BCWMC DESIGN SEQUENCE FLOW CHART

version 1.0

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BCWMC Performance Goal

New nonlinear and redevelopment projects: Retain on site a volume of 1.1" from new and fully reconstructed (D) impervious surfaces

Linear projects: Retain on site a volume equivalent to the larger of: 1.0" of runoff from the net increase in impervious surfaces or 0.5" of runoff from the new and/or fully reconstructed impervious surfaces

Conduct Site Review:

- Aerial Photos and Topographic Maps
- County Soil Surveys and other Soil Information as Available
- County Geologic Atlas
- Local Groundwater Levels
- DWSMA and Wellhead Protection Maps
- FEMA and Local Floodplain Maps
- Soil Borings and Site Survey
- MPCA Listing of Potentially Contaminated Sites
- Phase 1 and 2 Environmental Site Assessments
- TMDLs and Local Water Quality Standards
- Wetland Delineations, MNRAM Assessments, and Wetland Classifications
- Proposed Conditions, Conceptual/Preliminary Site Design
- Local zoning and land use requirements/ordinances, including stormwater rate control requirements
- Communication with Local Landowners, LGU, or Others Knowledgeable about the Site
- Site Inspection

Is the project linear? — Yes → Does the project create one acre or more of new and/or fully reconstructed impervious surfaces? — Yes → Are there restraints due to lack of available ROW, off site drainage and/or rate control requirements? (F) — Yes → Is FTO #2 feasible? — Yes →

- Select FTO # 2
- Provide documentation of offsite run on to project area
- Provide documentation of lack of right-of-way.

Is FTO #2 feasible? — No → Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.

Are there restraints due to lack of available ROW, off site drainage and/or rate control requirements? (F) — No →

Does the project create one acre or more of new and/or fully reconstructed impervious surfaces? — No → BCWMC performance goal does not apply

Is the project linear? — No → Does the project create one acre or more of new and/or fully reconstructed (D) impervious surfaces? — No → BCWMC performance goal does not apply

Are there zoning and land use requirements (density, parking, setbacks, etc.) that make the Performance Goal not feasible? — Yes → Is BMP relocation feasible? — No → Is FTO #1 feasible? — No → Is FTO #2 feasible? — No → Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.

Is FTO #1 feasible? — Yes →

- Select FTO #1
- Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal

Is FTO #2 feasible? — Yes →

- Select FTO #2
- Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal.

Is BMP relocation feasible? — Yes →

Are there zoning and land use requirements (density, parking, setbacks, etc.) that make the Performance Goal not feasible? — No →

Is the site located in a DWSMA, wellhead protection area, or within 200 feet of a drinking well? — Yes → Can a local unit of government provide a higher level of engineering review to ensure a functioning system that prevents adverse impacts to groundwater? — No →

- Select FTO #2
- No infiltration practices allowed
- Explore non-infiltration volume reduction practices
- Provide DWSMA or well location map

Can a local unit of government provide a higher level of engineering review to ensure a functioning system that prevents adverse impacts to groundwater? — Yes →

Is the site located in a DWSMA, wellhead protection area, or within 200 feet of a drinking well? — No →

Are there existing or proposed structures or infrastructure (e.g., rate control BMPs, utilities, buildings, roadway, easements) that make the Performance Goal not feasible? — Yes → Is BMP relocation feasable? — No → Is FTO #1 feasible? — No → Is FTO #2 feasible? — No → Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.

Is FTO #2 feasible? — Yes →

- Select FTO #2
- Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal

Is FTO #1 feasible? — Yes →

- Select FTO #1
- Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal

Is BMP relocation feasable? — Yes →

Are there existing or proposed structures or infrastructure (e.g., rate control BMPs, utilities, buildings, roadway, easements) that make the Performance Goal not feasible? — No →

Are active karst areas within 1000 feet up-gradiant or 100 feet downgradiant of the BMP location? — Yes → Can a local unit of government provide a higher level of engineering review to ensure a functioning system that prevents adverse impacts to groundwater? — No → Is BMP relocation onsite to a location without karst feasible? — No → Is FTO #2 feasible? — No → Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.

