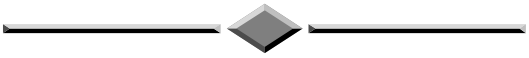
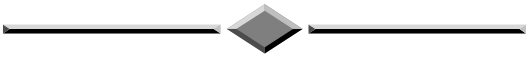
ALLEN COUNTY ENGINEER
~~BOARD OF COUNTY COMMISSIONERS~~
ALLEN COUNTY, OHIO

1501 N. Sugar Street, Lima, OH 45801
~~301 N. Main Street, Lima, OH 45801~~



STORMWATER DESIGN SPECIFICATIONS



Draft

~~August~~December, 2023

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STATUTORY AUTHORITY AND TITLE

These Specifications accompany the regulations that have been adopted by the Board of County Commissioners (the "Board"), Allen County, Ohio in accordance with and pursuant to the legal authority of Article XVIII, Section 3 of the Ohio Constitution, Section 307.79 of the Ohio Revised Code, and the Rules of 1501: 15-1-01 and 02 of The Ohio Administrative Code to be administered by a Board appointed agency ("Agency").

Unless otherwise exempted, this document shall be used for all land-disturbing public and private projects that change existing stormwater flow, conveyance system, or stormwater pollutant discharges from applicable premises within the jurisdiction of this document.

CHAPTER 1 - PLANNING OF NEW STORMWATER INFRASTRUCTURE

A. The current list of standards to be used in the design of storm drainage is as follows:

1. These regulations, Stormwater Management and Sediment Control Regulations of Allen County, Ohio.

2. Subdivision Regulations of Allen County, Ohio.

3. Standard Construction Drawings, Office of the Allen County Engineer, Allen County, Ohio, (latest revision).

4. Construction & Material Specifications by State of Ohio Department of Transportation, (latest edition).

5. The Ohio Department of Transportation Location and Design Manual, Volume 2 – Drainage Design

6. Rainwater and Land Development Manual, Ohio Environmental Protection Agency, (latest edition)

7. Ohio EPA Stormwater General Construction Permit (latest edition)

B. Preparation and approval of plans and specifications

The Board shall require all design plans, quantities, and itemized cost estimates for the stormwater facilities be prepared and stamped by a Registered Professional Engineer or a Registered Landscape Architect when the duties to be performed or the certifications that are to be made are within the powers and authority of a Landscape Architect pursuant to sections 4703.30 to 4703.49 of the Revised Code.

C. Layout Planning

When planning a new development, various drainage concepts should be evaluated before decisions are made as to site layout and grading, stormwater management facility locations, street location and alignments. Plans should be based upon integrating natural characteristics into the development.

As a part of any SWMSCP, a fundamental study of the drainage pattern of areas contiguous to the development must be made. Tributary flows having a direct effect on the storm sewerage of the proposed site shall be determined and included in the design capacities for storm conduits within the development. A map showing the drainage patterns of the surrounding areas shall be submitted with the Plan. The USGS has lidar and DEM information available at the USGS 3DEP website (https://www.usgs.gov/3d-elevation-program).

Planning the alignment of a storm sewer systems, flood routing paths, and location of water quality and detention structures should follow the lay of the land ~~be done in connection with the street layout and grading plan~~and use outlets that have adequate capacity to accept flows without increasing flooding or other hazards downstream. ~~The location of catch basins, manholes, storm sewer conduits, drainage channels and water quality/detention best management practices shall be approved by the Designee.~~ Provisions must be made to accommodate runoff from upstream areas. Diversion of runoff from its natural drainage course should be minimized and cannot increase peak flows in the downstream receiving system. The quantity control requirements limit the allowable release to an adequate outlet to the predeveloped condition at that point and increases the critical storm as more runoff is diverted from its natural outfall point.~~.~~

D. Storm System Sizing (where did this section go?)

~~D.~~E. Storm Drainage Easements

Drainage easements are required across private land for stormwater infrastructure that drains water from a development project[JG1], public land or R/W to a receiving stream or public storm sewer and include any stormwater quality or quantity control BMPs that control public drainage. The land situated within the drainage easement on private property is not subject to maintenance responsibilities by the public agency.

CHAPTER 2 – RUNOFF ANALYSIS METHODS

Three principle methods shall be used to estimate design peak discharges.

