FAIRFIELD COUNTY, OHIO

STORM WATER DESIGN MANUAL

For unincorporated areas of Fairfield County, Ohio

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Approved July 11, 2023

Commissioners

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References

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1 GENERAL CONSIDERATIONS

1.1 TITLE

These rules, guidelines, and standards contained herein shall be known and may be cited and referred to as the "Fairfield County, Ohio Stormwater Design Manual" and shall hereinafter be referred to as "this Manual".

1.2 PURPOSE

The purpose of the rules, guidelines, and standards set forth in this Manual and adopted by the Fairfield County Board of Commissioners is to provide engineering standards governing the design, construction, operation, maintenance, and use of stormwater management infrastructure in the unincorporated areas of Fairfield County (County). It is the intent of this Manual to minimize the impact on existing and natural drainage systems based on increased rates and volumes of runoff from the development of land. While the requirements set forth herein will not stop flooding or the damage caused by flooding, they do establish a basis for design which will:

1. Minimize the damage and inconvenience of flooding.
2. Provide drainage systems which continue to benefit their tributary area over the long term.
3. Minimize the adverse effects of new drainage systems on existing drainage systems.
4. Minimize the expense of maintaining the drainage facilities within the County.

1.3 AUTHORITY

The rules, guidelines, and standards set forth in this Manual are adopted by the Fairfield County Board of Commissioners in accordance with and pursuant to the legal grant of authority of the Ohio Revised Code (ORC) 711.101, to establish standards for the design and construction of improvements shown on the plats and plans within their jurisdiction.

1.4 JURISDICTION

The rules, guidelines, and standards set forth in this Manual shall be applicable to work within all public right-of-way and subdivisions of land as defined by Chapter 711 of the ORC hereinafter within the unincorporated areas of Fairfield County.

1.5 ADMINISTRATION

The Fairfield County Engineer's Office and its staff are herein delegated the authority on behalf of the Fairfield County Board of Commissioners to administer and enforce the provisions of this Manual, with technical assistance and support from the Fairfield County Regional Planning Commission (Regional Planning Commission) and the Fairfield Soil and Water Conservation District (Fairfield SWCD).

1.6 ADOPTION

This Manual shall become effective after adoption by the Fairfield County Board of Commissioners in accordance with Chapter 711.10 of the ORC. All or any previous Fairfield County stormwater

standards now in effect shall be deemed to be repealed upon adoption of the standards contained herein.

1.7 AMENDMENT

This Manual may be amended in accordance with the same procedure as stated in Section 1.6 of this Manual. The County Engineer, with input and collaboration with the Regional Planning Commission and Fairfield SWCD may put forth requests regarding amendments to the Fairfield County Board of Commissioners for their review and adoption in the manner prescribed under Ohio Revised Code 711.

1.8 INTERPRETATION

In their interpretation and application, the provisions of this Manual shall be held to be minimum requirements for the promotion of health, safety, and general welfare of the people of Fairfield County. As such, in the development process the Fairfield County Engineer's Office shall be entitled to apply reasonable interpretation of this Manual as is necessary to give force and effect to the purpose and intent of this Manual.

It is not intended by this Manual to interfere with, or abrogate, or annul any easements, covenants, or other agreements between parties unless they violate this Manual. When two specific provisions of this Manual conflict, or a provision of this Manual conflicts with any other lawfully adopted rules, regulations, ordinances, or resolutions, the most restrictive, or that imposing the higher standards shall apply.

1.9 SEPARABILITY

The invalidation of any clause, sentence, paragraph, or section of this Manual by a court of competent jurisdiction shall not affect the validity of the remainder of this Manual either in whole or in part.

1.10 DISCLAIMER

Neither submission of a plan under provisions of this Manual nor compliance with the provisions of this Manual shall relieve any person from responsibility for damage to any person or property otherwise imposed by law and shall not impose any liability upon Fairfield County for damage to any person or property.

1.11 DEFINITIONS

ADEQUATE OUTLET: An outlet functioning as designed or natural with sufficient capacity to carry the existing flow as well as the proposed flows in the post-development condition.

ANTI-SEEP COLLAR: Device that prevents the flow of water through the surrounding soil around a conduit that is used as an outlet for an infiltration, retention, or detention basin.

BENCHMARK: A relatively permanent object, natural or artificial, bearing a marked point whose elevation is above or below a referenced datum with a known published elevation.

BEST MANAGEMENT PRACTICES (BMP): Schedules of activities, prohibition of practices, maintenance procedures, and other best management practices (both structural and non-structural) to prevent or reduce the pollution of surface waters of the state. BMPs also include treatment requirements, operating procedures, and practices to control construction site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

BUILDING: Any structure, or part of a structure, which may or may not be constructed for human habitation.

CATCH BASIN: A structure for intercepting flow from a gutter or ditch and discharging the water through a conduit.

