



Model Comprehensive Stormwater Management and Erosion and Sediment Control Codes Updates: Background and References

CRWP's model Comprehensive Stormwater Management (CSM) and Erosion and Sediment Control (ESC) codes were revised to be in-line with the latest Ohio EPA NPDES Municipal Separate Storm Sewer System (MS4) Permit and Construction General Permits. CRWP added recommendations to improve stormwater management and promote green infrastructure and assist communities with addressing Total Maximum Daily Load (TMDL) requirements associated with their MS4 Permits. Recommendations include:

1. Require stormwater management for all commercial and industrial site development.
2. Require soil preservation and post-construction soil restoration.
3. Require use of stormwater control measures to reduce the temperature of runoff for development projects in watersheds draining to coldwater habitat streams.
4. Credit volume reduction attained through low impact development stormwater control measures toward peak discharge requirements.
5. Require redevelopment projects to manage greater than 20% of the water quality volume and incentivize infiltration-based SCMs for redevelopment.

Adopting these recommendations will improve stormwater management on private developments, lessen the burden of aging and undersized stormwater infrastructure on public entities, improve water quality, and help communities meet permit requirements. Key stormwater code recommendations and rationale are summarized below.

1. Stormwater Management for All Commercial and Industrial Site Development CSM Model Code - Page 10, Section XXXX.05(A), ESC Model Code - Page 9 Section XXXX.05(A)

Development and redevelopment of small sites less than one acre provides an opportunity to lessen the burden of stormwater runoff on MS4s. CRWP recommends communities require post-construction stormwater management for all commercial and industrial site development. The City of Eastlake already requires stormwater management for all commercial and industrial development projects. Communities may also consider adopting a lower than one acre threshold for stormwater management requirements to minimize these impacts. Reviewing building permits for typical residential and commercial development may assist communities with determining an appropriate threshold. For example, the City of Lakewood requires stormwater management for all developments disturbing 8,000 square feet or more (1339.01). The City of Aurora requires a Comprehensive Stormwater Management Plan for additions to commercial or industrial properties where that addition will add more than one-half (½) acre of impervious area to a site. (1175.05). The U.S. government requires the sponsor of any development or redevelopment project involving a federal facility with a footprint that exceeds 5,000 square feet to use site planning, design, construction, and maintenance strategies for the property to maintain or restore, to the maximum extent technically feasible, the predevelopment hydrology of the property with regard to the temperature, rate, volume, and duration of flow. Adopting this recommendation will help Phase II communities meet the TMDL requirements of their MS4 permit by addressing the following TMDLs: habitat, total suspended solids, nutrients, flow and dissolved oxygen.



2. Soil Preservation and Post-Construction Soil Restoration

CSM Model Code - Page 22, Section XXXX.09(A)(11)

Healthy soils help reduce stormwater runoff. CRWP recommends that communities require development projects to minimize soil disturbance and protect soil from compaction. If soil disturbance is unavoidable, communities may require restoration of disturbed soils by tilling the subsoil to 15-18 inches, incorporating compost in the top 12 inches and replacing topsoil to a minimum 4 inch depth. This recommendation is based on standards adopted by King County, Washington and the City of Salem, Oregon. Soil restoration is also a recognized best management practice in the State of New York. Adopting this recommendation will help Phase II communities meet the TMDL requirements of their MS4 permit by addressing flow and habitat TMDLs.

3. Stormwater Quality Control

CSM Model Code - Page 27, Section XXXX.09(C)(2)(e)

