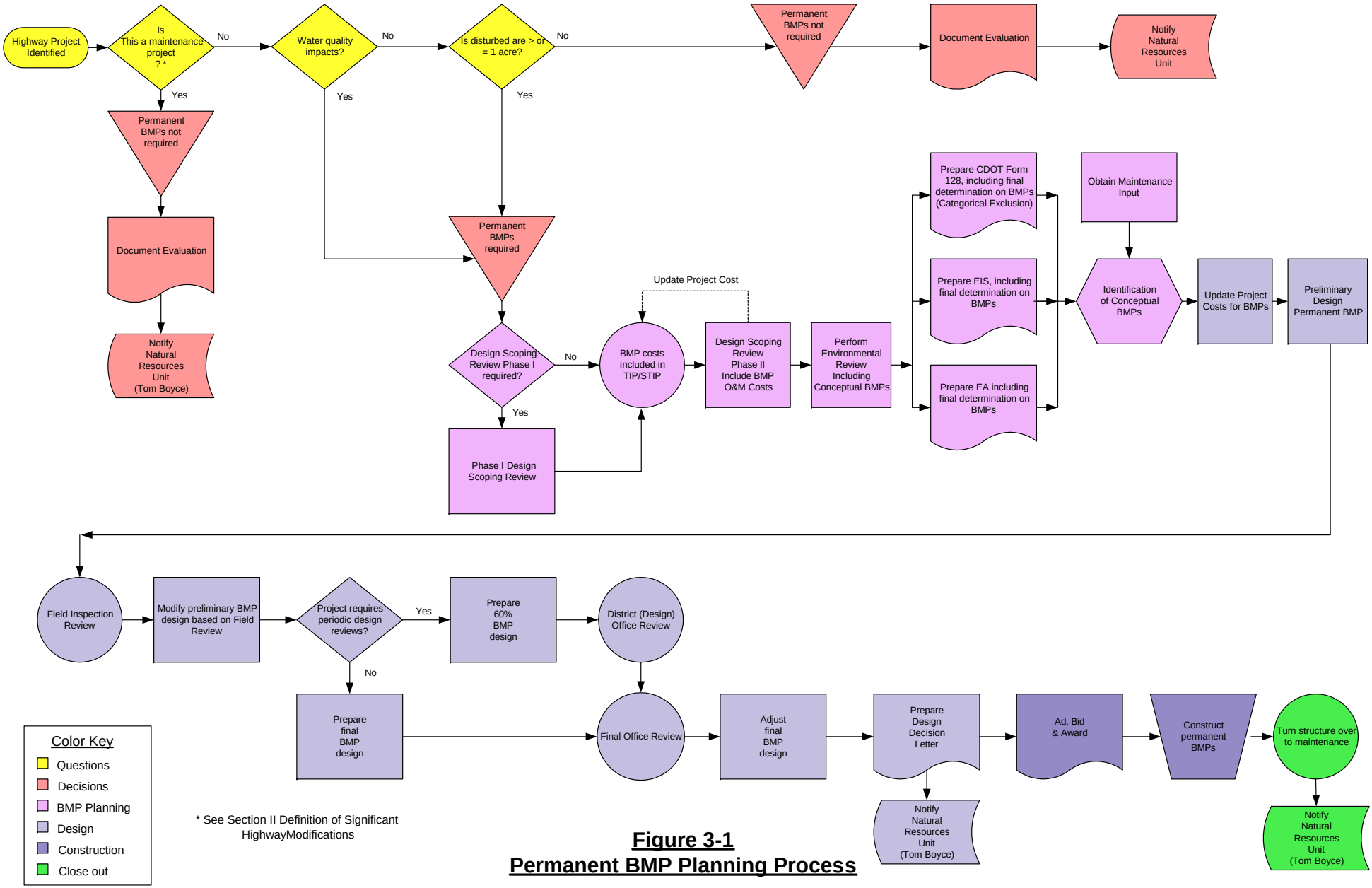

Figure 3-1
Permanent BMP Planning Process

A Phase II DSR is considered the formal review and is completed after funds have been budgeted for the project. Project concerns and future budget requirements are determined during this phase. All project development and design needs, including the cost of the design and construction of BMPs, must be identified and resolved during the scoping process before starting preliminary design. In order to ensure BMPs are included in the project, the conceptual design of the BMPs along with the footprints and the approximate locations and costs will be determined in this review.

19.I.3.5 Environmental Processes

Each project is assigned an environmental category of minor, intermediate, or major. The level of detail involved in the environmental evaluation is dependent on the category. As the project becomes more defined, it may change categories.

Projects are classified as "Minor" when significant environmental impacts and public controversy is not anticipated. CDOT Form 128 for Categorical Exclusions is prepared for these projects to document required clearances and permits. During the course of project development, review, design, "Minor" projects may be upgrade to "Intermediate" or "Major" if significant public interest or significant environmental issues are identified. Should a "Minor" project be later determined to have a significant environmental impact, it will be necessary to revise the DSR to include permanent BMPs.

"Intermediate" projects fall between "Minor" and "Major" projects. The environmental impacts of these projects are not clearly known and Environmental Assessments (EA) are prepared for these projects. The result of the EA is either a Finding of No Significant Impact (FONSI) or a determination that an EIS is required. The EIS/EA includes a review of the various impacts to the environment from the project. An important element of the project is a detailed evaluation of the water quality impacts.