CHANNEL: A natural stream that conveys water; a drainage ditch excavated and/or constructed for the flow of water.

COEFFICIENT OF RUNOFF (C): A value that varies with the ground and ground cover used in the rational method to determine the amount of a rainfall which is directed to streams and not absorbed into the ground.

COLLECTOR TILE SYSTEM: A tile system installed to control groundwater on properties without access to public sanitary service and is connected to a stormwater system. Collector tile system materials shall meet the sanitary standards defined in the Fairfield County Utilities CMS (latest edition) in preparation for tie in to planned/future sanitary sewer systems.

CONTRACTOR: The individual, firm, or corporation entering a Contract, or its authorized representatives legally empowered to act on its behalf.

CONSTRUCTION: The erection, alteration, repair, renovation, demolition, or removal of a building or structure; and the clearing, stripping, excavating, cutting, filling, grading, and regulation of sites in connection therewith.

COUNTY: Fairfield County, State of Ohio.

COUNTY BOARD OF COMMISSIONERS: The Board of County Commissioners of Fairfield County and their authorized representatives legally empowered to act on their behalf.

COUNTY ENGINEER: The Engineer of Fairfield County, or designated agent(s).

COUNTY SANITARY ENGINEER: The Sanitary Engineer of Fairfield County, or designated agent(s).

COVER: Distance measured from the top of the conduit vertically upward.

DESIGN ENGINEER: A Professional Engineer licensed in the State of Ohio and retained by the project owner.

DESIGN STORM: A given rainfall amount, areal distribution, and a time distribution, used to estimate runoff.

DETENTION: The capture, collection, and subsequent slow release of stormwater runoff; the primary purpose of which is to mitigate increases in stormwater runoff rates, providing protection, whether complete or partial, to down-slope areas, from the adverse effects of increased runoff rates.

DEVELOPER: Any individual, subdivider, firm, association, syndicate, partnership, corporation, trust, or any other legal entity commencing procedures under these regulations for the development of land for the developing entity or for another.

DEVELOPMENT: Any non-natural change to improved or unimproved real estate, including, but not limited to construction of buildings or other structures, installation of infrastructure or utilities, mining, dredging, filling, grading, paving, excavation, or drilling operations.

DEVELOPMENT AREA: An area owned by an individual, firm, or association being developed as a single phase or multiple phases (units) and used or being developed or redeveloped, for non-farm commercial, industrial, residential, or other non-farm purposes upon which earth disturbing/land disturbance activities are planned or underway.

DRAINAGE DITCH or DRAINAGE WAY: An open channel constructed to a designed size and grade to contain and convey stormwater without causing erosion or other adverse effects to the property.

EARTH DISTURBANCE: Any grading, digging, drilling, pushing, piling, throwing, trenching, unloading, or placing of fill material, composed of earth, soil, rock, sand, gravel, or demolition material.

EASEMENT: A grant by the owner of land for a specific use such as public utilities.

ENGINEER: An individual authorized to practice civil engineering as defined by ORC Title 47 – Occupations-Professions, due to his or her registration in the state of Ohio.

EROSION:

A. The wearing away of the land surface caused by running water, wind, ice, or other geological agents, including such processes gravitational creep.
B. Detachment and movement of soil or rock fragments by wind, water, ice, or gravity.

FAIRFIELD SWCD: Fairfield Soil & Water Conservation District.

FINISHED GRADE: The grade or elevation of a final surface conforming to the Site Grading Plan.

HYDRAULIC GRADE LINE (HGL): The surface or profile of water flowing in an open channel or a pipe flowing partially full. If a pipe is under pressure, the hydraulic grade line is that level that the water would rise to in a small, vertical tube connected to the pipe.

HYDROGRAPH: A graph of discharge rate versus time for a selected point in the drainage system.

IMPROVEMENTS: Street pavements, with or without curb and gutter, walks, sanitary, storm, and water lines, erosion control, or any other appropriate items.

LAND-DISTURBING ACTIVITIES: Any land change that may result in soil erosion from water or wind and the movement of sediment into waters or onto lands, including but not limited to, clearing, grubbing, grading, excavating, transporting, and filling of land, and installation of utilities.

MANHOLE: A structure that allows access to a closed drainage system.

MAP: The scaled representation of a parcel of land or a sub-division.

MAY: May is permissive and not mandatory.

MICROPOOL: Depressed area providing a settling pool located at the water quality outlet structure of a basin.

MS4: Municipal Separate Storm Sewer System.

OHIO RAINWATER AND LAND DEVELOPMENT MANUAL:

A. A manual describing construction and post-construction best management practices and associated specifications.
B. Ohio Rainwater and Land Development Manual - Ohio's Standards for Stormwater Management, Land Development, and Urban Stream Protection (latest edition).

ODOT CMS: Ohio Department of Transportation Construction and Materials Specifications (latest edition).