A. For small watersheds of 25 acres or less, the design runoff can be determined by the Rational Method. This method may also be used for storm sewer design and pavement spread calculations. This method shall not be used to design detention storage systems.

B. The runoff curve number method as published, Urban Hydrology for Small Watersheds (Technical Release 55, TR55), USDA, Natural Resource Conservation Service. This method may be applicable to individual areas up to 300 acres. This is primarily used for the design of quantity control BMPs using the critical storm method.

C. For watersheds larger than 300 acres draining rural undeveloped land with no significant impervious areas or storm sewers, the design runoff can be estimated by using the method published in the U.S.G.S. Techniques for Estimating Flood-Peak Discharges of Rural, Unregulated Streams in Ohio (WRI Rep. 89-4126) (computer program available), a replacement of the ODNR Bulletin 45 method. Or the USGS StreamStats website can be used to obtain flow rates.

2.1 Time of Concentration Calculation[JG2]

One of the basic assumptions underlying the Rational and TR-55 Runoff Curve Number Method is that runoff is the time required for water to flow from the most remote part of the drainage area under consideration to the design point. The time of concentration is used to determine the rainfall intensity in Formula 1 [JG3]~~above~~below. The time of concentration should be calculated using TR-55 methods with sheet flow, shallow concentrated, and channel flow components with the following rules.

A. The sheet flow length shall not be more than 100-feet.

B. The minimum time of concentration is 10 minutes[JG4]

C. The time of concentration shall be representative of the tributary land use. For example, time of concentrations shall not be calculated using isolated open space areas within the development that is mostly impervious.

D. A time of concentration calculation is not required for pavement spread calculations, a constant intensity of 3.1 inches/hour is used for these calculations.

2.2 The Rational Method

The Rational Method for estimating peak runoff utilizes the Rational Formula,

Q = C I A, where: Formula 1

Q = peak runoff rate in cubic feet per second;

C = runoff coefficient corresponding to surface imperviousness;

I = rainfall intensity in inches per hour corresponding to the storm design frequency and time of concentration,

A = area of the watershed tributary to the point under design in acres.

Coefficient of Imperviousness

The Table 1 lists runoff coefficients to be used utilizing the Rational Formula. The selected factor shall reflect the anticipated land. These coefficients are consistent and applicable to all drainage improvements in Allen County. The table lists coefficients for various surfaces that may be used to develop a composite runoff coefficient based on the percentage of different surfaces within a drainage area. The Agency or Designee may require breakdown of acres by land use for evaluation of runoff rates.

The designer should refer to the Soil Survey of Allen County, Ohio, publication by the Ohio Department of Natural Resources for general locations of various soil types in the development area.

Table 1 – Rational Method Runoff Coefficients

Cover Type and Hydrologic Condition	Average percent impervious area[3]	Runoff Coefficient for Hydrologic Soil Group[1]			
		A	B	C	D
Fully developed urban areas (vegetation established) with average runoff conditions and I_a=0.2S					
Impervious Areas					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		0.94	0.94	0.94	0.94
Gravel streets and parking lots		0.88	0.88	0.88	0.88
Open space (lawns, parks, golf courses, cemeteries, etc.)					
Poor condition (grass cover <50%)		0.29	0.48	0.63	0.70
Fair condition (grass cover 50% to 75%)		0.07	0.30	0.48	0.58
Good condition (grass cover >75%		NA	0.19	0.39	0.50
Commercial and business (TND[2] – Town Center)	85	0.70	0.77	0.83	0.85
Industrial	72	0.52	0.67	0.75	0.80
Residential Districts by Average Lot Size					
Multi-family (TND[2] – Neighborhood Center)[3]	80	0.63	0.75	0.80	0.83
1/12 to 1/6 acre lots (TND[2] – Neighborhood General)[3]	75	0.56	0.70	0.77	0.83
h 1/8 acre (TND[2] – Neighborhood Edge)	65	0.44	0.60	0.72	0.77
¼ acre	38	0.19	0.40	0.56	0.65
½ acre	25	0.11	0.32	0.50	0.60
1 acre	20	0.08	0.29	0.48	0.58
Undeveloped or agricultural lands with average runoff conditions and I_a=0.2S					
Cultivated Land					
Without conservation treatment		0.35	0.52	0.67	0.75
With conservation treatment		0.21	0.34	0.46	0.52
Pasture, grassland, or range – continuous forage for grazing					
Poor: <50% ground cover or heavily grazed with no mulch		0.29	0.48	0.63	0.70
Fair: 50 to 75% ground cover and not heavily grazed		0.07	0.30	0.48	0.58
Good: >75% ground cover and lightly or only occasionally grazed		NA	0.19	0.39	0.50
Meadow – continuous grass, protected from grazing and generally mowed for hay		NA	0.16	0.34	0.46
Brush – brush-weed-grass mixture with brush the major element					
Poor: <50% ground cover		0.06	0.27	0.44	0.56
Fair: 50 to 75% ground cover		NA	0.13	0.32	0.44
Good: >75% ground cover		NA	0.06	0.25	0.37
Woods[5]					
Poor: forest litter, small trees, and brush are destroyed by heavy grazing or regular burning		0.06	0.27	0.44	0.56
Fair: woods are grazed but not burned, and some forest litter covers the soil		NA	0.18	0.37	0.48
Good: woods are protected from grazing, and litter and brush adequately cover the soil		NA	0.12	0.32	0.44
Farmsteads – buildings, lands, driveways, and surrounding lots		0.17	0.39	0.54	0.63