"Major" projects are expected to have significant environmental impacts. Draft and Final Environmental Impact Statement (EIS) are prepared for these projects and the preferred alternative is Record of Decision (ROD).

During the environmental review/study process, the potential permanent BMPs identified in the DSR process will be reviewed to ensure that they will be adequate to mitigate potential impacts from the project on water quality. The EIS/EA process may bring to light the need for additional or different controls to address concerns that were not known during the DSR process. Maintenance staff must be involved at this time to ensure that the type, frequency, required equipment, and cost of upkeep required for the potential BMPs are considered and planned for as part of the overall budget for the project. Upon completion of the EIS/EA the final decision on the implementation of permanent BMPs is made. Complete elimination of BMPs cannot be made after this point. Modifications or substitutions to the BMPs identified in the EA/EIS, to equivalent or better functionality to address final design constraints, is acceptable if approved by the design hydraulic engineer or environmental specialist.

19.I.3.6 Field Inspection Review

The purpose of the FIR is to conduct a review of preliminary construction plans. Preliminary plans are expected to include a preliminary roadway alignment, preliminary Right-of-Way requirements, and a stabilization layout. All plans shall contain preliminary hydraulic designs, preliminary mitigation plans, including appropriate permanent BMPs, as were identified during the environmental review/study process, and locations of environmental constraints. Another purpose of the FIR is to identify and discuss unresolved issues or concerns and to establish specific criteria and direction to be

used in final design. Figure 3-2, CDOT Permanent BMP Checklist, is a tool to use in the review of the BMP design.

19.I.3.7 Design Office Review

The Design Office Review (DOR) is conducted for the more complicated projects after the design is approximately 60 percent completed. This review may not be conducted for less complicated projects. The review meeting provides a formal opportunity for coordination of work by different disciplines and for resolution of design issues. At this review, identified permanent BMPs will be considered part of the project design and may not be removed or significantly modified.

19.I.3.8 Final Office Review

When the design is substantially complete, a Final Office Review (FOR) is conducted to determine completeness and accuracy of the construction drawings. Again, the checklist shown in Figure 3-2 is a tool to use in the review to ensure appropriate consideration of BMPs.

A copy of the CDOT Permanent BMP Checklist must be sent to the appropriate regional office so that a regional summary can be prepared at the end of the year. This summary will be sent to the CDOT water quality program manager for compilation and inclusion in CDOT's annual report.

19.I.3.9 Construction

Permanent BMPs shall be constructed to significantly perform as designed in accordance with approved and issued final construction drawings and specifications. In multi-phase projects, permanent BMPs shall be planned and constructed as early as possible and may be used to satisfy some or all of the temporary erosion and sediment control requirements during construction. The CDOT Water Quality Program Manager shall be notified annually of all completed construction projects where permanent BMPs were constructed. During construction, if the environmental manager identifies additional BMP needs, they may be added if within budget constraints.

Figure 3-2

Draft Example CDOT Permanent BMP Checklist

Date: _____

Project Name

Project Location

	1 Planning (Reviewed during STIP/TIP and DSR)	Reviewed (initials)	Date
1.1	ID potential adjacent sensitive waters		
1.2	ID probable BMP Tier		
1.3	Conceptually select appropriate BMPs		
1.4	Conceptually estimate O&M requirements		
1.5	Discuss conceptual O&M with Maintenance		
1.6	Include costs for ROW and O&M in cost estimate		

	2 Design (Completed for Reviewed during FIR)	Reviewed (initials)	Date
2.1	ID BMP locations		
2.2	ID receiving water/sensitive water		
2.3	ID physical constraints		
2.4	Determine BMP Tier (meets pollutant removal design criteria)		
2.5	Select BMP(s) Sensitive Waters: consult Special Considerations BMP Matrix		
2.6	Coordinate with Maintenance for O&M		
2.7	Design BMP(s)		
2.8	Finalize ROW needs for BMPs		

	3 Documentation (Reviewed during FIR/FOR)	Reviewed (initials)		Date	
3.1	Sensitive waters determination and checkoff from CDPHE				
3.2	Tier justification				
3.3	O&M requirements (equipment, personnel, training, schedule)				
3.4	O&M acceptance by Maintenance				
3.5	Location/Size/Materials				
3.6	Design Data				

	4 Routing (Project Closeout)	Reviewed (initials)	Date

4.1	One copy of this checklist to be included with drainage design documents		
4.2	One copy of this checklist must be given to Regional staff for Regional compilation and summary		
4.3	Regions to forward summary of following to HQ staff for inclusion in annual report		
4.3.1	Number of projects		
4.3.2	Number of projects reviewed for compliance with New Development Program		
4.3.3	BMP information; type, size, material, location		
4.3.4	**BMP design + installation meet proper Tier criteria**		

19.I.4 DESIGN PROCESS AND BMP SELECTION

The following is an outline of the BMP design process. Portions of this process will need to be implemented beginning with the Design Scoping Review. The actual design steps and details for the design of BMPs will be included in Chapter 6 of the *CDOT Erosion Control and Stormwater Quality Guide*. Additional design guidance can be obtained from the *Urban Drainage Flood Control District Best Management Practice Design Manual*.