Is FTO #2 feasible? — Yes →

- Select FTO #2
- No infiltration practices allowed
- Explore non-infiltration volume reduction practices
- Provide soil borings or report from a professional geologist or geotechnical engineer.

Is BMP relocation onsite to a location without karst feasible? — Yes →

Can a local unit of government provide a higher level of engineering review to ensure a functioning system that prevents adverse impacts to groundwater? — Yes →

Are active karst areas within 1000 feet up-gradiant or 100 feet downgradiant of the BMP location? — No →

Is shallow groundwater or shallow bedrock present on site? — Yes → Conduct detailed site investigation (i.e., borings, excavations, consultation with a professional geologist). → Is there >3 feet of soil depth (>10 feet is preferred) from bottom of BMP to bedrock and groundwater? — No → Is BMP relocation onsite to avoid shallow groundwater and bedrock feasible? — No → Can BMP be raised? — No → Is FTO #2 feasible? — No → Select FTO #3. Provide site survey, maps, regulations, and/or cost estimates documenting that meeting the original performance goal or FTO alternatives is not feasible in addition to other documentation as required by LGU.

Is FTO #2 feasible? — Yes →

- Select FTO #2
- No infiltration practices allowed
- Explore non-infiltration volume reduction practices
- Provide soil borings or report from a professional geologist or geotechnical engineer.

Can BMP be raised? — Yes → Raise BMP enough to ensure 3 feet (preferably 10 feet) of soil between bottom of BMP and top of bedrock and groundwater.

Is BMP relocation onsite to avoid shallow groundwater and bedrock feasible? — Yes →

Is there >3 feet of soil depth (>10 feet is preferred) from bottom of BMP to bedrock and groundwater? — Yes →

Is shallow groundwater or shallow bedrock present on site? — No →

Is there presence of contaminated soils and/ or groundwater, or hotspot runoff? (G) — Yes → Can hotspot or contamination be isolated or remediated to mitigate risk of increased contamination? — No →

- Select FTO #2
- No infiltration practices allowed
- Explore non-infiltration volume reduction practices
- Provide Phase I or II ESAs, or other documentation of potential contamination or hotspot runoff
- Provide documentation of extent of contamination and remediation alternatives considered

Can hotspot or contamination be isolated or remediated to mitigate risk of increased contamination? — Yes →

Is there presence of contaminated soils and/ or groundwater, or hotspot runoff? (G) — No →

Are there very low infiltrating soils (<0.2 inches per hour)? — Yes → Is BMP relocation onsite to a higher-infiltrating location feasible? — No → Can BMP be sized to drain dry within 48 hours (24 hours in locations that are tributary to trout streams)? — No → Provide soil boring or infiltration test results documenting low-infiltrating soils. → Is FTO #1 (lower volume control standard) feasible, allowing the BMP to drain within 48 hours (24 hours in locations that are tributary to trout streams)? — No →

- Select FTO #2
- No infiltration practices allowed
- Explore non-infiltration volume reduction practices
- Provide soil boring or infiltration test results documenting low infiltration rates.

Is FTO #1 (lower volume control standard) feasible, allowing the BMP to drain within 48 hours (24 hours in locations that are tributary to trout streams)? — Yes →

- Select FTO #1
- Provide soil boring or infiltration test results documenting high-infiltrating soils.

Can BMP be sized to drain dry within 48 hours (24 hours in locations that are tributary to trout streams)? — Yes →

Is BMP relocation onsite to a higher-infiltrating location feasible? — Yes →

Are there very low infiltrating soils (<0.2 inches per hour)? — No →

Are there very high infiltrating soils (>8 inches per hour)? (E) — Yes → Is BMP relocation onsite to a lower-infiltrating location feasible? — No → Can subgrade be modified to slow the rate of infiltration to less than 8 inches per hour? — No →

- Select FTO #2
- No infiltration practices allowed
- Explore non-infiltration volume reduction practices
- Provide soil boring or infiltration test results documenting high-infiltrating soils.