Notes:

NA – Method to derive value is not applicable for curve number values less than 40.

1 These runoff coefficients were calculated using curve numbers obtained from the USDA-NRCS Technical Release 55 *Urban Hydrology for Small Watersheds* assuming a 10-year, 24-hour storm. For larger design storms the runoff coefficients shall be increased using the following C value correction factors:

1.1 for the 25-year design storm

1.2 for the 50-year design storm

Rainfall Intensity

The basis for computing rainfall intensity is the NOAA Atlas 14 precipitation frequency estimates for various storm durations. A best fit curve is fit through the data to develop Formula ~~1~~2, which is then used to solve for intensity "I" (in/hr). The X, Y, and Z variables have been predetermined based on the best fit analysis and shown on Table 2. The variable "t" is the time of concentration for the area tributary to the design point in minutes.

Rainfall Intensity (I) = $x / (y + t)^z$ Formula 2

TABLE 2 Formula 2 Coefficients			
Storm Frequency (year)	x	y	z
1	45.23	10.13	0.88
2	54.66	10.42	0.88
5	53.44	9.48	0.83
10	53.12	8.83	0.79
25	29.21	4.10	0.61
50	27.92	3.20	0.58
100	24.17	1.75	0.52

2.3 Regression Equations

For rural unregulated streams in Allen County, the use of the USGS StreamStats online web application is permissible which uses the following reference:

Flood-Frequency Estimates for Ohio Streamgages Based on Data through Water Year 2015 and techniques for Estimating Flood-Frequency Characteristics of Rural, Unregulated Ohio Streams

Within the above reference, flows can be obtained manually by the use of the equations shown on Table 5 on Page 15. Allen County is located in Regression Region B.

2.4 Runoff Curve Number Method

The National Resource Conservation Service (NRCS) TR-55 runoff curve number (RCN) method can be used to compute peak flow rates and hydrographs for a number of applications including but not limited to offsite areas, streams, storm sewers, and quantity control practices. The TR-55 method shall be used for all new quantity control BMP designs. Table 3 is from the City of Columbus Drainage Manual and lists the recommended RCN to use for various land uses.