19.I.4.1 General

As part of the multi-discipline staff effort to design a new highway or significant highway redevelopment, hydraulic and environmental engineers perform the work of evaluating and designing permanent BMPs. The project Hydraulic Engineer or design Hydraulics Engineer is responsible for the design of the BMPs. The project Hydraulic Engineer or design Hydraulic Engineer often depends on the expertise of an environmental specialist to assist in the design of BMPs. CDOT maintenance staff are also important resources in that they often have historical knowledge of field performance and of maintenance concerns, which may influence the design of BMPs. The CDOT Project Engineer is ultimately accountable to ensure that all elements of the project plans are constructed, including BMPs.

Coordination between the maintenance staff, environmental specialist and hydraulic engineers is required to design elements for an effective stormwater collection system that also protects water quality. This coordination should occur from project conception through the design and construction phases of projects and should include the construction staff to ensure the intent and function of the design is clearly understood.

During the environmental review/study, the environmental specialist and/or project Hydraulic Engineer will finalize the potential permanent BMPs to mitigate potential water quality impacts.

19.I.4.2 Process Steps

The design process will generally include the following steps. It will be necessary that the Water Quality Capture Volume, as defined later, be provided. Following these steps may, in some cases, provide adequate water quality capture volume BMPs, such as detention ponds. For example, by revegetating adjacent slopes, newly generated runoff may be adequately treated. These steps represent the main storm water quality design steps typically employed for projects. While some of the steps, such as considering porous pavement, would not normally be considered during a roadway design project, they are included as they may be applicable to other CDOT projects. For example, CDOT may consider using porous pavement for additional parking at one of the maintenance facilities.

Employ runoff reduction practices. This means reducing, wherever possible, the amount of paved surfaces and non permeable surfaces like sidewalks and slope paving. These impermeable areas block the infiltration of rain into the ground and produce runoff.

Stabilize drainageways. This means providing improvements to drainageways such as grade control, vegetation, and embankment stabilization such that the drainageways may convey runoff without suffering degradation.

Provide detention for Water Quality Capture Volume (WQCV). A simplified explanation of the WQCV is that one of the primary mechanisms for improving stormwater runoff quality is by providing a proscribed volume for detention of the “first flush” of runoff. This “first flush” often contains the main water quality degrading constituents such as sediments, floating and dissolved contaminates. The detention of this “first flush” allows for settlement of suspended solids, entrapment of floating debris, and biological uptake of other pollutants.

Consider the need for industrial and commercial BMPs. This means providing BMPs to address the particular needs of industrial and commercial situations. For example, planning for fuel spills from fueling areas. Typically, these are not part of normal CDOT projects. These may apply CDOT maintenance facilities and other CDOT properties such as rest areas.

Specific BMPs and methodologies to accomplish steps one through three are discussed in more detail in the drainage Manual and the Guide. This guide will be revised as necessary. An important factor in the BMP details is the inclusion of performance standard criteria for each BMP. This will present a mechanism by which to check the effectiveness of the BMP.

After BMPs are constructed, they must not be modified in the field without the prior approval of the design hydraulic engineer, as this may adversely impact the BMPs performance. This must be conveyed to the maintenance staff in an educational forum. If issues arise related to the BMP after construction, modifications may not be made to the BMP without involving a hydraulic engineer to ensure that the changes do not adversely affect the intended operation of the BMP.

19.I.4.3 Stormwater Management Selection Guide

In order to maintain predevelopment hydrological conditions and treat water quality, uniform BMP design criteria need to be established to guide BMP implementation on various projects. BMP design and maintenance practices criteria considered were 80% total suspended solids (TSS) removal rate and the water quality capture volume. This is an expected removal rate based on adequate data and/or analysis from a professionally accepted source.

The alternative of using 80% TSS removal criteria for BMP selection is based on many factors. TSS is a measure of the concentrations of sediment and other solid particles suspended in the water resource. TSS can be an indirect measure of other pollutants carried by runoff, because nutrients such as phosphorus, metals, and organic compounds are typically attached to sediment particles. Research has shown that many of the practices or combinations of practices can achieve the 80% removal goal. Several states and local governments have implemented a TSS removal treatment standard of 80 percent for their runoff management programs. This management measure can also be achieved by applying one or more management practices together to achieve the TSS removal for practices that by themselves do not achieve the 80% TSS removal.

The first flush or the water quality capture volume (WQCV) is generally defined as the first 0.5 inch of runoff from impervious surfaces, or other depth if justified by another methodology applicable to the Colorado climate. The first flush is considered to contain the highest concentration of pollutants. The WQCV is detained in a basin or impoundment structure to allow the pollutants to settle out.

The above design criteria may not always be applicable for every CDOT project site. As an alternative only on CDOT projects, BMP banking can be considered at highly constrained project sites that are not suitable for BMP implementation. BMP banking takes the required BMP implementation level at a portion of a project site or at the whole site, if it is small enough, and applies it to a more suitable site along the same waterbody with a specified mitigation factor. The mitigation sites to be identified during the planning stages of the project. Banking procedures will be designed to have an equivalent water quality benefit to the receiving water.

In selecting a management measure for a particular project, three levels of BMP implementation have been developed from the above design criteria. These three levels are outlined in Table 4.1 below. These management options have been carefully established based on existing design criteria that are used in Colorado and other states. All CDOT projects will begin at the intermediate, Tier 2, design criteria and will either be upgraded or downgraded to the next Tier based on further evaluation. Section 4.5.1 provides criteria for modifying the tier level.

