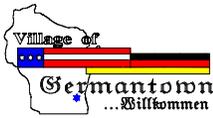


**DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 7.0: STORM WATER MANAGEMENT REQUIREMENTS**

TABLE 1.0: GOVERNING AGENCIES AND APPLICABLE CODES/GUIDELINES/RULES	
Wisconsin Department of Natural Resources (WDNR)	<ul style="list-style-type: none"> • Ch NR 151 & 216 Wisconsin Administrative Code • Technical Standards (a.k.a., Conservation Practice Standards) • Permit to Discharge under the Wisconsin Pollutant Discharge Elimination System (WPDES)
Milwaukee Area Sewerage District (MMSD)	<ul style="list-style-type: none"> • Ch 13 Rule • <i>Surface Water and Storm Water Rules Technical Guidance</i>
Village of Germantown	<ul style="list-style-type: none"> • Ch 27, 28 & 29 Municipal Code • <i>Design, Drafting & Construction Standards and Specifications</i> • <i>Stormwater Maintenance Manual for Private Facilities</i> • <i>Declaration of Covenant for Storm Water Management Facility Maintenance</i>
Private Storm Sewers, Ditches and Swales	<ul style="list-style-type: none"> • Man-made exterior sewer and surface runoff management systems intended to directly drain runoff from privately-owned buildings, driveways, parking lots, lawns, etc. These systems are typically created by site plans associated with subdivision plats of survey, certified survey maps, or individual lot plats of survey. • Private easements shall overlay all private storm sewers, ditches, and swales. All private drainage easements shall be labeled as “Private Drainage Easements” on plats of survey, site plans, and as-built drawings. • Private property owner(s), or homeowners or neighborhood associations, shall maintain private storm sewers, ditches and swales. In event private storm sewers, ditches and swales are overlain by public easements, maintenance remains responsibility of the private property owner(s) or association.
Public Storm Sewers, Ditches and Swales	<ul style="list-style-type: none"> • Man-made exterior sewer and surface runoff management systems intended to directly drain runoff from Village-owned buildings, streets, parks, lawns, etc. These systems are typically situated on Village-owned buildings and grounds, Village-owned outlots, and Village-owned rights-of-way. • Public easements shall overlay all public storm sewers, ditches, and swales not situated in Village-owned right-of-way. All public drainage easements shall be labeled as “Public Drainage Easements” on plats of survey, site plans, and as-built drawings. • The Department of Public Works shall maintain public storm sewers, ditches and swales.

TABLE 2.0: SWMP APPLICABILITY	
Triggers requiring a storm water management plan (SWMP)	<ul style="list-style-type: none"> • Site is situated within the MMSD ultimate sewer service area • Sites accumulating ½-acre or more of newly created impervious surface when summed from Jan. 1, 2002 to present • Demolition or construction during redevelopment disturbs an area larger than 2 acres • Parking lot reconfiguration or re-contouring • Sites subject to post-construction performance standard for new development and redevelopment as presented in [NR] §151.121 and §151.241, Wis. Admin. Code. • Village Engineer discretion where drainage facilities, the environment, or property may be adversely affected

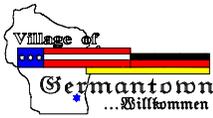


DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 7.0: STORM WATER MANAGEMENT REQUIREMENTS

<p>Exceptions not requiring a SWMP</p>	<ul style="list-style-type: none"> • Area of impervious surface < 5% of total site area • Site tributary to an existing storm water management facility designed to handle all prospective runoff from all tributary sites • Recreational trails less than or equal to 10-feet in width and has a continuous pervious buffer at least 5-feet wide on each side • Residential infill in which the site is: <ul style="list-style-type: none"> ○ Exclusively residential ○ 5 acres or less ○ The net increase of impervious area < 20% of total site area, and ○ Each site boundary is contiguous to: a) sites that contain earlier development served by sanitary sewers, streets, or public water supply, or b) by parkland, other public land, a utility ROW, or watercourse • Parking lot maintenance (i.e., sealing, milling & overlay, pulverize & compacting)
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TABLE 3.0: SWMP RUNOFF REDUCTION REQUIREMENTS			
Sites accumulating ½-acre or more of newly created impervious surface when summed from Jan. 1, 2002 to present		Storm (probability/recurrence interval)	Maximum Runoff Release Rate (cubic feet per second per acre)
		1%/100-year	0.5
		50%/2-year	0.15
Alternative volumetric method for sites ½-acre or more of newly created impervious surface when summed from Jan. 1, 2002 to present		<ul style="list-style-type: none"> • Limit post-development runoff volume to existing condition runoff volume during a critical time period for both the 1%/100-year and the 50%/2-year storms 	
Demolition or construction during redevelopment disturbing an area larger than 2 acres while not accumulating ½-acre or more of newly created impervious surface when summed from Jan. 1, 2002 to present		Area Disturbed by Demolition or Construction	Reduction to the Existing Runoff Release Rate
		Between 2 and 3.5 acres	10%
		From 3.5 to 5 acres	15%
		Greater than 5 acres	20%