Table 3 – Runoff Curve Numbers for Typical Land Uses

Cover Type and Hydrologic Condition	Average percent impervious area[4]	Curve Numbers for Hydrologic Soil Group			
		A	B	C	D
Fully developed urban areas (vegetation established) with average runoff conditions and I_a=0.2S					
Impervious Areas					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Gravel streets and parking lots (excluding right-ofway)[6]		96	96	96	96
Open space (lawns, parks, golf courses, cemeteries, etc.)					
Poor condition (grass cover <50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover >75%		39	61	74	80
Commercial and business (TND[2] – Town Center)	85	89	92	94	95
Industrial	72	81	88	91	93
Residential Districts by Average Lot Size					
Multi-family (TND[2] – Neighborhood Center)[3]	80	86	91	93	94
1/12 to 1/6 acre lots (TND[2] – Neighborhood General)[3]	75	83	89	92	94
1/8 acre (TND[2] – Neighborhood Edge)	65	77	85	90	92
¼ acre	38	61	75	83	87
½ acre	25	54	70	80	85
1 acre	20	51	68	79	84
Undeveloped or agricultural lands with average runoff conditions and I_a=0.2S					
Cultivated Land					
Without conservation treatment		72	81	88	91
With conservation treatment		62	71	78	81
Pasture, grassland, or range – continuous forage for grazing					
Poor: <50% ground cover or heavily grazed with no mulch		68	79	86	89
Fair: 50 to 75% ground cover and not heavily grazed		49	69	79	84
Good: >75% ground cover and lightly or only occasionally grazed		39	61	74	80
Meadow – continuous grass, protected from grazing and generally mowed for hay		30	58	71	78
Brush – brush-weed-grass mixture with brush the major element					
Poor: <50% ground cover		48	67	77	83
Fair: 50 to 75% ground cover		35	56	70	77
Good: >75% ground cover		30[5]	48	65	73
Woods[5]					
Poor: forest litter, small trees, and brush are destroyed by heavy grazing or regular burning		45	66	77	83
Fair: woods are grazed but not burned, and some forest litter covers the soil		36	60	73	79
Good: woods are protected from grazing, and litter and brush adequately cover the soil		30[6]	55	70	77
Farmsteads – buildings, lands, driveways, and surrounding lots		59	74	82	86

Notes:

1 All CN values are from USDA-NRCS Technical Release 55 *Urban Hydrology for Small Watersheds* unless otherwise noted. Refer to this publication to obtain CN values for conditions not listed.

2 TND = Traditional Neighborhood Development

3 Curve numbers were calculated based upon percent of impervious area.

4 The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the stormwater system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition.

5 Actual curve number is less than 30; use CN=30 for runoff computations

6 The curve number for gravel streets and parking lots without right-of-way is derived from the TR-55 values for gravel streets and roads that include right-of-way.

CHAPTER 3 - STORM SEWER AND CULVERT DESIGN CRITERIA

3.1 Required Submission of Data

Sufficient data shall be submitted with the construction drawings to ascertain the adequacy of the design. Information to be submitted shall include:

1. A tributary area map having one-foot contours for onsite areas and up to two (2) foot contours for offsite area.
   (Minimum scale 1 inch = 200 ft.);

2. A map of the contiguous drainage basin;

3. A layout of the area to be sewered showing existing and proposed improvements, including grading;

4. Information regarding anticipated land use;

5. Location and elevation of the outfall point. If outletting into an open channel or stream, sufficient information must be provided to substantiate the tailwater assumptions

6. Information on existing and proposed utilities, sanitary sewers, or other conflicting substructures;

7. Calculations for the determination of inlet times;

8. A storm sewer hydrology computation sheet.

9. For public streets, a gutter spread and inlet capacity computation sheet.

3.2 Allowable Flow Velocities into Erodible Channels

Where pipes outlet into an erodible channel, measures shall be taken to lessen potentially destructive velocities. Erosion control devices such as stilling basins, riprap, or revetments may be required. ODOT L&D Manual Volume 2 can be used for riprap design.

Table 4 lists safe or permissible velocities for erodible channels.

TABLE 4
Permissible Velocities for Erodible Channels

Channel Material	**Maximum Velocity** (feet per second)
Sandy or Sandy Loam	2.5
Firm Loam or silts	3.5
Clay, Fine gravels	5.0
Shale, Hard Pan, Coarse Gravel	6.0
Grasses up to 5%	5.0

3.3 Storm Sewer Sizing and Layout Requirements

Design Storm

All new storm sewer systems must be adequate to convey anticipated runoff of a watershed. The design storm varies by functional classification, see Table 5. ~~from a 10-year, 24-hour frequency storm at full flow capacity. Pressure flows for ten (10) year design storms shall be avoided. Stormwater runoff and design criteria for pipe size will be determined from a hydrologic analysis using a method as designated in Section III, Runoff Analysis. The method utilized shall be comparable to the watershed area, which is being evaluated~~The rational method is the preferred methodology. The runoff curve method can also be used.~~.~~

Table 5 – Storm Sewer Design Criteria

Functional Classification	Open channel Design Storm	Hydraulic Grade Check Storm
Major Arterial ADT > 9,000	10-year	25-year
Minor Arterial and Collectors ADT 3,501 – 9,000	5-year	25-year
Local Streets, Parking Lot, and Development Areas	2-year	5-year

The design storm assumes a free outfall condition to the receiving stream, channel, detention basin, or storm sewer. The full flow capacity of the storm sewer cannot be exceeded by the design storm peak flow. The hydraulic grade check storm incorporates a constant tailwater condition associated with the outlet conveyance system or basin. During the check storm the hydraulic grade line in the sewer cannot exceed the inlet or top of casting elevations.

