



**Preparation Guidelines for
Operations and Maintenance Plans (O&M
Plans) for Permanent Water Quality Control
Measures (PWQ CMs)**

This document will guide CDOT staff and consultants, including Design Engineers, Project Engineers, Hydraulic Engineers, and Environmental and Maintenance staff, in the development of an Operations and Maintenance Plan (O&M Plan) for Permanent Water Quality Control Measures (PWQ CM) installed during a project’s active construction phase for long-term treatment of runoff from the project area after construction is complete. PWQ CMs include extended detention basins, sand filters, media filter drains, and other constructed and proprietary structures.¹ The CDOT Drainage Design Manual and Maintenance Manual provide additional general direction on the design and maintenance of PWQ CMs.

The development of an O&M Plan for each PWQ CM needs to occur for compliance with the requirements of the Municipal Separate Storm Sewer System (MS4) Permit issued by the Colorado Department of Public Health and Environment (CDPHE), specifically Part I.E.2.v. The O&M Plan is intended to serve as a reference document for maintenance staff to review prior to leaving the maintenance yard so that they arrive at each PWQ CM site with the staff and equipment required to maintain the PWQ CM, an understanding of access requirements and maintenance expectations, and a knowledge of necessary procedures required to maintain the PWQ CM to its original design specifications. The O&M Plan will reflect as-built conditions.

An example O&M Plan has been provided. The example O&M Plan is representative only. The information and text included in the example O&M Plan are not reflective of what should or should not be done at any site; it is reflective only of the *type* of information that should be provided. All O&M Plans for PWQ CMs shall generally conform to the example regarding the type of information provided; however, not all necessary contents may be included on the example O&M Plan. Unique features may warrant inclusion of additional information. This guidance document provides a thorough discussion of the elements that will be required, if applicable, on an O&M Plan for PWQ CMs. The O&M Plan will be a doubled-sided 11x17 with a font size of at least 11 point. If an item is not required, note that it is not required rather than omitting it from the O&M Plan.

No.	Front of 11x17 Sheet
1.	<p><u>Title block and title text</u></p> <p>The front and back of each O&M Plan shall include a title block and title text that includes the facility name, the type of PWQ CM (one of seven SAP PWQ CM categories), the SAP number, the project subaccount number, the Colorado county the CM is in, the CDOT Region the CM is in, the route and route segment the PWQ CM is treating, and the month and year the facility was constructed. It will also include the CDOT Region Maintenance Section or Local Agency responsible for maintenance.</p>
2.	<p><u>Location map</u></p> <p>A large-scale location map shall cover enough area and include enough major roadways that the O&M Plan user can find the PMQ CM. The location map shall show CDOT roadway(s) with mileposts, north arrow, and location of PWQ CM. Scale shall be between 1"=1000' and 1"=5000'.</p>
3.	<p><u>Detailed as-built plan view</u></p> <p>A smaller scale detailed plan view of the PWQ CM location shall show all nearby roadways; all maintenance access points, turn-arounds, and sediment/debris stockpile areas; at least one hard maintenance control point including elevation; right-of-way, property boundaries, ownership, and easements; areas to remain undisturbed by maintenance activities such as areas regulated by a 404 permit or any other sensitive areas; and areas to be mowed or to receive other weed control activities including weed spraying. Major features shall be identified such as forebays, micropools, inlets, outlets, structures, trickle channels, etc. Include the 100-year floodplain if applicable. If a power source usable by maintenance staff is present at the site, it shall be shown in the detailed plan view. Any weight-restricted areas shall be shown. Detailed instructions need not be provided on the detailed plan view if they are included in the notes. Scale shall be between 1"=20' and 1"=100'. The location of the access point to the PWQ CM may need to be delineated by dimensions from roadway centerline, edge of pavement, or other hard, visible structure if it is below grade or otherwise may be difficult to find. For</p>

¹ Refer to the PWQ Section of the Drainage Design Manual for more information (<https://www.codot.gov/programs/environmental/water-quality/documents/drainage-design-manual-1>).





