Recommended Best Management Practices for

Dissolved Oxygen & Organic Enrichment

Total Maximum Daily Load Fact Sheet

About Dissolved Oxygen & Organic Enrichment

Dissolved Oxygen (DO) in surface water is used by all forms of aquatic life and is typically measured to assess the "health" of lakes and streams; too much or too little DO can result in unhealthy aquatic conditions. In addition, large fluctuations in DO levels over a relatively short period of time can impair or kill fish and invertebrates. The two main sources of dissolved oxygen are the atmosphere and aquatic plants. Atmospheric oxygen is mixed into turbulent stream water as it flows along rocks and riffles in the stream. Atmospheric oxygen can also enter a stream through ground water recharge. Oxygen is also produced by aquatic plants and algae as a product of photosynthesis. Photosynthesis is the process by which green plants and certain bacteria synthesize carbon dioxide (using light as an energy source) and hydrogen (usually water) to produce necessary carbohydrates for development. Most forms of photosynthesis release oxygen as a byproduct.

The amount of oxygen that can dissolve in water is also limited by physical conditions such as temperature, atmospheric pressure, low flow and organic enrichment. Aquatic life can have a hard time in stagnant water that has a lot of rotting, organic material (organic enrichment), especially in the summer. The concentration of DO is inversely related to water temperature; when ambient air temperatures increase, the amount of available DO decreases. Conditions may be especially serious during periods of hot, calm weather and may result in summertime fish kills. Photosynthesis is the primary process affecting the dissolved oxygen/temperature relationship. Water clarity and duration of sunlight affects the rate of photosynthesis. Bacteria in water can also consume oxygen as organic matter decays. Thus, excess organic material in lakes and rivers can cause eutrophic conditions that result in an oxygen-deficient situation that can impact a water body and create a "dead zone."

Sources of Dissolved Oxygen & Organic Enrichment

DO & Organic Enrichment are related to a wide variety of sources of pollution, such as stream bank and streambed erosion, sediment conveyed by storm water runoff, decaying plant and animal matter, industrial discharges, waste and sewage. TMDL reports for DO, organic enrichment and low flow are often developed for localized water quality conditions that can be addressed through the adoption of best management practices.

Best Management Practices that Address Dissolved Oxygen & Organic Enrichment

The following summarizes BMPs your community will be required to include in your revised Storm Water Management Program (SWMP) to meet the minimum performance standards of NPDES Permit #OHQ000003. Furthermore, it suggests means by which a community can tailor their SWMP to specifically address the dissolved oxygen and organic enrichment TMDL.

MCM 1: Public Education and Outreach BMPs

Your program must reach at least 50% of your population. To do so, your community is required to implement more than one mechanism and target at least five different storm water themes or messages over the permit term, at least one of which must be targeted to the development community.

To address DO/OE, choose at least one of the following themes:
• Protection and maintenance of natural vegetative buffers along waterways • Management of manure and pet wastes • Reduction and management of residential and agricultural fertilizers • Reduction of soil erosion on residential and agricultural land uses • Composting and management of grass clippings and yard wastes • Operation & Maintenance of on-site sewage treatments systems • Construction site erosion and sediment control practices • Pond maintenance education (e.g., manage waterfowl, install aerators, maintain vegetative buffers, etc.)

MCM 2: Public Participation and Involvement

Your program shall include a minimum of five public involvement activities over the permit term.

To address DO/OE, implement at least one of the following activities:
• Streamside plantings and cleanups • Storm drain stenciling • Construct a rain garden with assistance from the public • Allow residents to provide input on new proposed ordinances that reduce TSS (i.e., downspout disconnection, conservation development, riparian and wetland setbacks, etc.) • Conduct a charity car wash that implements best management practices and promotes environmental responsibility • Establish public reporting mechanism (complaint hotline, webpage, etc.) to identify non-compliance from construction sites • Have residents pledge to a "no-fertilizer" lawn program • Construct a rain garden with assistance from the public • "Green" workshops where residents make environmentally-friendly lawn care and cleaning supplies

MCM 3: Illicit Discharge Detection and Elimination (IDDE)

All communities should have an applicable IDDE code in place and have developed an MS4 map, as required by previous generations of the MS4 permit.