ODOT L&D Volume 2: Ohio Department of Transportation, Location and Design Manual, Volume 2 – Drainage Design (latest edition).

OHIO EPA CONSTRUCTION GENERAL PERMIT: Ohio EPA General Permit Authorization for Stormwater Discharges Associated with Construction Activity Under the National Pollutant Discharge Elimination System (Ohio EPA Permit No. OHC000005 or current version).

OWNER: The person in whom is vested the fee ownership, dominion, or title of property (i.e., the proprietor). The word "owner", when applied to property, shall include any part-owner or joint owner of the whole or any part of such property.

PERMANENT STABILIZATION: The establishment of a minimum of 75% of the permanent vegetation, decorative landscape mulching, matting, sod, riprap, and landscaping techniques to provide permanent erosion control on areas where construction operations are complete or where no further disturbances is expected for at least one year.

PERMEABILITY: The quality of the soil that enables water to move downward through the soil profile.

POST-DEVELOPMENT: The hydrologic and hydraulic condition of the project site at the completion of construction.

PRE-DEVELOPMENT: The hydrologic and hydraulic condition of the project site immediately before development or construction begins.

REGIONAL PLANNING COMMISSION: Fairfield County Regional Planning Commission.

RETENTION: The collection and storage of stormwater runoff without subsequent discharge other than through infiltration into the ground or evaporation.

RIGHT-OF-WAY: The land between property lines utilized as street, alley, or crosswalk.

RUNOFF: The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and eventually is returned to streams, rivers, lakes, and ponds. That part of the precipitation which runs off the surface of a drainage area after all abstractions are accounted for.

SEDIMENT: Solid material, both mineral and organic, that is or was in suspension, is being or has been transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface either above or below water.

SEDIMENT BASIN: A facility such as a depression storage area, a pond or trap, barrier, dam, or other suitable detention facility built across an area of water flow to settle by gravity or filtration and retain sediment carried by surface drainage runoff water.

SEDIMENT AND EROSION CONTROL PLAN: A written description, in graphical and descriptive terms, subject to review and approval by the approving agency, of methods for controlling sediment pollution from accelerated erosion of a development area of one or more contiguous acres or when part of a larger development area.

SHALL: Shall means mandatory; not permissive.

SITE: Any lot or parcel, or a series of lots or parcels of land adjoining, or joined together under one ownership where building, clearing, constructing, developing, stripping, grading, or excavating is performed.

STABILIZATION: The prevention of soil movement by any vegetative and/or structural means. Temporary erosion and sediment controls shall remain in place until final site stabilization has achieved at least 75% of the specified vegetation growth.

STAFF: A group of individuals employed by the Fairfield County Engineer's Office.

STORM DRAINAGE SYSTEM: All facilities, structures, natural watercourses, outlets, waterways or streams, swales or ditches, and sewers which carry stormwater, groundwater, surface water, subsurface drainage water, and unpolluted cooling water.

STORM SEWER OR STORM DRAIN: A pipe or conduit which carries storm and surface waters or drainage, from the point of origin to some point of disposal but excludes sanitary wastewater and industrial wastewater.

STORMWATER: Water runoff resulting from storm events, including snow melt, surface water runoff, and drainage.

STORMWATER MANAGEMENT REPORT: The detailed analysis and supporting documentation for the design of the stormwater management system required for construction, which must be approved by the County Engineer.

STREAM: A body of water running or flowing on the earth's surface or a channel in which such flow occurs. Flow may be seasonal, ephemeral, intermittent, or perennial.

STRIPPING: Any activity which removes or significantly disturbs the vegetative surface cover.

SURVEYOR: An individual authorized to practice surveying as defined by ORC Title 47 – Occupations-Professions, due to his or her registration in the state of Ohio.

TEMPORARY STABILIZATION: The establishment of temporary vegetation, mulching, geotextiles, sod, preservation of existing vegetation, and other techniques capable of quickly establishing cover over disturbed areas to provide erosion control between construction operations.

TOPSOIL: Surface and upper surface soils which presumably are darker colored, fertile soil materials, ordinarily rich in organic matter or humus debris.

WATERCOURSE: A channel in which a flow of water occurs either continuously or intermittently.

WATER QUALITY VOLUME (WQv): The volume of stormwater runoff which must be captured and treated prior to discharge from the developed site after construction is complete.

WATERS OF THE STATE: All streams, lakes, reservoirs, ponds, marshes, wetlands, or other waterways which are suited wholly or partly within the boundaries of the state, except those private waters which do not combine or effect a junction with surface water. Waters defined as sewage systems, treatment works, or disposal systems in Section 6111.01 of the ORC are not included.