Can subgrade be modified to slow the rate of infiltration to less than 8 inches per hour? — Yes →

Is BMP relocation onsite to a lower-infiltrating location feasible? — Yes →

Are there very high infiltrating soils (>8 inches per hour)? (E) — No →

Are there adverse surface water hydrologic impacts from infiltration practices (e.g., impacting perched wetland)? — Yes → Can the BMP be relocated onsite to avoid adverse hydrologic impacts? — No → Would BMPs accommodating FTO Alternative #1 avoid adverse hydrologic impacts?

Would BMPs accommodating FTO Alternative #1 avoid adverse hydrologic impacts? — Yes →

- Select FTO #1
- Provide report documenting potential hydrologic impacts from infiltration on the site, prepared by registered engineer, hydrologist, or wetlands specialist.

Would BMPs accommodating FTO Alternative #1 avoid adverse hydrologic impacts? — No →

- Select FTO # 2
- Explore non-infiltration volume reduction practices
- Provide report documenting potential hydrologic impacts from infiltration on the site, prepared by registered engineer, hydrologist, or wetlands specialist.

Can the BMP be relocated onsite to avoid adverse hydrologic impacts? — Yes →

Are there adverse surface water hydrologic impacts from infiltration practices (e.g., impacting perched wetland)? — No →

Complete Design Using Performance Goal
(As modified by FTO alternatives, if applicable)

BCWMC Flexible Treatment Options (FTO)

The Flexible Treatment Options (FTO) alternatives presented here should be employed when the Performance Goal is not feasible and/or allowed. The designer should document the reasons why the Performance Goal and rejected FTO alternatives are not feasible and/ or allowed.

FTO #1
Applicant attempts to comply with the following conditions:

1.a. Achieve at least 0.55" volume reduction goal for new nonlinear and redevelopment projects,
1.b. Achieve volume reduction to the maximum extent practicable (as defined by the MS4 permit) for linear projects, and
1.c. *Remove 75%* of the annual TP load, and
1.d. Options considered and presented shall examine the merits relocating project elements to address, varying soil conditions and other constraints across the site

FTO #2
Applicant attempts to comply with the following conditions:

2.a. Achieve volume reduction to the maximum extent practicable (as defined by the MS4 permit), and
2.b. *Remove 60%* of the annual TP load, and
2.c. Options considered and presented shall examine the merits of relocating project elements to address, varying soil conditions and other constraints across the site.

FTO #3
Off-site mitigation (including banking or cash or treatment on another project, as determined by the local authority) equivalent to the volume reduction performance goal can be used in areas selected in the following order of preference:

1. Locations that yield benefits to the same receiving water that receives runoff from the original construction activity
2. Locations within the same Department of Natural Resource (DNR) catchment area as the original construction activity
3. Locations in the next adjacent DNR catchment area up-stream
4. Locations anywhere within the local authorities jurisdiction

Notes:

A. Volume reduction techniques considered shall include infiltration, rainwater harvesting & reuse, bioretention, permeable pavement, tree boxes, grass swales and/or additional techniques included in the MIDS calculator or the Minnesota Stormwater Manual.
B. Applicant shall document the flexible treatment options decision sequence, following the order of alternatives presented here.
C. For FTO #2, the applicant is encouraged to use BMPs that reduce volume. Secondary preference is to employ filtration techniques, followed by rate control BMPs.
D. Fully reconstructed impervious surfaces: Areas where impervious surfaces have been removed down to the underlying soils. Activities such as structure renovation, mill and overlay projects and other pavement rehabilitation projects that do not alter the underlying soil material beneath the structure, pavement or activity are not considered full reconstruction. In addition, other maintenance activities such as catch basin and pipe repair/ replacement, lighting, and pedestrian ramp improvements shall not be considered fully reconstructed impervious surfaces. Reusing an existing building foundation and re-roofing of an existing building are not considered fully reconstructed.
E. Soils that infiltrate too quickly may not provide sufficient pollutant removal before the infiltrated runoff enters groundwater.
F. A reasonable attempt must be made to obtain right-of-way during the project planning process
G. Hotspots includes any portion of a facility where infiltration is prohibited under an NPDES/SDS industrial stormwater permit issued by the MPCA