	example, if the PWQ CM is a below-grade vault with manhole access, and there are multiple manholes in the vicinity, it will be necessary to indicate which specific manhole(s) access the PWQ CM.
4.	<p><u>Profile</u></p> <p>While not required for every PWQ CM, if critical information cannot be sufficiently in sections and/or the plan view, a profile view of the main flow path through the PWQ CM may be added to show critical elevations and information. Such information may include variations in slope of the main channel invert or pipes and culverts, the extents and depth of the filter media, and underdrains and other structures. The profile shall show permanent pool elevations, crossing utilities, flow direction, and any design water surface elevations used such as the elevation of the water quality capture volume (WQCV) or any specific design storm event. General maintenance notes may be included on the profile or reserved for the detailed notes on the back of the O&M Plan.</p>
5.	<p><u>Sections</u></p> <p>Enough PWQ CM sections shall be included to detail all tops of walls, inverts, rims, dimensions, and flowline elevations of all CM components including, but not limited to, forebays, inlets, micropools, outlets, trickle channels, storm sewers, underdrains, sumps, headwalls, wingwalls, overflow weirs, orifice plates, grates, screens, gates, trash racks, and filter media dimensions and specifications. Sections of proprietary structures may be as provided by the manufacturer. Nearby utilities shall be shown in the sections as applicable. A section showing the maintenance access roads shall also be included with the access road surfacing material and thickness, minimum width, maximum grade, and any weight limitations.</p>
6.	<p><u>Grate Details</u></p> <p>Details of all grates must be included with enough information that the maintaining agency can reorder grates if they are stolen. This includes exterior dimensions, materials, and bar spacing in both directions.</p>
7.	<p><u>Front page notes</u></p> <p>While the first page of the O&M Plan is generally reserved for plans, sections, profiles, and details, any notes of high importance may be added here as well as on the second page of the O&M Plan. These may include detailed notes on critical items such as how to handle wetlands or weeds on site, unique access instructions, or IGA conditions. These notes may also be included on the back page to provide redundancy.</p>
No.	Back of 11x17 Sheet
1.	<p><u>Notes on general project information</u></p> <p>The notes shall include the project subaccount number; name(s) of the receiving water; the name, phone number, email of the CDOT Project Engineer for the design of the PWQ CM; the property owner's name(s), contact name, address, phone number, and contact email address if available; the maintaining agency's name(s), contact name, address, phone number, and contact email address if available; the design engineer's name(s), contact name, address, phone number, PE license number, and contact email address if available. If CDOT is the maintaining agency, the name of the Maintenance Section Superintendent shall be included.</p>
2.	<p><u>Notes on the general facility description</u></p> <p>The notes shall include a general facility description that includes what type of PWQ CM the facility is; how it functions (filtration, sedimentation, etc.); and the origin of the runoff it treats, including tributary area. A brief note about the overall project under which the PWQ CM was constructed, if applicable, should be included as well as the CDOT Maintenance Section and Local Agency (if applicable) that approved the design. If the facility will not treat the 100-year storm event but will receive inflow exceeding its volumetric capacity, a note should be added on how those flows are safely conveyed through and beyond the facility. If flows are bypassed prior to reaching the PWQ CM, a note shall be included that details the function and location of the bypass structure.</p>
3.	<p><u>Notes on the anticipated inspection and maintenance frequency and procedure</u></p>