1.12 CONSTRUCTION REQUIREMENTS

The latest edition of the Ohio Department of Transportation (ODOT) Construction and Materials Specifications (CMS) and Standard Construction Drawings (SCD) shall govern the construction of stormwater related facilities described in this Manual, except those details provided in Appendix A, which take precedence. The latest edition of the City of Columbus CMS and SCD shall also be applicable for the construction of stormwater related facilities described in this Manual, unless otherwise stated herein. All construction activity within the unincorporated areas of Fairfield County must also comply with the requirements stipulated by the Ohio EPA and Section 5 of this Manual, whichever is more restrictive.

1.13 DRAINAGE EASEMENTS

An adequate easement shall be required along any subsurface drainage tile, wet/dry basin, drainage way, drainage ditch, watercourse, stream, storm sewer, flood routing path, or other stormwater infrastructure that is not already within the right-of-way. Easements for flood routes shall be established to 1 foot above the 100-year storm elevation. The easement shall be of sufficient width to allow for maintenance and replacement of such drainage infrastructure. Final determination of easement width is subject to approval by the County Engineer.

A. Open Drainage Easements
Constructed open watercourses that are to be publicly owned and maintained and lie outside the public right-of-way, shall be provided with an easement that includes:

1. The full width of the channel as measured from top-of-bank to top-of-bank plus a minimum width of 15 feet on one side, or a minimum width of 30 feet centered along the watercourse, whichever is greater.
2. A minimum width of 15 feet for vehicles for access and maintenance, which will have a maximum cross slope of 2% and extend along the entire length of the channel. This distance measured shall be exclusive of the width of the channel.

Where onsite constructed open channels are designed to serve as a major flood routing path for offsite flows through the development, easement widths shall be extended to include the total flow width for the 100-year event plus 1 foot in elevation.

B. Stormwater Controls Easements
Stormwater controls that are to be publicly owned and maintained and lie outside the public right-of-way, shall be provided with an easement that includes:

1. The area of the stormwater control plus a 15-foot perimeter beyond the maximum designated flood limits of the structure and its appurtenances. Appurtenances shall include but are not limited to, forebay(s), benches, risers, outlet pipes, etc.
2. The easement shall include a minimum width of 15 feet around the perimeter of each stormwater control and to each inlet structure and outlet structure for vehicle access, general maintenance, and repair/replacement. The vehicle access way shall include a maximum side slope of 2%, shall be sloped toward the direction of the stormwater control, and shall allow for adequate turn-around of maintenance vehicles. The easement shall include a minimum width of 15 feet from the nearest public road right-of-way to the stormwater control for vehicle access.

C. Closed Drainage Easements

An easement shall be provided on a closed storm drainage course for the purpose of general maintenance and access. The width of these easements shall be per **Table 1-1**. Easement widths for pipe sizes and/or cover depth not listed in Table 1-1 shall be determined by the County Engineer. Closed drainage easements shall be restricted from use by utilities unless approved by the County Engineer.

Table 1-1: Minimum Closed System Easement Widths

Cover Depth (ft)	Minimum Easement Width (ft)	Minimum C/L Offset (ft)	Minimum Easement Width (ft)	Minimum C/L Offset (ft)	Minimum Easement Width (ft)	Minimum C/L Offset (ft)
	12" Diameter		***15" - 18" Diameter***		***21" - 24" Diameter***	
2	30	10				
3	30	11	30	11	30	12
4	30	12	30	12	30	12
5	30	12	30	12	30	12
6	30	12	40	12	40	12
7	40	12	40	12	40	12
8	40	12	40	12	40	13
9	40	12	40	12	40	13
10	40	12	45	13	45	13
	27" - 36" Diameter		***48" Diameter***		***> 48" Diameter***	
4	30	13			***Determined by County Engineer***	
5	40	13	40	13		
6	40	13	40	13		
7	40	13	40	13		
8	40	13	45	14		
9	45	13	45	14		
10	45	13	45	14		

11	45	13	45	14	

D. Drainage and Future Sanitary Easements
Drainage easement shall be provided on all collector tile systems. These easements will serve as drainage easements, in conjunction with planned/future sanitary sewers. These easements are required to allow for the construction, operation, maintenance, repair, replacement, or removal of sanitary sewers or collector tiles without encroaching upon or disturbing the drainage structures and facilities. Easements, in this case, shall be a minimum of 30 feet in width. Easements adjacent to right-of-way may be reduced to no less than 20 feet in width with the consent of the County Engineer. The easements shall be labeled "Drainage and Future Sanitary Sewer Easements". No other utilities are permitted within drainage and sanitary sewer easements, unless approved by the County Sanitary Engineer and County Engineer.

E. Obstructions in Easements
Buildings, accessory structures, fences, or obstructions of any kind are restricted within storm drainage related easements. Such encroachment may be permitted, in rare instances, with prior approval of the County Engineer. Before structures of any kind are constructed over, upon, or across storm related easements, the property owner shall submit detailed plans and specifications of such structures to the County Engineer. The property owner shall not proceed with construction of the structure until the County Engineer has approved the plans and specifications as not interfering with the use of the easement granted herein or with the function of the drainage features.