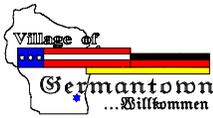
TABLE 4.0: SWMP TOTAL SUSPENDED SOLIDS (TSS) REDUCTION REQUIREMENTS	
New development	<ul style="list-style-type: none"> • 80% removal as compared to no controls
In-fill > or = 5 acres	<ul style="list-style-type: none"> • 80% removal as compared to no controls
In-fill < 5 acres on or after Oct. 1, 2012	<ul style="list-style-type: none"> • 80% removal as compared to no controls
Redevelopment	<ul style="list-style-type: none"> • 40% removal from parking areas and roads as compared to no controls
In-fill < 5 acres before Oct. 1, 2012	<ul style="list-style-type: none"> • 40% removal as compared to no controls



**DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 7.0: STORM WATER MANAGEMENT REQUIREMENTS**

TABLE 5.0: SWMP INFILTRATION REQUIREMENTS	
Low imperviousness	<ul style="list-style-type: none"> For development up to 40 percent connected imperviousness, such as parks, cemeteries, and low density residential development, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 90 percent of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than one percent of the post-construction site is required as an effective infiltration area.
Moderate imperviousness	<ul style="list-style-type: none"> For development with more than 40 percent and up to 80 percent connected imperviousness, such as medium and high density residential, multi-family development, industrial and institutional development, and office parks, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 75 percent of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 2 percent of the post-construction site is required as an effective infiltration area.
High imperviousness	<ul style="list-style-type: none"> For development with more than 80 percent connected imperviousness, such as commercial strip malls, shopping centers, and commercial downtowns, infiltrate sufficient runoff volume so that the post-development infiltration volume shall be at least 60 percent of the pre-development infiltration volume, based on an average annual rainfall. However, when designing appropriate infiltration systems to meet this requirement, no more than 2 percent of the post-construction site is required as an effective infiltration area.

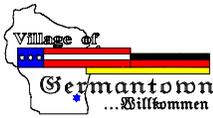
TABLE 6.0: SWMP ANALYSIS REQUIREMENTS	
Analysis Method	<ul style="list-style-type: none"> <i>Technical Release 55 (TR-55): Urban Hydrology for Small Watersheds</i>, Soil Conservation Service, USDA
Acceptable Software	<ul style="list-style-type: none"> Carlson HydroCAD Hydroflow PondPack
Study Area	<ul style="list-style-type: none"> The sum of the development / redevelopment area and all area tributary to the development / redevelopment area Tributary area can be excluded if applicant can safely by-pass runoff from the tributary area around the development / redevelopment area
Rainfall Depths & Distribution	<ul style="list-style-type: none"> NOAA Atlas 14, <i>Precipitation-Frequency Atlas of the United States, Volume 8, Version 2.0: Midwestern States (Colorado, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, Wisconsin)</i> SCS Type II Distribution



DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
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Runoff Curve Numbers (RCN)	<ul style="list-style-type: none"> TR-55 methodology, excluding the following maximum curve numbers for existing conditions required by MMSD <i>Surface Water and Storm Water Rules Technical Guidance</i> <table border="0" style="margin-left: 40px;"> <thead> <tr> <th style="text-align: center;">Predominant Hydrologic Soil Group</th> <th style="text-align: center;">Maximum Pervious Area Curve Number</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">A</td> <td style="text-align: center;">55</td> </tr> <tr> <td style="text-align: center;">B</td> <td style="text-align: center;">68</td> </tr> <tr> <td style="text-align: center;">C</td> <td style="text-align: center;">77</td> </tr> <tr> <td style="text-align: center;">D</td> <td style="text-align: center;">80</td> </tr> </tbody> </table>	Predominant Hydrologic Soil Group	Maximum Pervious Area Curve Number	A	55	B	68	C	77	D	80
Predominant Hydrologic Soil Group	Maximum Pervious Area Curve Number										
A	55										
B	68										
C	77										
D	80										
Time of Concentration (Tc)	<ul style="list-style-type: none"> TR-55 methodology 										