Required BMPs that directly address DO/OE:
• Maintain and continue updating the MS4 map on an annual basis (i.e., outfalls, names and locations of surface waters that receive discharges from those outfalls, catch basins, pipes, ditches, flood control facilities (retention/detention ponds), post-construction water quality BMPs and private post-construction water quality BMPs which have been installed to satisfy Ohio EPA's NPDES Construction Storm Water general permit and/or your local storm water management code requirements)
• Develop and maintain a list and map of Sewage Treatment Systems[1] that discharge to your MS4; work with the local health department to identify and prioritize solutions to failing STS

• Based upon data collected from previous screenings, establish a prioritization schedule for ongoing dry-weather screening of outfalls
• Develop an IDDE plan that clearly defines the department(s) and/or agency(s) responsible for investigating and resolving confirmed sources of illicit discharges
• Develop an enforcement escalation plan that outlines how your community will address illicit discharges o Clearly define escalation enforcement roles between affected agencies o Work with local health department to identify and eliminate failing sewage treatment systems o Establish timeframes for investigation and elimination
• Document in the SWMP how community emergency spill response and cleanup plans are communicated and coordinated between applicable agencies and/or departments
• Train street, service, public works, building, and parks and recreation staff to identify sources of illicit discharge
BMPs that will enhance your community's ability to address DO/OE:
• Establish an IDDE surveillance plan focused on sources of DO/OE such as: o Sewage treatment systems o Cross-connections and infiltration & inflow (I/I) o Animal waste (agricultural and pet) o Grass clippings and yard waste
• Establish a schedule for regular meetings or other communications between third-party service providers (e.g., health department, SWCD, etc.) and the MS4 manager

1 - STS also includes home sewage treatment systems (HSTS) as referenced by the MS4 NPDES OHQ000003.

MCM 4: Construction Site Runoff

All communities should have an applicable construction runoff control code in place as required by previous generations of the MS4 permit.

Required BMPs that directly address nutrients:
• Update your existing construction runoff control code to meet or exceed the requirements of the NPDES Construction General Permit (OHC000004), including the federal effluent limitations in Part II
• Ensure most current erosion, sediment and non-sediment control BMP standards are required to be utilized (e.g., Rainwater & Land Development)
• Complete Storm Water Pollution Prevention Plan (SWP3) reviews and approvals prior to construction commencement
• Conduct monthly site inspections throughout construction, as well as a final site inspection to ensure correct implementation of erosion, sediment and non-sediment control BMPs in the approved SWP3
• Develop an enforcement escalation plan that outlines how and when your community will address noncompliance with approved erosion, sediment and non-sediment control plans
• Establish a standard operating procedure to respond to complaints
BMPs that will enhance your community's ability to address nutrients:
• Include the following in your code: o Require on-site protected areas (i.e., wetlands, riparian areas, other valuable resources) to be physically marked in the field prior to commencement of earth disturbing activities o Require 50-ft natural vegetative buffers to be maintained between the limits of disturbance and water resources o Maintain wetlands in their natural states wherever feasible
• Ensure portable toilets are maintained and emptied without spills

• Ensure proper storage of landscape materials on construction sites
• Require MS4 compliance inspectors to provide a written report of findings to construction site operators for every site inspection; the report would summarize compliance and non-compliance matters
• Establish a Sediment and Erosion Control bond equivalent to the cost to stabilize (vegetate) disturbed areas of the sites in cases of nonperformance (i.e. developer foreclosure/bankruptcy)

MCM 5: Post-Construction Runoff Control

All communities should have an applicable storm water management code in place as required by previous generations of the MS4 permit.

Required BMPs that directly address DO/OE:
• Update your existing storm water management code to meet or exceed the requirements of NPDES OHC000004, including the federal effluent limitations in Part II
• Ensure the most current post-construction BMP standards are required to be utilized (e.g., Rainwater & Land Development)
• Complete Storm Water Pollution Prevention Plan (SWP3) reviews and approvals prior to construction commencement o Ensure SWP3 includes an executed Maintenance Agreement and Long-Term Maintenance Plan for post-construction BMPs o Review 100% of SWP3s where the larger common plan of development/sale disturbs one or more acres.
• Conduct monthly site inspections throughout construction, as well as a final site inspection to ensure correct implementation of post-construction BMPs in the approved SWP3
• Establish a program to ensure long-term maintenance of post-construction BMPs, including a protocol for enforcement escalation of your storm water management code
• Prior to commencing earth disturbing activities, ensure 100% of applicable sites have a fully executed Maintenance Agreement for the site, including an approved Maintenance Plan for each post-construction BMP
BMPs that will enhance your community's ability to address DO/OE:
• Update the design specification for bioretention to require internal water storage whenever feasible (as recommended by ODNR's Rainwater Manual)
• Include at least one of the following in your storm water management code: o Require on-site protected areas (i.e., wetlands, riparian areas, other valuable resources) to be physically marked in the field prior to commencement of earth disturbing activities o Prioritize and incentivize the following types of post-construction BMPs: ▪ Wet extended detention basins ▪ Dry extended detention basins with forebays and micropools ▪ Infiltration basins and trenches with appropriate pretreatment, e.g. vegetated swales, filter strips, etc. ▪ Bioretention areas ▪ Permeable pavement ▪ Tree box filters
• Require MS4 compliance inspectors to provide a written report of findings to construction site operators for every site inspection; the report would summarize compliance and non-compliance matters and establish a deadline for corrective action
• Establish a performance bond for post-construction BMPs and require the community engineer to generate documentation of acceptance before releasing bond