1.14 DESIGN EXCEPTIONS

Accepted procedures and requirements related to stormwater management within the unincorporated areas of Fairfield County are provided in this Manual and supplemented by reference materials identified herein. The County recognizes that there may be individual projects involving special or unusual design challenges and the County's standards, as expressed in this Manual, may not provide solutions to all drainage problems. The County Engineer may consider and grant design exceptions on a project-by-project basis. All design exceptions must have the written approval of the County Engineer and comply with Section 1.14.1 of this Manual. Intended design exceptions must be requested during the preliminary engineering phase. These design exception requests shall be submitted in writing and, if approved by the County Engineer, documented (showing approval date and assigned ID number) on the title sheet of the final construction drawings that contain storm drainage improvements. Any approved design exceptions are not to be considered as precedent for future projects. The County Engineer does not have the authority to grant variances to state or federal regulations.

1.14.1 **Procedures for Design Exceptions**:

A. Projects that are subject to review and approval of Fairfield County Regional Planning Commission, shall follow the requirements and fee schedule of the current Fairfield County Subdivision Regulations.

B. Projects that are not subject to review and approval of Fairfield County Regional Planning Commission, shall follow the requirements of the Fairfield County Engineer. This requires

filling out the Design Exception Request Form provided in Appendix B and submitting the Form to the County Engineer with applicable fees. It is encouraged to discuss the design exception request with the County Engineer prior to submitting a formal Design Exception Request Form.

1.15 SURVEY STANDARDS

This section defines the minimum requirements for the practice of surveying within Fairfield County.

A. All surveys conducted for the purpose of designing or preparing plans and maps for improvements requiring approval by the County Engineer shall be stamped by a Professional Surveyor licensed in Ohio.

B. Survey activities shall meet the Minimum Standards for Boundary Surveys set forth in Ohio Administrative Code (OAC) Section 4733.37. [Also, reference: Fairfield County minimum standards for conveyance.]

C. Survey and mapping activities shall also meet the standards in the latest edition of the ODOT Survey and Mapping Specifications.

D. Topographic Standards
   1. The elevation of 90% of all identifiable points shall be in error not more than one-half of the contour interval.
   2. No point shall be in error more than a full contour interval.
   3. 1’ contour interval shall be the minimum standard.

E. Coordinate System
   1. Survey and mapping activities shall be tied to and referenced in the NAD 1983 State Plane Ohio South FIPS 3402 Feet coordinate system.
   2. Survey and mapping activities shall be tied to and referenced in the North American Vertical Datum of 1988 (NAVD 88).

2 HYDROLOGY REQUIREMENTS FOR STORMWATER CONVEYANCE DESIGN

This section outlines the standards for acceptable hydrology methodologies and requirements for stormwater conveyance design. The County accepts two methods for calculating stormwater runoff peak flows: the Rational Method (assuming a drainage area of less than 5 acres and for minor conveyance system design only) and the NRCS TR-55 method. The NRCS TR-55 method is required for drainage areas larger than 5 acres, for developing runoff hydrographs for basins and sub-basins, and for determining the required storage volume for detention and retention basins. The USGS Regression methodology is also an acceptable peak flow calculation method for large culvert design only and with prior approval from the County Engineer. Sections 2.1 through 2.4 define the hydrological components needed for these methods.

2.1 DRAINAGE AREA DETERMINATION

The drainage area shall be determined from one or more of the following sources:

1. Field investigation and topographic surveys.
2. Fairfield County Auditor Topographical Maps/GIS data with spot elevations provided at each point where runoff exits the site or ties to an existing stormwater system (preliminary design only).

Final drainage calculations and design shall be based on field verified 1 foot contour interval mapping completed by a Professional Surveyor licensed in Ohio with at least a 50-foot buffer beyond the property line unless a design variance is approved by the County Engineer. Spot elevations are required at all critical design points and outlet structures. Topographic and boundary survey data shall be certified by a Professional Surveyor licensed in Ohio. Survey data can be obtained using LiDAR using real-time kinematic correction methods and an appropriate number of ground control points.

Stormwater runoff from offsite upstream tributary areas that discharge to or across a development site shall be accommodated within the stormwater facilities planned for the development site.

No stormwater management plans will be approved until it is demonstrated that offsite runoff will be adequately conveyed through the development site in a manner that will not cause or contribute to hazardous or detrimental upstream or downstream flooding or erosion. The estimation of the offsite flows must be done separately from the estimation of onsite flows (i.e., separate hydrographs for offsite areas must be determined). Detention/retention is not required for the offsite flows unless the downstream condition warrants it. Offsite flows must be treated for water quality per Ohio EPA requirements, unless the offsite flow is bypassed around the site.

The allowable release rate from a site shall be the allowable release rate for the site plus all offsite flow for each return period storm. All calculated flow volumes routed through attenuation structures shall be determined by adding all hydrographs for on and off-site areas tributary to the structure.