Table 4.1

BMP Management Levels

Tier 1: Maximum Design Criteria	Tier 2: Intermediate Design Criteria with Constraints	Tier 3: Minimum Design Criteria
-Project needs to provide 100% of the required WQCV for a BMP -Or the Project needs to provide BMPs to remove at least 80% of the average annual TSS loading from the average storm events	-Project can utilize a combination of WQCV and TSS design removal to reduce the average annual TSS loading from the average storm events to pre-project levels -Project may consider BMP banking for only CDOT projects	-Project needs to control and treat for TSS to ensure that TSS levels do not exceed pre-project TSS levels -Project may consider BMP banking for only CDOT projects

Within Tier 3, the pre-project TSS levels will need to be estimated based on current maintenance operations such as sanding in the winter time. The pre-project TSS will then serve as the maximum amount of TSS allowable in the post-project conditions. The additional TSS generated by the project must be controlled and treated to reach the pre-project TSS levels.

19.I.4.4 BMP Management Options

General management options to achieve the three levels of BMP implementation have been identified below each with some advantages, disadvantages, and comparative cost information to assist in the selection process. It is unlikely that any single BMP will be able to completely meet all management objectives; trade-offs between costs and performance almost always occur. Often, more than one BMP will be necessary.

Table 4.2

∗Comparison of BMP Advantages, Disadvantages, and other Characteristics for BMPs that meet the 80% TSS requirement

Structural BMPs that do meet the 80% TSS requirement				
BMP	Advantages	Disadvantages	Longevity	Comparative Cost
Wet Ponds	-Can provide peak flow control -Can serve large developments; most cost-effective for larger, more intensively developed sites -Enhances aesthetics and provides recreational benefits -Little ground water discharge -Permanent pool in wet	-Not economical for drainage area less than 10 acres -Potential safety hazards if not properly maintained -If not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors -Requires considerable space, which limits use in densely urbanized areas with expensive land and property values -Not suitable for hydrologic soil	High	Moderate to high compared to conventional runoff detention

Table 4.2

∗Comparison of BMP Advantages, Disadvantages, and other Characteristics for BMPs that meet the 80% TSS requirement

Structural BMPs that do meet the 80% TSS requirement				
BMP	Advantages	Disadvantages	Longevity	Comparative Cost
	ponds helps to prevent scour and resuspension of sediments -Provides moderate to high removal of both particulate and soluble urban runoff pollutants	groups "A" and "B" (USDA-NRCS classification) unless a liner is used -With possible thermal discharge and oxygen depletion, may severely impact downstream aquatic life -Water rights related to exposed groundwater		
Constructed Stormwater Wetlands	-Ability to reduce biochemical oxygen demand, suspended solids, and heavy metals -Ability to store phosphorus, depending on soil absorption chemistry	-Minimum watershed drainage area is 10 acres -Need a constant source of flow, it is desirable that the water table is at or near the surface -Should not be used for flood control or stream channel erosion control -Requires a sediment control facility upstream -Plants are a short-term sink for phosphorus, but if plants are not harvested, as much as 75% of the phosphorus can be released back to the wetlands when the plant dies -Access needs to be provided to allow maintenance and harvesting of vegetation -May not be effective year round	High	-Construction costs are moderate to high
Infiltration Basin	-Provides ground water recharge -Can serve large developments -High removal capability for particulate pollutants and moderate removal for soluble pollutants -When basin works, it can	-Possible risk of contaminating ground water -Only feasible where soil is permeable and there is sufficient depth to rock and water table -Fairly high failure rate -If not adequately maintained, can be and eyesore, breed mosquitoes, and create undesirable odors	Low	-Construction cost moderate, but rehabilitation cost high

Table 4.2

∗Comparison of BMP Advantages, Disadvantages, and other Characteristics for BMPs that meet the 80% TSS requirement

Structural BMPs that do meet the 80% TSS requirement				
BMP	Advantages	Disadvantages	Longevity	Comparative Cost
	replicate predevelopment hydrology more closely than other BMP options -Basins provide more habitat value than other infiltration systems	-Regular maintenance activities cannot prevent rapid clogging of infiltration basin		
Infiltration Trench	-Provides ground water recharge -Can serve small drainage areas -Can fit into perimeters, and other unused areas of a development site -Helps replicate predevelopment hydrology, increases dry weather baseflow, and reduces bankfull flooding frequency	-Possible risk of contaminating ground water -Only feasible where soil is permeable and there is sufficient depth to rock and water table -Since not as visible as other BMPs, less likely to be maintained by residents -Requires significant maintenance	Low	-Cost-effective on smaller sites -Rehabilitation costs can be considerable
Filtering Basin	-Ability to accommodate medium-size development (3–80 acres) -Flexibility to provide or not provide ground water recharge -Can provide peak volume control	-Requires pretreatment of stormwater through sedimentation to prevent filter media from prematurely clogging	Low to Moderate	-Information not available

∗Adapted from FHWA, 2000.