Minimum Size

Minimum storm sewer size is 12-inches in diameter[JG5]

Manning's Roughness Coefficients

The Manning's 'n' values shall be as recommended by the manufacturer of the materials.

Grades

Storm sewer grades shall provide for a minimum velocity of three (3) feet per second for the design ~~flow~~storm.

Alignment

Storm sewers shall be on a constant grade between manholes.

All changes in direction, size, or slope of storm sewers shall be made only at manholes unless unusual conditions warrant the use of a concrete collar. In such cases, approval must be obtained from the County Engineer.

Substructure Crossings

Crossings with other major underground sewers and utilities should be on an angle greater than 45 degrees. If insufficient vertical clearance is available, a concrete cradle with or without steel reinforcement may be required. The allowable clearance without special support between waterlines and sanitary sewers shall be twelve (12) inches. Clearances between other utilities shall be coordinated with the Owner of that utility.

Manhole and Catch Basin Spacing

Manhole spacing shall conform to the following table:

PIPE SIZE	MAXIMUM SPACING
15" or less	350 feet
18" or greater	500 feet

Materials

Materials for storm sewers and appurtenant structures shall be approved by the Agency and Designee. When alternate types of materials are included for bidding purposes, hydraulic designs must be developed for each alternate material to demonstrate its acceptability.

The designer shall evaluate the trench conditions and pipe loading to determine strength classifications required for various conduits in the design.

Catch Basin Inlets

Catch basin inlets on public streets shall be curb opening with gutter grate combinations per standard drawing CB-1 or as approved by the governing jurisdiction. Any catch basin located outside of curb and gutter shall have flat grates with sufficient opening top convey the design storm.

Pavement Spread

To determine pavement inlet spacing along a public street, the design discharge shall be based on the Rational Method using a rainfall intensity of 3.1 inches per hour.

The spread of water on the pavement shall be limited to eight (8) feet into the outside traveled lane. On continuous grade streets, the maximum depth of flow shall be five (5) inches.

At all intersections, it will be necessary to remove one hundred percent (100%) of pavement spread flow to eliminate cross street flow. The inlets shall be located at the beginning of the upstream curb return before the crosswalk.

At sag locations, sufficient basins shall be provided to prevent 25-year storm flows from overtopping the street R/W lines.

Connector Pipes

All catch basin connector pipes shall connect to the main line at manholes unless otherwise approved by the Designee. Direction changes shall not be designed between structures except where concrete collars may be necessary to avoid major substructure interference. Such designs will require approval.

Flood Routing

The 100-year flood routing path shall be shown on the drainage plan or in the stormwater report exhibits. The County may require calculations showing that the 100-year storm can be safely routed to the onsite stormwater basin or other outfall using a combination of storm sewers and overland flood routing paths.

3.4 Culvert Design Criteria[JG6]

All culverts shall be designed with a uniform barrel cross section throughout their length. Side by side culverts within the channel of a stream are discouraged as they can become a maintenance burden. Location alignment, material specifications, and end treatments, (e.g., headwalls, wingwalls, riprap, apron slabs), shall be approved by the appropriate political subdivision.

Design Discharge

All new culvert designs must be of adequate capacity to convey anticipated runoff of a watershed from a fifty (50) year frequency storm at just full flow, using Manning's equation for capacity calculations. Pressure flows for fifty (50) year design storms shall be avoided. Culverts shall meet manufacturer's recommendations for minimum and maximum cover, for bedding, and for backfilling.

Flow Line Elevations

Flow line elevations of proposed culverts may be required by the County Engineer to be up to 1.5 feet below the existing ditch flow line, for anticipated ditch clean-outs. Consultation with the Allen County Engineer shall be made to determine the status of any open ditch encountered within the proposed development. The county engineer administers the Permanent Maintenance Program of Petitioned Ditch Projects.