	<p>Initial PWQ CM inspection shall be annually plus after storms producing more than 1 inch of rainfall per hour. at a minimum, with an inspection form filled out for each inspection. Inspection frequency may be adjusted based on findings of inspections during the first year. PWQ CM maintenance shall be annually at a minimum. Maintenance frequency may be increased based on findings of inspections during the first year and any requirements issued by the EPA or CDPHE. Examples of items to be inspected include pond forebays, low water crossings, riprap side slopes and inverts, grouted riprap, inlets, access ramps, storm sewer outfalls, incoming and outgoing pipes, pond outlet structure including interior of structure, canal gate (to be exercised), restrictor plate, micropool, trash rack, well screen.</p> <p>The maintenance procedure shall include the following at a minimum, provided they are applicable: Traffic control plan; confined space entry protocols; dewatering and water control requirements such that a dewatering permit is not required; sediment and debris removal and disposal requirements, including longest reach distance from access road; mowing and weed control; information on wetlands and other sensitive areas; any other maintenance required maintenance activities; items to be replaced; any materials testing requirements if sediment must be tested for contaminants prior to disposal; post-maintenance considerations such as restoring flow patterns, removing temporary dewatering and water control measures such as stop logs, or additional cleanup requirements.</p>
4.	<p><u>Notes on required maintenance equipment, materials, staffing, and responsibility</u> The notes shall include all equipment, materials, and labor that is anticipated to be required to maintain the PWQ CM. Equipment may include, but not be limited to mowers, pumps, hoses, vac trucks (note reach required), air compressors, shovels, buckets, excavators (note reach required), inflatable coffer dams, weed killer, generators, and sprayers. Anticipated sizes of all equipment shall be included. Materials may include proprietary replacement products such as filter bags or media that need to be ordered in advance or more general filter media. Materials notes should include approximate quantities. Staffing notes shall include the minimum number of maintenance staff expected to be required to complete the maintenance activities. For example, if two employees are required to operate a pump or install a coffer dam, this should be noted in this section.</p> <p>These notes shall include a description and details of any inter-governmental agreements (IGAs) regarding maintenance of the PWQ CM and which entity is responsible for which aspects of maintenance. The IGA description and details should include the dates and parties subject to the agreement and a general summary of the agreement, including what happens if one party does not fulfill its contractual obligations. Also note if CDOT or a Local Agency is relying on C.R.S. 43-2-135 as the maintenance mechanism.</p>
5.	<p><u>Notes on ROW, adjacent ownership, and access</u> The notes shall include a general description of the right-of-way shown in the detailed plan view, the adjacent property ownership, and locations and dimensions of maintenance access. These notes shall include property access requirements such as whether locked gates might be encountered, locations of keys, access codes, and vehicular weight limitations. Notes shall also include additional applicable specific instructions (e.g., must approach access drive from the south).</p>
6.	<p><u>Notes on vegetation management</u> The notes are specific to seed mixes, mowing, and weed control. There may be some redundancy with the notes on the anticipated inspection and maintenance procedure and frequency. These notes are intended to be more detailed. The notes shall include all seed mixes (dryland/upland and/or wetland mixes) and any trees or shrubs that have been planted at the site. Seed mixes shall include all genus, species, variety, and pounds pure live seed per acre of each type of seed that was planted as well as the location (e.g. above elevation XXXX.XX, on the low flow channel side slopes, etc.).</p> <p>These notes shall also indicate the total area to be mowed, in acres, and any notes on mowing.</p> <p>How weed control is to be accomplished (e.g. mowing, spraying, etc.) shall be included in the notes. Different areas may require different methods, and these shall be noted. These notes shall also include criteria on replacement of seed or other vegetation.</p>





7.	<p><u>Notes on hydraulic design</u></p> <p>The notes shall include all flow rates used in the hydraulic design including base flow and the 2- and 100-year peak inflow and outflow at a minimum. The notes shall include other calculated flow rates as applicable, the WQCV and associated water surface elevation, the excess urban runoff volume (EURV) and associated water surface elevation, if applicable, the 100-year volume and associated water surface elevation if applicable, and the volumes of major structures that can accumulate sediment including forebays, micropools, and sumps. Depths of major structures shall be noted. The WQCV drain time and EURV drain time shall be noted if applicable.</p>
8.	<p><u>Notes on sensitive areas, wetlands, and permits</u></p> <p>The notes shall include descriptions of any environmentally sensitive areas, wetlands to remain undisturbed, and areas covered by a 404 permit or other environmental permit and how maintenance activities are different for these areas, if applicable. The notes shall include any monitoring or inspections required by 404 or other environmental permits. The notes shall also include information on any current or retired groundwater monitoring wells, any hazardous materials that were or could reasonably be anticipated to be encountered on site, and any known unmitigated hazards. Permits that may be required include a floodplain development permit if the CM is within the 100-year floodplain and CDPHE permits such as construction dewatering, stormwater discharge, groundwater, etc.</p>
9.	<p><u>Notes on snow and ice control</u></p> <p>Notes shall include descriptions of locations where maintenance staff are responsible for snow and ice control if necessary for sidewalks and/or roadways within the PWQ CM and the methods by which snow and ice are to be controlled. If requirements for snow and ice control exist, they are likely a Local Agency requirement.</p>
10.	<p><u>Notes on miscellaneous information</u></p> <p>Notes shall include any other items or details that are important for understanding the inspection and maintenance requirements of the site or for general informational purposes. One required item is the approximate survey date, horizontal and vertical datum, and coordinate system information.</p>
11.	<p><u>Notes on homeless encampments</u></p> <p>The note included on the O&M Plan template shall be included on all O&M Plans. The contact person for all PWQ CMs maintained by CDOT should be the Maintenance Section Superintendent. For PWQ CMs maintained by a local agency, contact the local agency to determine who should be contacted.</p>