2.2 RAINFALL DATA

Rainfall data shall be in accordance with data for Fairfield County, Ohio provided by NOAA National Weather Service Hydrometeorological Design Studies Center's Precipitation Frequency Data Server (PFDS), NOAA Atlas 14 Point Precipitation Frequency Estimates. Rainfall distribution for stormwater

management systems shall be in accordance with SCS Type II, 24-hour duration rainfall distribution.

2.3 TIME OF CONCENTRATION

Time of concentration (T_c) for a drainage area is defined as the time a drop of water takes to drain from the hydraulically most remote point in the watershed to the point of interest, or the time for a watershed to reach equilibrium. T_c influences the shape and peak of the runoff hydrograph. Urbanization usually decreases T_c, thereby increasing the peak discharge rate. But T_c can be increased as a result of (a) ponding behind small or inadequate drainage systems, including storm drain inlets and road culverts, or (b) reduction of land slope through grading. In general, higher and faster peak discharge is associated with smaller T_c. T_c determines the average rainfall rate on the rainfall intensity-duration-frequency curve. Different methods are available for computing T_c for a drainage area. The acceptable method in Fairfield County is the NRCS Velocity Method. The minimum T_c shall be 5 minutes in all cases.

A. Factors affecting Time of Concentration (T_c) and Travel Time (T_t)
   1. Surface Roughness: One of the most significant effects of urban development on flow velocity is less retardance to flow. That is, undeveloped areas with very slow and shallow overland flow through vegetation become modified by urban development. The flow is then delivered to streets, gutters, and storm sewers that transport runoff downstream more rapidly. Travel time through the watershed is generally decreased.
   2. Channel Shape and Flow Patterns**:** In small non-urban watersheds, much of the travel time results from overland flow in upstream areas. Typically, urbanization reduces overland flow lengths by conveying storm runoff into a channel as soon as possible. Since channel designs have efficient hydraulic characteristics, runoff flow velocity increases and travel time decreases.
   3. Slope: Slopes may be increased or decreased by urbanization, depending on the extent of site grading or the extent to which storm sewers and street ditches are used in the design of the water management system. Slope will tend to increase when channels are straightened and decrease when overland flow is directed through storm sewers, street gutters, and diversions.

B. T_c Calculation
   1. The Velocity Method for computing T_c uses time of concentration as the sum of travel times for segments along the hydraulically most distant flow path. Travel times for each segment are computed and summed to arrive at the time of concentration. The segments used in the velocity method are of three types:
      a. Sheet Flow
      b. Shallow Concentrated Flow
      c. Open Channel Flow

   Water moves through a watershed in combinations of these segments in the order given. The type that occurs is a function of the conveyance system and is best determined by field inspection. Time of concentration (T_c) is the sum of time of travel values for the various consecutive flow segments:

$$T_c = t_{sheet} + t_{shallow} + t_{channel} + t_{conduit}$$

Sheet flow

Sheet flow is flow over plane surfaces and usually occurs at the upstream boundary of a watershed. Generally, the depth of sheet flow is less than 1 inch and is a steady, uniform flow. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, rocks, erosion, and transportation of sediment. The maximum acceptable sheet flow length is less than 100 feet for paved areas, and less than 300 feet in length for unpaved areas. In no case shall sheet flow account for more than 20 minutes in duration. Sheet flow will not exceed 1 inch in depth. For Sheet flow of less than 300 feet, use Manning's Kinematic Solution (Overton and Meadows 1976) to compute T_{sheet}

$$t_{sheet} = \frac{0.007(nL)^{0.8}}{(P2)^{0.5} S^{0.4}}$$

t_{sheet} = travel time (hr),
n = Manning's roughness coefficient
L = flow length (ft)
P2 = 2-year, 24-hour rainfall (in)
S = slope of hydraulic grade line (land slope, ft/ft)

This simplified form of the Manning's kinematic solution is based on the following assumptions:

a. Shallow steady uniform flow
b. Constant intensity of rainfall excess (that part of a rain available for runoff)
c. Rainfall duration of 24 hours
d. Minor effect of infiltration on travel time

Shallow Concentrated Flow

Sheet flow is assumed to occur for no more than 300 feet after which water tends to concentrate in rills and then gullies of increasing proportion. This type of flow is classified as shallow concentrated flow. Shallow concentrated flow is assumed not to have a well-defined channel and has flow depths of 0.1 to 0.5 feet. To estimate shallow concentrated flow travel time, a velocity is determined based on the slope and surface type. For the purposes of this Manual, only paved and unpaved surfaces will be considered. The following equations will provide the estimated velocity based on slope for paved and unpaved surfaces:

$V = 16.1345\ s^{0.5}$ (Unpaved)
$V = 20.3282\ s^{0.5}$ (Paved)

V = average velocity (ft/s)
s = slope of hydraulic grade line (watercourse slope, ft/ft)

These two equations are based on a solution of the Manning equation with different assumptions for n (Manning roughness coefficient) and r (hydraulic radius, ft). For unpaved areas, n is 0.05 and r is 0.4; for paved areas, n is 0.025 and r is 0.2.