Table 4.3

∗Comparison of BMP Advantages, Disadvantages, and other Characteristics for BMPs that **do not** fully meet the 80% TSS requirement

Structural BMPs that do not fully meet the 80% TSS requirement

Table 4.3

∗Comparison of BMP Advantages, Disadvantages, and other Characteristics for BMPs that **do not** fully meet the 80% TSS requirement

BMP	Advantages	Disadvantages	Longevity	Comparative Cost
Vegetated Filter Strip	-Low maintenance requirements -Can be sued as part of the runoff conveyance system to provide pretreatment -Can effectively reduce particulate pollutant levels in areas where runoff velocity is low to moderate -Provides excellent urban wildlife habitat -Economical	-Often concentrates water, which significantly reduces effectiveness -Ability to remove soluble pollutants highly variable -Limited feasibility in highly urbanized areas where runoff velocities are high and flow is concentrated -Requires periodic repair, regrading, and sediment removal to prevent channelization	Low if Poorly Maintained	Low
Water Quality Inlet **Catch Basins with Sand Filter**	-Provide high removal efficiencies of particulates -Require minimal land area -Flexibility to retrofit existing small drainage areas -Higher removal of nutrient as compared to catch basins and oil/grit separator	-Not feasible for drainage areas greater than 5 acres -Only feasible for areas that are stabilized and highly impervious -Not effective as water quality control for intense storms	High	Information not available
Water Quality Inlet Oil/Grit Separator	-Captures coarse-grained sediments and some hydrocarbons -Requires minimal land area -Flexibility to retrofit existing small drainage areas and applicable to most urban areas -Shows some capacity to trap trash, debris, and other floatables -Can be adapted to all regions of the country	-Not feasible for drainage area greater than 1 acre -Minimal nutrient and organic matter removal -Not effective as water quality control for intense storms -Concern exists for the pollutant toxicity of trapped residuals -Require high maintenance -Potential for septic flushing if not maintained regularly	High	-High, compared to trenches and sand filters
Extended Detention	-Can provide peak flow control	-Removal rates for soluble pollutants are quite low	High	-Lowest cost alternative in

Table 4.3

∗Comparison of BMP Advantages, Disadvantages, and other Characteristics for BMPs that **do not** fully meet the 80% TSS requirement

Dry Pond with Micropool	-Possible to provide good particulate removal -Can serve large development -Requires less capital cost and land area when compared to wet pond -Does not generally release water or anoxic water downstream -Provides excellent protection for downstream channel erosion -Can create valuable wetland and meadow habitat when properly landscaped	-Not economical for drainage area less than 10 acres -If not adequately maintained, can be an eyesore, breed mosquitoes, and create undesirable odors	size range

∗Adapted from FHWA, 2000.

19.I.4.5 BMP Evaluation Process

The following section provides a general outline for choosing the appropriate BMPs for a development site. The proposed BMP selection process is designed as a sequential approach that incorporates a series of checks and balances, integrates management objectives, and site conditions, and relies on current knowledge of stormwater BMP technology. The process is designed to allow decisions to progress from a preliminary screening level to a more detailed evaluation and selection of candidate best management alternatives. The decision making process for choosing a stormwater BMP will weigh the goals of the proposed facility against the limiting site feasibility factors of the proposed BMP site or BMP location. The limiting feasibility factors may include: topographic and geologic constraints, contributing drainage area size, environmental impacts, and maintenance access and requirements.

The evaluation process consists of three types of analyses.

An evaluation is performed to identify potential environmental impacts that include sensitive waters and threatened and endangered species. Water quality constituents of concern for the receiving water body may be identified through the EA/EIS process or by the CDPHE. BMP effectiveness information will need to be utilized to identify BMPs with demonstrated performance in controlling targeted constituents in stormwater runoff.

BMPs are further narrowed down by physical design constraints such as drainage area, soil type and infiltration capacity, depth to groundwater, and site topography.

Coordination with CDOT maintenance staff for consideration of the long term operations and maintenance requirements and costs for the BMPs are included in the evaluation.

The decision making process has been developed to assist in systematic progression towards identifying suitable BMPs for a project. Each CDOT project begins at the intermediate design level, Tier 2, and at

each stage of the evaluation process the BMP level can be upgraded or downgraded based on identified constraints. In some cases, the designer may be able to accommodate certain limiting feasibility factors by providing innovative design which addressees or remedies the constraint. Once the BMP is selected, the supporting criteria and supporting documentation justifying increases or decreases in the Tier, should be presented to the various review committees to ensure proper evaluation and review. This will help to avoid extensive changes to the stormwater management strategy during the review process.

Sensitive Waters Evaluation

One of the first considerations in selecting a stormwater BMP is to assess the environmental impacts associated with the site development and the placement of the BMP. Local, State, and Federal regulations may restrict the disturbance, or encroachment upon any of the following: wetlands, State Waters, wetland buffer, floodplains, conservation easement, and other sensitive resources. The environmental impacts evaluation should consider the receiving waters and the existence of threatened or endangered species to determine if additional measures may be necessary because the receiving water is considered "sensitive." The criteria in Table 4.4 will be applied to determine a resultant BMP implementation tier level for each project due to environmental considerations. For large projects that may impact multiple waterbodies, the project should be divided into segments which impact each basin. Each basin will be looked at separately.

Projects must investigate additional BMP requirements from any local watershed regulatory agencies. (An example of such an agency is the Cherry Creek Basin Water Quality Authority for areas in the Cherry Creek Reservoir Watershed.) For projects within the boundaries of such agencies, the project must investigate what additional BMP requirements might be required by the local agency. In some cases, the agency may be concerned with the control of a water quality constituent that is known to be of concern with runoff from highways. For example, fecal coliform may be the constituent of concern. However, based on various studies, highways are not a recognized major source of fecal coliform. Additional structural BMPs to address the fecal coliform loading specifically may not be appropriate. Another example is phosphorus loading. Since highways can be a significant source of phosphorus, it may be necessary to choose a BMP with a high removal rate for phosphorus as well as evaluate nonstructural BMPs such as modification of CDOT's fertilizing practices within the project area.