- Require submittal of as-built drawings for post-construction BMPs to ensure installation and/or conduct a physical inspection of BMPs at least once during the NPDES permit term

- Adopt at least one of the following planning and development codes:
  - Conservation development
  - Riparian and wetland setbacks
  - Downspout disconnections (redirect flow to rain gardens, rain barrel systems, open vegetated channels and/or filter strips)
  - Revised parking codes (e.g., decrease overall number of spaces, allow alternative pervious materials, shared parking, etc.)

- Incentivize the following within existing developed areas:
  - Retrofitting of storm water management control systems to treat the WQv and/or increase infiltration
  - Encourage commercial, industrial and institutional land owners to reduce impervious surfaces and replace them with storm water practices that infiltrate, capture and reuse, or otherwise reduce storm water runoff such as permeable pavement, cisterns, infiltration basins and trenches, bioretention with internal water storage, open channel swales, etc.

- Require an applicable community department (e.g., service, engineering) to annually inspect public and private post-construction BMPs, or require private property owners to submit an annual maintenance report. Ensure corrective actions are performed as needed by the applicable party.

MCM 6: Pollution Prevention/Good Housekeeping

As required by previous generations of the MS4 permit, all applicable community-operated facilities should have an SWPPP developed in accordance with the requirements of Ohio EPA's Industrial Storm Water General Permit.

Required BMPs that directly address DO/OE:

- Update and implement facility SWPPPs to reflect minimum requirements of the Ohio EPA General NPDES Permit for Storm Water Associated with Industrial Activities (OHR000005)
  - Perform inspection requirements
    - quarterly routine facility inspections, quarterly visual assessment of storm water discharges, and an annual comprehensive site inspection with annual report

- Complete an annual training for applicable employees on any combination of the topics listed below

- Your community is required to implement Pollution Prevention & Good Housekeeping practices at the following municipally-operated facilities:
  - Streets, roads and highways
  - Municipal parking lots
  - Maintenance and storage yards, including, but not limited to, municipal composting facilities and leaf collection yards
  - Golf courses, parks, and related maintenance facilities
  - Waste transfer stations, compost facilities, solid waste facilities (e.g. municipal solid waste (MSW) landfills, and construction and demolition (C&D) landfills)
  - Marinas
  - Fleet and/or maintenance shops
  - Salt/sand storage locations
  - Snow disposal areas

BMPs that will enhance your community's ability to address DO/OE:

- Programs which can be implemented to address TSS from the above sources include:
  - Street and parking lot sweeping
  - Catch basin cleaning

o Ditch cleaning or trash collection program for open channel MS4s o Timely stabilization of disturbed soils and soil stockpiles at the service yard, landfills and on municipal construction activity o Protection of catch basins and other appropriate sediment controls when conducting road repairs, waterline repairs and other maintenance activities of the Service Department or Department of Public Works o BMPs for granular fertilizer storage and application o Establish wash stations directed to sanitary sewers or utilize dry cleanup methods for lawn care equipment, golf carts, boats, and other municipal vehicles and equipment used in parks and golf course maintenance o Locate snow disposal areas where there are wide vegetative buffers or within berms o Integrated Pest Management (IPM) and reduction of fertilizer use o Implement low-mow or no-mow practices that preserve buffer areas around streams, wetlands and storm water basins
• At community-owned and operated facilities (maintenance garages, golf courses, parks, community gardens, cemeteries, etc.) maintain, protect and restore permanent natural vegetative buffers between developed areas and water resources
• Relocate stockpiles of waste materials and erodible materials away from stream banks and steep slopes and/or install appropriate sediment controls around such materials
• Install green infrastructure such as bioretention, permeable pavement, cisterns, green roofs, and infiltration trenches or basins at municipal facilities and/or retrofit existing storm water management ponds to treat the WQv
• Vegetate open areas at maintenance and storage yards to reduce TSS production