After determining average velocity, use the $t_{shallow}$ equation to estimate travel time for the shallow concentrated flow segment. The travel time for shallow concentrated flow is calculated as follows:

$$t_{shallow} = \frac{L}{3600\ V}$$

$t_{shallow}$ = Travel time for shallow concentrated flow in hours
L = Flow length in feet
V = Velocity in fps

Open Channel Flow

Open channel flow occurs beyond shallow concentrated flow when the flow depth exceeds 0.5 feet in depth and enters into pipe systems, drainage ditches, or natural channels. The velocity of flow in an open channel or pipe can be estimated using the Manning's equation. Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. However, field observations shall determine the presence of defined channels or swales where depth of flow would exceed the 0.5-foot limitation of shallow concentrated flow. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for the bankfull condition.

Manning's equation is:

$$V = \frac{(1.49)\left(r^{\cdot 2/3}\right)s^{1/2}}{n}$$

V = average velocity (ft/s)
r = hydraulic radius (ft) and is equal to a/pw
a = cross sectional flow area (ft2)
pw = wetted perimeter (ft)
s = slope of the hydraulic grade line (channel slope, ft/ft)
n = Manning's roughness coefficient for open channel flow

After average velocity is computed using the above equation, $t_{channel}$ (for both channel and conduit flow) can be determined using the following equation:

$$t_{channel} = \frac{L}{3600\ V}$$

$t_{channel}$ = Travel time for shallow concentrated flow in hours
L = Flow length in feet
V = Velocity in fps

Given varying cross-sections of flow paths, and varying peak rates of flow and resulting varying depths of flow for different return periods, it is expected that each return period would result in a different $t_{channel}$. To help simplify the modeling process the County will accept an average cross-section of the open channel in segments of 250 feet in length, with a depth of flow determined by the 2-year return period event. This simplification is for determining the $t_{channel}$ only and is not to be used for the design of new open channels. New channels are to be designed using the design storm specified in the Section 3.4.

2.4 SOIL VARIABLES

Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four hydrologic soil groups (HSG) (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The soils in the development area must be identified from the latest edition of the Fairfield County Soil Survey, which can be obtained online at https://websoilsurvey.nrcs.usda.gov/app/.

Most urban areas are only partially covered by impervious surfaces: the soil remains an important factor in runoff estimates. Any disturbance of a soil profile can significantly change its infiltration characteristics. With urbanization, native soil profiles may be mixed or removed or fill material from other areas may be introduced. HSG A and B shall not be used for hydrology calculations in Fairfield County. HSG D shall be used for areas where soil has been previously disturbed by construction activities in the urban environment.

2.5 PEAK FLOW & RUNOFF VOLUME DETERMINATION

2.5.1 Rational Method

The rational method shall only be used for smaller drainage areas up to a maximum of 5 acres where no well-defined natural channel exists, and sheet flow prevails. The use of the rational method shall be limited to the design and evaluation of enclosed minor conveyance systems. This method is not acceptable for major conveyances with drainage areas that exceed 5 acres. The peak flow is obtained from the following equation:

$$Q = fCiA$$

where:

Q = Peak Discharge (cubic feet per second, cfs)

f = C value correction factor

C = Coefficient of runoff. An average C is to be computed based on the percentage of each land use within the drainage area (City of Columbus Manual Table 2-5 – see paragraph below).

i = Average rainfall intensity from NOAA Atlas 14 Intensity Duration Frequency (IDF) data for a given storm frequency and a duration equal to the time of concentration (inches per hour, in/hr)

A = Drainage area (acres)

The coefficient of runoff, C, is expressed as a dimensionless decimal value that estimates the percentage of rainfall that becomes runoff. The runoff coefficients in Table 2-5 of the current version of the City of Columbus Division of Sewerage and Drainage Stormwater Drainage Manual

shall be used for runoff projections using the rational method. Runoff coefficients used to project onsite flows for multi-family, commercial, and industrial type developments must be calculated based on the actual impervious surface amounts planned for the development site. The estimation of offsite flows may be determined using the appropriate runoff coefficient for the undeveloped land uses and/or the categorical development types (residential, commercial, and industrial).

The runoff coefficients in Table 2-5 of the City of Columbus Division of Sewerage and Drainage Stormwater Drainage Manual were calculated using curve numbers assuming a 10-year, 24-hour storm. The following C value correction factors, f, shall be used for larger design storms:

- f = 1.0 up to the 10-year design storm
- f = 1.1 for the 25-year design storm
- f = 1.2 for the 50-year design storm
- f = 1.3 for the 100-year design storm

2.5.2 NRCS TR-55 Method

The methods explained in "Urban Hydrology for Small Watersheds", Technical Release No. 55 (TR-55), latest edition, shall be used to calculate runoff volumes and peak rates of flow. TR-55 can be obtained from the United States Department of Agriculture, Natural Resources Conservation Service. Runoff Curve Numbers values are to be taken from one of the TR-55 tables listed below.