Table 4.4

Sensitive Waters Evaluation of the Receiving Water Body **** Note Phase I + II MS4 areas trigger Tier I***

Sensitive Waters Evaluation Criteria	BMP Tier Categories			Resultant BMP Tier
	Tier 1	Tier 2	Tier 3	
303(d) List				
Is the receiving water body on the 303(d) List?	Yes	No		
For what pollutants is the receiving water body listed impaired? (The water body may be listed for constituents that need specific treatment BMPs.)	List pollutants of concern:			
Use Classifications				
Is the receiving water body classified as Outstanding Waters?	Yes		No	

Table 4.4

Sensitive Waters Evaluation of the Receiving Water Body **** Note Phase I + II MS4 areas trigger Tier I***

Sensitive Waters Evaluation Criteria	BMP Tier Categories			Resultant BMP Tier
	Tier 1	Tier 2	Tier 3	
Is the receiving water body classified as Recreation - Class 1a/1b or Class 2?	Class 1 Class 2*		No, (classification not assigned)	
Is the receiving water body classified as Aquatic Life -- Cold Class 1 or Class 2? Or Aquatic Life – Warm Class 1 or 2?	Cold Class 1	Cold Class 2 Warm Class 1 or 2	No, (classification not assigned)	
Is the receiving water body classified as Agriculture ?		Yes	No, (classification not assigned)	
Is the receiving water body classified as Domestic Water Supply?	Yes		No (n/a)	
Threatened and Endangered Species				
Does the project area or adjacent have the potential to impact threatened and endangered species?	Yes		No	
Resultant BMP Tier				

Most restrictive BMP Tier from the above evaluation questions.

* If Outside Phase I and Phase II areas, Rec. Class 2 move to Tier 2

For each sensitive waters evaluation question, note the required BMP Tier level that applies for a project. The resultant BMP Tier level is determined by selecting the most stringent BMP Tier level of all of the evaluation questions. In other words, if a single item is in tier 1 , then it is in tier 1. The CDOT Regional Planning and Environmental Manager (RPEM) shall check the stream classifications determined for the receiving water body impacted by a project by submitting the classifications determined to the CDPHE for verification. The CDPHE will provide a certification letter for the stream classification that will be applicable throughout the entire duration of the project even if the CDPHE changes the classifications at any point in time during the project.

Physical Design Constraints

The physical characteristics of the site must be compatible with the performance of a selected BMP. Physical design constraints such as limited land availability for BMP implementation, existing adjacent development, and difficult topography must be weighed with the environmental factors. The consideration of physical design constraints may reduce the BMP Tier level. Table 4.5 provides some general site considerations to evaluate the feasibility of various BMPs based on the project scope. Site

considerations include drainage area that needs to be set aside for BMP installation, in-situ soils, minimum head requirement, and configuration.

It should be noted that per the Clean Water Act, existing wetlands, wetlands constructed for wetlands mitigation, and state waters may not be considered for water quality treatment credit. Constructed wetlands for water quality treatment must be constructed solely for the treatment benefit and may not be combined with mitigation efforts.

Table 4.5

∗Site Considerations for Structural BMPs

BMP	Area Typically Served (acre)	Area Required for BMP	In Situ Soils	Minimum Head Requirement (ft) **	Configuration
Infiltration Trench	2 – 4	2 – 4%	Dependent	3 – 8	Off-line/ On-line
Infiltration Basin	2 – 20	2 – 4%	Dependent	3 – 4	Off-line
Bioretention	1 – 50	4 – 10%	Independent	2 – 4	Off-line/ On-line
Detention Ponds	2 min	10 – 20%	Independent	3 – 6	Off-line/ On-line
Wetlands	1 min	10%	Dependent	1 – 8	Off-line/ On-line
Underground Sand Filters	2 – 5	2 – 3%	Independent	1 – 8	Off-line
Surface Sand Filters	2 – 5		Independent	5 – 8	Off-line
Organic Medial Filters	2 – 5	2 – 3%	Independent	5 –8	Off-line
Vegetated Swales	2 – 4	10 – 20%	Dependent	2 – 6	Off-line
Vegetated Filter Strips	NA	25% min	Dependent	Negligible	Off-line
Oil-Grit Separators	1 – 2	<1%	Independent	3 – 6	Off-line
Catch Basin Inserts	< 1	None	Independent	1 – 2	Off-line
Manufactured Systems	1 – 2	None	Independent	4	Off-line
Porous Pavement	2 – 4	NA	Dependent	NA	NA

Table 4.5

∗Site Considerations for Structural BMPs

BMP	Area Typically Served (acre)	Area Required for BMP	In Situ Soils	Minimum Head Requirement (ft) **	Configuration

∗Adapted from FHWA, 2000.

NA - not available.

**Minimum Head Required is either the depth of water in the typical design or the total drop in water level for flow-through designs.

Adjacent Land Owner Concerns

Additional stormwater BMP selection constraints may need to be considered to coordinate with adjacent municipalities in the Phase I and II permit areas that are regulated by different MS4 requirements than CDOT. Each municipality in the Phase I and II permit areas has established drainage water quality and quantity criteria. Coordination will be required to determine what the BMP/New Development design requirements are for the adjacent municipality in the project area and ensure that the most stringent MS4 requirements are applied to the project. Further coordination will be required to ensure the project BMP design, construction, and the adjacent municipality to ensure MS4 compliance approves maintenance. Design considerations shall include an investigation of existing runoff to determine if the runoff is being treated upstream or downstream. Runoff that is treated upstream or downstream may not be required to be treated for a project. Runoff from the roadway project that is not treated for water quality on site may be treated at a downstream facility that is designed to treat the roadway runoff. Also, BMP maintenance may require an internal government agreement (IGA) to schedule routine maintenance between responsible entities for projects where MS4 municipalities overlap.