Especially during the summer, pavement and rooftops capture solar radiation, reaching temperatures much higher than those of natural surfaces. During a storm, this heat is transferred to stormwater runoff, with runoff temperatures at times exceeding 110°F. Heated runoff can potentially affect any aquatic ecosystem, but it is especially a concern in coldwater stream environments that support coldwater fish, such as the native brook trout for which the maximum temperature is 73°F in July. In addition to the direct effects of increased temperature, warm water contains less dissolved oxygen which is vital for fish and many other aquatic organisms. The survival of fish is important to both the ecosystem and the economy. For example, according to a 2011 survey by the U.S. Fish and Wildlife Service, an estimated 1.4 million anglers fishing in Ohio spend more than \$2.2 billion a year. CRWP recommends that communities require that development projects on sites within watersheds of coldwater habitat streams use stormwater control measures (SCMs) to infiltrate the water quality volume or reduce the temperature of discharged runoff. SCMs that reduce the temperature of discharged runoff include bioretention, permeable pavement, underground detention, and incorporation of shading and infiltration in parking lot design (Jones and Hunt 2009, Long and Dymond 2013, University of New Hampshire Stormwater Center 2011, Wardynski et al. 2013). Adopting this recommendation will help Phase II communities meet the TMDL requirements of their MS4 permit by addressing habitat TMDLs.

4. Stormwater Quantity Control

CSM Model Code - Page 33, Section XXXX.09(D)(9)

Research has demonstrated that low impact development (LID) stormwater control measures (SCMs) such as permeable pavement and bioretention systems can reduce the volume and peak flow rates of runoff, even on sites with poorly draining soils (Winston et al. 2015). CRWP's revised model comprehensive stormwater management code includes recommended language that will allow communities to credit the runoff volume reduction provided by permeable pavement, bioretention or other LID SCMs toward the required volume for peak discharge



requirements. The Ohio Department of Natural Resources is currently developing design guidance and volume reduction calculators to support crediting of runoff volume reduction from the use of LID SCMs toward meeting local peak discharge requirements. The Chagrin River Watershed Partners, Inc. co-led research to inform the development of these tools with ODNR, Old Woman Creek National Estuarine Research Reserve, North Carolina State University, and Erie Soil and Water Conservation District. Adopting this recommendation will help Phase II communities meet the TMDL requirements of their MS4 permit by addressing the following TMDLs: flow, habitat, nutrients, dissolved oxygen and bacteria (bioretention only for bacteria).

5. Stormwater Management on Redevelopment Projects

CSM Model Code - Page 34 Section XXXX.09(E)(1)

Communities can reduce the burden on their stormwater infrastructure by incentivizing infiltration of stormwater runoff and removal of impervious surfaces. In addition to providing water quality benefits, these techniques reduce stormwater volume, which limits stress on community infrastructure and mimics pre-development hydrology. CRWP developed code recommendations to incentivize infiltration of stormwater runoff and removal of impervious surface during development based on model policies and design guidance currently in effect or in development for other states including Maryland and New York. CRWP recommends communities require that Comprehensive Stormwater Management Plans for redevelopment projects accomplish one of the following:

1. Reduce existing site impervious areas by at least 25 percent. A one-for-one credit towards the 25 percent net reduction of impervious area can be obtained through the use green roofs.
2. Infiltrate and/or evapotranspire at least 25 percent of the water quality volume.
3. Capture, treat and release 50 percent of the water quality volume

Adopting this recommendation will help Phase II communities meet the TMDL requirements of their MS4 permit by addressing TMDLs for total suspended solids, nutrients, habitat, flow, dissolved oxygen and bacteria.



References

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- Long, D.L. and R.L. Dymond. 2013. “Thermal pollution mitigation in cold water stream watersheds using bioretention.” *Journal of the American Water Resources Association*, 50 (4): 977-987.
- University of New Hampshire Stormwater Center. 2011. *Examination of thermal impacts from stormwater best management practices*. Report prepared with support from U.S. Environmental Protection Agency Region 1 TMDL Program, January 2011.
- Wardynski, B.J., R.J. Winston, and W.F. Hunt. 2013. “Internal water storage enhances exfiltration and thermal load reduction from permeable pavement in the North Carolina mountains. *Journal of Environmental Engineering*, February 2013, 187 – 195.
- Winston, R.J., J.D. Dorsey, and W.F. Hunt. 2015. *Monitoring the Performance of Bioretention and Permeable Pavement Stormwater Controls in Northern Ohio: Hydrology, Water Quality, and Maintenance Needs*. Report to Chagrin River Watershed Partners, Inc., August 15, 2015.