The flow line of the culvert may be required to be lowered below existing stream grade due to US Army Corps or Ohio EPA permit requirements. The current Nationwide Permit requirements for closed conduits within an ephemeral, intermittent, or perennial stream require the flow line of the culvert to be buried by at least 10% of the height of the conduit when the rise of the structure is 36-inches or greater and has a slope of less than 1%. Evidence that the proper permits from the USACE or Ohio EPA shall be made available to the County prior to construction of the culvert.

Environmental Permitting

Environmental permitting may be required due to any fill, permanent or temporary, placed below the ordinary high-water mark (OHWM) of the stream. Activities that are considered impacts below the OHWM include but are not limited to the placement of earthen fill, rip-rap, piers, and conduits.

Please note USACE or Ohio EPA requirements frequently change regulations in regards to impacts to jurisdictional streams.

CHAPTER 4 - POST CONSTRUCTION RUNOFF QUALITY AND QUANTITY CONTROL

4.1 Purpose

Post-construction runoff quality and quantity controls are permanent controls designed to protect and maintain a receiving stream's physical, chemical and biological characteristics.

4.2 Applicability

For all construction activities that will disturb one or more acres of land or will disturb less than one acre that are part of a larger common plan of development or sale which will disturb one or more acres of land, the post construction BMP(s) chosen shall be able to manage stormwater runoff for protection of stream channels, stream stability, and water quality.

For linear transportation projects in existing or new public R/W, the Ohio Department of Transportation Location and Design Volume 2 may be used to meet Ohio EPA water quality requirements. Quantity control requirements are not required for public R/W improvements. Exceptions to this include new R/W associated with single-family developments.

4.3 Required Submission of Data

Sufficient data shall be submitted with the construction drawings to ascertain the adequacy of the design. Information to be submitted shall include but not be limited to the following:

1. A drainage area map having one-foot contours for onsite areas and up to two (2) foot contours for offsite area.
   (Minimum scale 1 inch = 200 ft.);

2. Separate tributary boundaries for onsite and offsite areas tributary to each onsite BMP before and after development. Additional tributary boundaries are required for undetained areas.

3. A layout of the area to be sewered showing existing and proposed improvements, including grading;

4. Information regarding anticipated land use;

5. Location and elevation of the outfall point. Sufficient information is required to determine if the outfall is an adequate outlet that can safely convey runoff to a receiving water body without causing increases in flooding or erosion. If outletting into an open channel or stream, sufficient information must be provided to substantiate the tailwater assumptions

6. Information on existing and proposed utilities, sanitary sewers, or other conflicting substructures;

7. Time of concentration calculations

8. Output from a hydrologic/hydraulic model showing sufficient information to recreate the model in a similar program.

9. Water quality calculations and drawdown curve

10. Summary tables showing allowable release rates, inflow rate to onsite BMP, outflow rates from BMPs, peak elevations, and volume used to meet the requirements.

11. Location of floodplains as well as jurisdictional streams and wetlands

4.4 Grandfathering Policy

This section of the manual has been added to aid in the transition from older policy standards to the newer standards as it relates to water quality and quantity controls. Many projects in the County are expansions of existing projects with previously designed stormwater control practices or no practices at all.

Water Quality

The 1st generation of the Ohio EPA water quality permit was enacted in April of 2003. Projects that applied for initial General Permit coverage under this permit or subsequent permits are required to provide water quality controls per EPA requirements.

Existing water quality BMPs designed under previous generations of the General Construction Permit (on or after April 2003) can continue to be used as a compliant BMP for new permit coverage area(s) with no change in design as long as the permit coverage area was part of the original planned area for the development with no significant change in planned drainage area or impervious area.

An example of being able to use a previously design water quality BMP for new project compliance would be a large development with a regional water quality BMP that accounted for the development of a 2-acre outlet. The outlet remained vacant for several years after the initial construction of the BMP in 2006. The outlot is then considered part of a larger common development that drains to a regional water quality BMP. The regional BMP in this example may have been designed using the older 0.75-inch rainfall depth and older runoff coefficient equation, which is acceptable by current Ohio EPA standards.

For further guidance please consult the Ohio EPA Construction General Permit website.