Maintenance Considerations

In order to be effective, stormwater pollution control devices must accumulate pollutants, especially sediment, oil and grease, and other constituents. BMPs are designed to trap pollutants either by filtration or sedimentation. If not properly maintained, these systems can become point sources of pollution and the pollutants that they were designed to remove from runoff.

Maintenance considerations such as long-term operation, maintenance costs related to each BMP considered for implementation, easy access, and the cost of routine maintenance activities such as mowing, sediment removal, vacuum equipment and maintenance equipment, filter/media replacement, and trash removal need to be considered in the overall cost estimate for the BMP design. General maintenance considerations for BMPs in varying climate conditions are described in Table 4.6, which includes comparative operation and maintenance costs.

Maintenance requirements must be carefully planned and implemented when BMPs are located completely below the surface and access is limited to access hole openings or the removal of concrete panels. Underground BMPs may be considered confined spaces and require additional measures to ensure safe access for inspection and maintenance. Some BMP technologies require periodic maintenance on an annual or semiannual basis. The difficulty in performing maintenance or level of effort to perform the required maintenance should be careful considered as the increased level of effort increases may increase maintenance costs.

Long term maintenance of the BMPs to ensure continued efficiency and functionality is required. For example, if a vacuum truck is required to provide routine cleaning service to an underground sediment vault, the funds to support the vacuum equipment, confined space entry equipment, personnel, and training must be made available to ensure the long term effectiveness of the BMP.

Table 4.6

∗Maintenance Considerations for Best Management Practices

BMP	Maintenance Burden	O& M Costs	Cold Climate Restrictions	Arid and Semi-Arid Restrictions
Infiltration Basins Infiltration Trenches	High	Moderate	-Avoid areas with permafrost -Monitor groundwater for chlorides -Do not infiltrate road/parking lot snowmelt if chlorides are a concern -Increase percolation requirements -Use 20 foot minimum setback between road subgrade and practice	-No recharge in hotspot areas -Do not treat pervious areas -Use multiple pretreatment -Soil limitations exist in arid areas
Vegetated Filter Strips	Low	Low	-Small setback may be required between filter strips and roads when frost heave is a concern -Avoid areas with permafrost -Use cold- and salt-tolerant vegetation -Plowed snow can be stored in-practice	-Use drought-tolerant vegetation
Grassed Swales	Low	Low	-Avoid areas with permafrost -Use cold- and salt-tolerant vegetation -Plowed snow can be stored in the practice -Increase underdrain pipe diameter and size of gravel bed -Provide ice-free culverts -Ensure soil bed is highly permeable	-Not recommended for pollutant removal in arid areas -Of limited use in semi-arid areas -Ensure adequate erosion protection of channels
Porous Pavement	Low	Moderate	-Only use on non-sanded surfaces -Pavement may be damaged by snow plows -Maintenance is essential	
Filtration Basins and Sand Filters	Moderate	Moderate	-Reduced treatment effectiveness during cold season -Underground filters only effective if placed below the frost line -Peat/compost media ineffective during winter and may become impervious if frozen	-Preferred in both arid and semi-arid areas. Arid area filters require greater pretreatment
Water Quality Inlets	Cleaned twice a year	Moderate	-Few restrictions	

Table 4.6

∗Maintenance Considerations for Best Management Practices

BMP	Maintenance Burden	O& M Costs	Cold Climate Restrictions	Arid and Semi-Arid Restrictions
Extended Detention Dry Pond	High	Low	-Protect inlet/outlet pipes -Use large-diameter (> 8 in) gravel in underdrain of outfall protection -Consider seasonal operation -Provide ice storage volume -Cold-tolerant vegetation	-Preferred in arid climates and acceptable in semi-arid climates
Wet Ponds	Low	Low	-Protect inlet/outlet pipes -Use large-diameter (> 8 in) gravel in underdrain of outfall protection -Consider seasonal operation -Provide ice storage volume -Cold-tolerant vegetation	-Not recommended in arid areas and of limited use in semi-arid areas
Wetlands	Annual harvesting of vegetation	Moderate	-Protect inlet/outlet pipes -Use large-diameter (> 8 in) gravel in underdrain of outfall protection -Consider seasonal operation -Provide ice storage volume -Cold-tolerant vegetation	-Not recommended in arid areas and of limited use in semi-arid areas

∗Table adapted from EPA, 2002.

19.I.4.6 Qualitative and Quantitative Analysis for Retrofit Projects

Evaluating the environmental benefits of retrofitting a BMP for water quality treatment at project in qualitative and quantitative terms can be valuable in determining the feasibility of a retrofit BMP. Quantitative terms include, load reduction of nutrients and/or sediment to the receiving water body (by estimating the potential load reduction before and after BMP implementation). Other water quality improvements may include nutrient removal or physical restoration. For most projects, it may not be easy to compare measurable environmental outcomes. Surrogate measures may include evaluating existing conditions at the retrofit site, and operations and maintenance of the BMP.