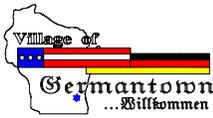
TABLE 7.0: STORM WATER MANAGEMENT FACILITY DESIGN REQUIREMENTS	
Location	<ul style="list-style-type: none"> Situated entirely within development / redevelopment Off-site locations are permissible, but require recorded easement agreements and recorded maintenance agreements
Outlots & Easements	<ul style="list-style-type: none"> For subdivisions, situated within an outlet in which responsibility is equally divided among subdivision property owners and in which the outlet is accessible to Village via right-of-way or easement For other than subdivisions, easements shall overlay the facilities Easements shall overlay all conveyance systems serving more than one property
Pond & Infiltration Basin Geometry	<ul style="list-style-type: none"> Ponds shall be wet ponds conforming to WDNR technical standard <i>Wet Detention Pond (1001)</i> Infiltration basins shall conform to WDNR technical standard <i>Infiltration Basin (1003)</i> Dry ponds are prohibited Curvilinear geometry preferred over geometric shapes Forebays required at each inflow point Side slopes: 4H:1V preferred, 3H:1V maximum Safety shelf : 10-foot minimum width, 18-inches maximum depth, 12-inches minimum depth Top-of-berm width: 10-foot minimum
Outlet Structure	<ul style="list-style-type: none"> Concrete riser structures imbedded into side slopes with high-performance turf reinforcement mat (HPTRM) or rip-rip armoring preferred Corrugated metal risers and trash racks are prohibited Clog protection that does not abut but instead protrudes from the outlet structure(s) are required
Emergency Overflow Spillway	<ul style="list-style-type: none"> Situate so not a nuisance to adjacent properties Elevation 6-inches above 100-year storm elevation Armor with HPTRM from bottom of safety shelf up through spillway and spillway's side slopes and down to outside toe-of-slope. Rip-rap armor at toe-of-slope.
Matting	<ul style="list-style-type: none"> HPTRM for emergency overflow spillway Turf reinforcement mat (TRM) for pond inside side slope and for drainage channels Erosion control re-vegetative matting (ECRM) for pond top-of-berm and outside side slope



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SECTION 7.0: STORM WATER MANAGEMENT REQUIREMENTS

Vegetation	<ul style="list-style-type: none"> • Trees prohibited on pond and infiltration basin inside side slopes and top of berm • Promote native plant diversity • Establish and maintain 15-25 foot “no-mow and chemical free” buffer zone
Aeration	<ul style="list-style-type: none"> • Aeration is required in the main pool of wet ponds and prohibited in forebays
Wet Ponds used as Temporary Sediment Basins for Developments having 5 acres or more of land disturbance	<ul style="list-style-type: none"> • Temporary sediment basins shall conform to WDNR technical standard <i>Sediment Basin (1064)</i> • TR-55 methodology required for 1-year, 24-hour storm with RCN for “newly graded area” • Include design and model in SWMP • Construction sequence converting temporary sediment basin into wet pond, including dredging and removal of accumulated sediments
Green Infrastructure	<ul style="list-style-type: none"> • Green infrastructure is permissible. • Example green infrastructure BMPs include downspout disconnection, rainwater harvesting, rain gardens, planter boxes, bioswales, permeable pavements, green alleys and streets, green parking, green roofs, urban tree canopy, and land conservation.
Snow Storage Areas	<ul style="list-style-type: none"> • Site plans shall designate snow storage areas. • Snow storage shall be prohibited upon green infrastructure BMPs and prohibited upon all areas used for runoff infiltration.

TABLE 8.0: STORM WATER MANAGEMENT PLAN REPORT	
Certification	<ul style="list-style-type: none"> • Wisconsin Professional Engineer seal & signature required on all drafts whether preliminary or final • Reports without signed PE seal will not be reviewed and the engineer will be summoned to affix & sign the PE seal
Copies	<ul style="list-style-type: none"> • Two original copies are required, one for the Village and one for forwarding to MMSD
Binding	<ul style="list-style-type: none"> • SWMP shall be bound with D-sized drawings folded and inserted into flaps
Narrative	<ul style="list-style-type: none"> • Site description • Intentions of development / redevelopment • Impact to down-gradient drainage facilities • Tabular summary of pre-development hydrology, water quality analysis, and assumptions • Tabular summary of post-development hydrology, water quality analysis, and assumptions • Tabular comparison of results vs. regulatory requirements
Green Infrastructure	<ul style="list-style-type: none"> • The stormwater management plan shall include an analysis of at least two green infrastructure BMPs appropriate for the site as compared to use of traditional BMPs only. For example, for green infrastructure BMP “G1” and traditional BMP “T1”, the analysis shall be of the following form: [“G1” + (“T1”-“G1”)] as compared to “T1”. • Analysis criteria shall include runoff peak flow reduction, runoff volume reduction, initial construction cost, life cycle, annual operation and maintenance cost, and seasonal weather constraints. • The analysis shall include a Wisconsin professional engineer’s recommendation whether or not to include green infrastructure BMPs in the site’s runoff management system.