Quantity Control

The preference is for the quantity control practices be designed to the current standards of this manual. Substantially incomplete projects approved prior to 2013 are not exempt from this manual and may not continue construction without providing documentation that the quantity control practice adheres to the requirements of this manual.

For existing quantity control practices that are being used for new projects, a redesign of the practice may be required. If more than 1 acre of unplanned impervious area, or more than a 50% increase in unplanned new impervious area is added to a previously designed quantity control practice then the quantity control practice shall be designed to current standards.

For previously designed quantity control practices that are required to be redesigned to current standards, the predeveloped runoff conditions shall be the condition of the site prior to the initial development that was required to provide quantity control. For example, an existing quantity control practice was designed for a project in 1995. The site was an agricultural field prior to that development. The new basin design shall then use an agricultural land use for existing conditions.

4.5 Permanent Maintenance of Stormwater Control Structures

The Owner and/or Developer shall maintain all facilities and practices installed as part of the approved BMP Maintenance Plan. This maintenance will continue in perpetuity by the Owner from the date that construction was released by the Administrator and/or as required by the applicable subdivision regulations. This date shall begin upon receipt of the NOT confirmation correspondence from OEPA and receipt of As-Built Construction Drawings.

Owner/Developer must provide detailed drawings and stand-alone maintenance plans for all post-construction BMPs. Maintenance plans shall also be provided by the permittee to the post-construction operator of the site (including homeowner associations). Maintenance plans must be signed by Owner.

The County has the right to access the BMP for inspections per the Right of Entry Permit submitted by the site owner/developer.

Any drainage system installed in accordance with public regulations within the road right-of-way of the State, County, Township or other municipality shall be maintained by that political subdivision.

The use of innovative and/or emerging stormwater management post-construction technologies shall be at the discretion of the Allen County Drainage Engineering Department and could require monitoring to ensure compliance with OEPA's NPDES CGP requirements.

The Post-Construction BMP Maintenance Plan shall be prepared in accordance with the OEPA NPDES CGP and include the following minimum requirements:

A. Description of post-construction BMPs to be installed during construction, including estimated installation schedule and sequencing plan (including post-construction sediment removal and installation of final outlets).

B. Rationale for selection - to address anticipated downstream impacts (on the channel and floodplain, morphology, hydrology and water quality).

C. A designated entity for stormwater inspection and maintenance responsibilities.

D. The routine and non-routine maintenance tasks to be undertaken.

~~E.~~F. A schedule for inspection and maintenance.

~~F.~~G. Any necessary legally binding maintenance easements and agreements.

~~G.~~H. Construction drawings or excerpts showing the plan view, profile and details of the outlet(s).

~~H.~~I. A map showing all access and maintenance easements[JG7].

J. For all BMPs, provide relevant elevations and associated volumes that dictate when removal of accumulated sediments must occur.

~~I.~~K. Signature of Owner acknowledging the annual inspection and maintenance agreement.

Owners Submission of Completion -

1. Letter of Completion - The Owner must submit a Letter of Completion to the Administrator upon completion of site construction and final stabilization. On this letter, the Owner shall certify that construction, including final stabilization, and installation of the post-construction water quality BMP is complete and in accordance with the approved permit.

2 Release of the Permit - Once the results of the final inspection signify compliance with the approved SWP3 plans and conditions, including final stabilization, the permit shall be terminated.

3 Release of Surety [JG8]- One (1) year after release of the permit, the final inspection for the release of the surety may be conducted. The Owner shall contact the Administrator to schedule this inspection.

4. Right of Entry Permit[JG9]

4.6 Post-Construction Water Quality Control BMPs

The BMP(s) chosen must be compatible with site and soil conditions. Structural post-construction stormwater treatment practices shall be incorporated into the permanent drainage system for the site. The BMP(s) chosen must be sized to treat the water quality volume (WQv) per the requirements indicated within the OEPA NPDES CGP. BMPs shall be designed such that the drain time is long enough to provide settlement treatment, but short enough to provide storage available for successive rain events.

The post-construction best management practice controls are identified in OEPA's NPDES CGP and shall be incorporated in project development and design. All BMPs shall be designed and constructed per the *Ohio Rainwater and Land Development Manual*.