Qualitative Comparison

Several qualitative measures can be applied to determine if a BMP would a suitable retrofit candidate for water quality treatment at a project site. These general considerations include below are not exhaustive. Concerns are site-specific and should be evaluated on a site-by-site basis. If any of the concerns cannot be mitigated, then the retrofit site is not a feasible candidate for water quality treatment improvements.

An evaluation of the existing BMP operation. Evaluation should detect functional problems with the BMP that would preclude it from providing the designed water quantity and quality control. Problems may include ground water recharge, overtopping, and short-circuiting.

An evaluation of maintenance performed on BMP. Frequent maintenance performed on the BMP can be in excess of the general BMP maintenance requirements for that type of BMP structure and may be an indicator of other problems such as a high sediment load in the drainage shed. Also, the lack of maintenance may be an indicator of poor access or the lack of sufficient equipment and personnel to perform the required maintenance. Perpetual maintenance problems may not make a BMP a good candidate for retrofitting.

An evaluation of environmental impacts. The existing BMP plays an integral part in the watershed that it was designed to serve during a previous time. Retrofitting a BMP may present environmental concerns such as habitat disturbance or the destruction or filling in of wetlands. Also, the new retrofit BMP may require a larger footprint than the existing BMP, which could potentially increase habitat disturbance.

An evaluation of impacts on future developments and community. It is critical that upstream and downstream landowners are not impacted by the proposed BMP improvements. Consideration should be given to evaluate any potential impacts to adjacent developments. Also, it would be prudent to obtain public input on the proposed BMP improvements to ensure that community issues are address such as potential recreational use.

Quantitative Comparison

Ranges of removal efficiencies have been reported by a number of literature sources for structural BMPs. BMP pollutant removal ranges for structural BMPs are lists in Table 4.7 below. These reported ranges can be utilized to estimate the potential pollutant removal benefit for a retrofit BMP. Some projects may impact sensitive waters where the receiving water body may be listed impaired for constituents that may need specific treatment BMPs.

Table 4.7

∗ BMP Pollutant Removal Ranges for Stormwater Runoff and Most Probable Range for BMPs

Type of BMP	(1)	TSS	TP	TN	TZn	TPb	BOD	Bacteria
Grass Buffer	LRR:	10-50	0-30	0-10	0-10	N/A	N/A	N/A
	EPR	**10-20**	**0-10**	**0-10**	**0-10**	N/A	N/A	N/A
Grass Swale	LRR:	20-60	0-40	0-30	0-40	N/A	N/A	N/A
	EPR	**20-40**	**0-15**	**0-15**	**0-20**	N/A	N/A	N/A
Modular Block Porous Pavement	LRR:	80-95	65	75-85	98	80	80	N/A
	EPR	**70-90**	**40-55**	**10-20**	**40-80**	**60-70**	N/A	N/A
Porous Pavement Detention	LRR:	8-96	5-92	-130-85	10-98	60-80	60-80	N/A
	EPR	**70-90**	**40-55**	**10-20**	**40-80**	**60-70**	N/A	N/A
Porous Landscape Detention	LRR:	8-96	5-92	-100-85	10-98	60-90	60-80	N/A
	EPR	**70-90**	**40-55**	**20-55**	**50-80**	**60-80**	N/A	N/A
Extended Detention Basin	LRR:	50-70	10-20	10-20	30-60	75-90	N/A	50-90
	EPR	**55-75**	**45-55**	**10-20**	**30-60**	**55-80**	N/A	N/A
Constructed Wetland Basin	LRR:	40-94	-4-90	21	-29-82	27-94	18	N/A
	EPR	**50-60**	**40-80**	**20-50**	**30-60**	**40-80**	N/A	N/A
Retention Pond	LRR:	70-91	0-79	0-80	0-71	9-95	0-69	N/A
	EPR	**80-90**	**45-70**	**20-60**	**20-60**	**60-80**	N/A	N/A

Sand Filter Extended Detention	LRR:	8-96	5-92	-129-84	10-98	60-80	60-80	N/A
	EPR	**80-90**	**45-55**	**35-55**	**50-80**	**60-80**	**60-80**	N/A
Constructed Wetland Channel*	LRR:	20-60	0-40	0-30	0-40	N/A	N/A	N/A
	EPR	**30-50**	**20-40**	**10-30**	**20-40**	**20-40**	N/A	N/A

Ref: Bell et al. (1996), Colorado (1990), Harper & Herr (1992), Lakatos & McNemer (1987), Schueler (1987), Southwest (1995), Strecker et al. (1990), USGS (1986), US EPA (1983), Veenhuis et al. (1989), Whipple and Hunter (1981), Urbonas (1997.

(1)LRR Literature reported range, **EPR**—expected probable range of annual performance by Volume 3 BMPs.

N/A Insufficient data to make an assessment.

*The **EPR** rates for a Constructed Wetland Channel assume the wetland surface area is equal or greater than 0.5% of the tributary total impervious area.

19.I.5 IMPLEMENTATION SCHEDULE - AFTER PROGRAM APPROVAL DATE

The following is a schedule for implementation of the program.

Table 1

CDOT New Development and Redevelopment Program Implementation Schedule

Program Component	Implementation Date*
1. Incorporate material in Appendix I into CDOT Drainage Design Manual	Within 6 month
2. Incorporate material in Appendix II into CDOT Erosion Control and Stormwater Quality Guide	Within 6 months
3. Training Activities to Disseminate Program to CDOT Regional Offices	Within 12 months

Dates are following written receipt of the program approval from CDPHE.