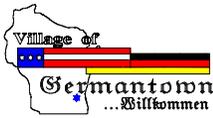


**DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 7.0: STORM WATER MANAGEMENT REQUIREMENTS**

Appendix A	<ul style="list-style-type: none"> • Site information exhibits
Appendix B	<ul style="list-style-type: none"> • Soils reports
Appendix C	<ul style="list-style-type: none"> • Pre-development hydrology analysis • Include off-site tributary areas • Include graphic model, input data, summary sheets, hydrographs, watershed & sub-basin exhibits
Appendix D	<ul style="list-style-type: none"> • Pond & outlet structure drawings & detail sheets
Appendix E	<ul style="list-style-type: none"> • Post-development hydrology analysis • Include off-site tributary areas • Include graphic model, input data, summary sheets, hydrographs, watershed & sub-basin exhibits, additional analysis for plugged outlet conditions, and (if applicable) MMSD volumetric design procedure
Appendix F	<ul style="list-style-type: none"> • Post-development water quality analysis • Include input data & output results
Appendix G	<ul style="list-style-type: none"> • Sediment basin & outlet structure drawings & detail sheets
Appendix H	<ul style="list-style-type: none"> • Sediment basin hydrology analysis & orifice sizing computations • Include off-site tributary areas • Include graphic model, input data, summary sheets, hydrographs, watershed & sub-basin exhibits, additional analysis for plugged outlet conditions, and orifice sizing computations

Appendix I	<ul style="list-style-type: none"> • Sediment basin water quality analysis • Include off-site tributary areas • Include input data & output results
MMSD Ch 13 Surface Water and Storm Water Reviews Storm Water Management Plan Submittal Checklist	<ul style="list-style-type: none"> • Engineering Consultant shall prepare the entire MMSD Surface Water and Storm Water Review package

TABLE 9.0: SUBMITTAL REQUIREMENTS	
Construction Drawings, MMSD Surface Water and Storm Water Review Package, As-Built Drawings & Compliance Reports	<ul style="list-style-type: none"> • Plans on D-sized paper prepared, sealed and signed by Wisconsin P.E. • Datum: Local NVGD 1929 datum required • Submit both paper and electronic copies to Village Engineer • Preparation and submittal of construction drawings, MMSD Surface Water and Storm Water Review package, as-builts, and compliance reports shall be at the Engineering Consultant's expense.



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Plan Review	<ul style="list-style-type: none"> • Engineering Consultant shall prepare the entire MMSD Surface Water and Storm Water Review package • If applicable, Engineering Consultant shall prepare the entire Dept. of Safety & Professional Services_Plumbing Plan Review package for “private” storm water services • Submit 1 original paper and 1 electronic copy of all documents to the Village Engineer for review • Village Engineer will provide Engineering Consultant an Owner Letter once the documents are accepted by the Village • Engineering Consultant shall submit the entire package to the MMSD with the Owner Letter • If applicable, Engineering Consultant shall submit the entire Dept. of Safety & Professional Services_Plumbing Plan Review package for “private” storm water services with the Owner Letter • Preparation and submittal of plan review packages shall be at the Engineering Consultant’s expense.
Street Excavation in ROW Permit	<ul style="list-style-type: none"> • Contractor to prepare and submit with fee to Village Engineering Dept.
Erosion Control Permit	<ul style="list-style-type: none"> • Contractor to prepare and submit with fee to Village Inspection Services (Building Inspection) Dept.
Building Permit	<ul style="list-style-type: none"> • Plans, reports and permits shall be reviewed and accepted by the MMSD, Dept. of Safety & Professional Services, and Village Engineer before the Village will issue a building permit
Occupancy Permit	<ul style="list-style-type: none"> • As-Builts and compliance reports shall be reviewed and accepted by the Village Engineer before the Village will issue an occupancy permit

TABLE 10.0: MAINTENANCE REQUIREMENTS

Maintenance Agreement	<ul style="list-style-type: none"> • Complete the Village’s template <i>Declaration of Covenant for Storm Water Management Facility Maintenance</i> • Submit a draft with the SWMP report for review • Include as-built drawings in final draft • Responsible party to execute before notary after accepted by Village Engineer • Village Clerk to record at Washington Co. at responsible party’s expense
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DESIGN, DRAFTING & CONSTRUCTION STANDARDS & SPECIFICATIONS
SECTION 7.0: STORM WATER MANAGEMENT REQUIREMENTS

On-going Certifications	<ul style="list-style-type: none">• Responsible party shall employ a Wisconsin Professional Engineer or Registered Land Surveyor to recertify the facilities conform to original designs every five (5) years
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