For projects located within the watershed with a U.S. EPA approved TMDL as identified within the OEPA Small MS4 NPDES General Permit, Green Infrastructure (GI) BMPs are to [JG10]be incorporated as part of the sites stormwater management infrastructure to manage the sites calculated WQv where feasible. Acceptable GI BMPs (Infiltration Post-Construction Practices) are identified within the OEPA NPDES CGP. The infiltration BMPs shall be designed and constructed

per the Ohio Rainwater and Land Development Manual.

4.7 Post Construction Water Quantity Control Criteria

The critical storm method shall be used to size quantity control BMPs. The critical storm for a specific development area is determined as follows:

A. Determine, using TR-55 runoff curve number method, the total volume of runoff from a 1-year 2.12-inch rainfall event, occurring on the ~~development area~~area of disturbance before and after development to each predeveloped outfall point; and from the volume calculated, determine the percent increase in volume of runoff due to development, and using this percentage, select the twenty-four (24) hour critical storm from Table 5.

B. The post-developed volume includes all onsite disturbed area proposed to the predeveloped outlet and may include more or less area than the predeveloped condition. Offsite area being diverted from a different outfall~~let~~ to the proposed outfall~~let~~ does count towards the post-developed volume in the critical storm calculation but not the predeveloped. O~~, but o~~ffsite area that is being passed through to the same predeveloped outfall~~let~~ does not count toward the critical storm volume in either the pre or post condition.

C. Stormwater diversions from one watershed to another have the ability to exacerbate downstream flooding, erosion, and create water quality problems in the receiving stream. While small changes in the pre and post watershed boundaries to a specific outfall are acceptable, any major changes in watershed area to a predeveloped outfall are not permitted without proof of benefit and public comment.

TABLE 5
CRITICAL STORM FOR DISCHARGE LIMITATION

If the percentage of increase in volume of runoff is:		
equal to or greater than	**and less than**	**The critical storm for discharge limitation will be**
- - -	10%	1 Year
10%	20%	2 Year
20%	50%	5 Year
50%	100%	10 Year[TD11]~~*~~
100%	250%	25 Year
250%	500%	50 Year
500%	- - -	100 Year
Source: Ohio EPA Rainwater and Land Development Manual		

D. Once the critical storm has been established, the allowable release rate for the critical storm is the 1-year predeveloped release rate. For all storms greater than the critical storm the allowable release rate is the predeveloped rate for that particular storm event. Offsite areas tributary to the detention facility can be passed through at their current rate for all storm events contingent on the offsite area being tributary to the same downstream watercourse or storm sewer as it was before development.

E. The designer shall establish adequate storage and outlet structures to accommodate the necessary detention for the site including any water quality requirements. The ability to regulate the stormwater discharge is dependent on the detention basin volume and the proposed outlet structure. The basin and outlet system shall be analyzed by utilizing a computer program able to run the NRSC curve number method and a Type II 24-hour rainfall distribution. The Rational Method is not an accepted methodology for design of detention / retention basins.

4.8 Rainfall Depths and Rainfall Distribution

For the purposes of calculating onsite and offsite peak flow rates to meet the critical storm method, the NRCS Type II rainfall distribution shall be used and coupled with NOAA Atlas 14 24-hour duration Rainfall Depths as shown on Table 6.

TABLE 6
NOAA Atlas 14 24-hour Rainfall Depths

Rain Event Year	**Rainfall Depth** Inches
1	2.12
2	2.53
5	3.11
10	3.59
25	4.27
50	4.83
100	5.41

4.9 BMP As-Built Requirements

Prior to final acceptance of the pond improvements, as-built data shall be submitted to the Allen County Drainage Engineering Department verifying that the outlet structure(s) and above normal pool pond volume have been built as designed and will function accordingly. The as-built information shall be prepared and stamped by an Ohio Registered Professional Civil Engineer or an Ohio Registered Landscape Architect.

4.10 Wetlands

For onsite or offsite wetlands to remain after development, sufficient baseflow hydrology is necessary to support their continued function. This generally means conveying a percentage of the predeveloped 1-year storm runoff volume to the basin after development. Conveying at least 80% of the predeveloped 1-year volume to the wetland after development is a suggested minimum volume. For volumes in excess of 150% of the predeveloped 1-year volume consideration may be given to only convey the water quality outlet to the wetland and allow other flows to bypass the wetland.