- Table 2-2a Runoff curve numbers for urban areas
- Table 2-2b Runoff curve numbers for cultivated agricultural land
- Table 2-2c Runoff curve numbers for other agricultural lands

Normal antecedent moisture condition (Type II rainfall distribution) shall be used in all cases when NRCS methods are used.

2.5.3 USGS Regression Equations

With prior approval of the County Engineer, the regression equations presented in USGS Report 93-135 (utilizing the web-based USGS StreamStats) is an accepted method for estimating design peak-discharge values for streams with drainage areas between 17 and 2,600 acres. The application of this method is limited to the estimation of peak discharges for large culvert installation and replacement projects only.

3 STORMWATER CONVEYANCE DESIGN

No site improvements related to storm drainage shall be approved unless there is an adequate outlet for stormwater as determined by the County Engineer. All stormwater is required to be conveyed to an adequate outlet or waters of the state where approved. Where a public storm sewer is accessible as determined by the County Engineer, the design engineer shall connect the flows with the public system. Storm drainage shall not be allowed to be conveyed to any sanitary sewer system.

3.1 ROADWAY CULVERTS

A. Culvert design shall be according to the standards and procedures outlined in the latest edition of ODOT L&D Volume 2, unless otherwise described in this section.

B. All materials used in construction of roadway culverts shall conform to the ODOT CMS.

C. The minimum size of all culverts to be owned by the County shall be 12 inches.

D. Single barrel culverts shall be utilized in design. Multi-barrel culverts may be utilized through the design exception process.

E. Culverts shall be designed to convey the flows from the design storm frequencies listed in Table 3-1 (over 24-hour storm duration). Design engineers shall refer to the latest edition of the Fairfield County Roadway Manual for roadway classification.

Table 3-1: Culvert Design Storm Frequency

Fairfield County Roadway Classification (refer to Fairfield County Roadway Manual for classification definitions)	**Design Storm Event**
Interstate Highways, Other Freeways, and Expressways	50-year
Major Arterial	25-year
Minor Arterial and Collectors	25-year
Locals, Other Parking and Development Areas	10-year

F. The plan format for all culverts shall comply with the latest edition of ODOT L&D Volume 2. The drainage area, design discharge (cfs), and 100-year storm discharge shall be shown on the construction drawings for each culvert.

G. The roadway overtopping depth shall not exceed six inch (6”) depth for the 100-year storm discharge. The designer shall show the overtopping area on the roadway for the 100-year event.

H. All culverts in subdivisions shall have appropriate headwalls and other appropriate structures and improvements to protect the facility as determined by the County Engineer. Full height headwalls shall not be allowed within the clear zone and will generally not be permitted unless protected by a guardrail.

I. Culverts within the dedicated right-of-way shall be backfilled with compacted granular material to within 6 inches of the subgrade of the existing ground in accordance with ODOT CMS Item 304.

J. Culvert hydraulics shall be analyzed through FHWA HY-8 or ODOT CDSS software package. For larger style bridges and flood plain analysis, the designer shall utilize HEC-RAS software.

3.2 STORM SEWERS

A. Storm sewer design shall be according to the standards and procedures outlined in the latest edition of ODOT L&D Volume 2, unless otherwise described in this section.

B. All materials used in construction of storm sewers shall conform to the ODOT CMS.

C. The rational or NRCS methods may be used to calculate peak flow rates for storm sewer design. The rational method may only be used for drainage areas less than 5 acres. Results are to be tabulated in the provided standard calculation sheets for storm sewer system design (Appendix C).

D. The minimum post-development T_c for pervious areas draining to storm inlets shall be 15 minutes. The minimum T_c for impervious drainage areas is 5 minutes.

E. Storm sewers shall be designed to convey the runoff from the 5-year storm with the system flowing full and the 10-year hydraulic grade line shall be fully contained within the system.

F. All storm sewer systems shall be designed using Manning's equation.

G. The minimum inside diameter of all storm sewers shall be 12 inches.

H. A manning's roughness coefficient (n) of 0.013 shall be used for all pipe materials to design storm sewer systems.

I. All storm sewer and collector tile systems shall be designed based on a minimum velocity of 3 feet per second and a maximum velocity of 12 feet per second. In cases where the outlet velocity is greater than 5 feet per second, the downstream receiving stream or channel must have adequate erosion control protection or energy dissipation.

J. Crown elevations for storm sewers shall match at junctions, when possible.

K. The maximum length between manholes/access structures shall be 300 feet, regardless of pipe size.

L. All storm sewers shall be located within easements established according to criteria in Section 1.13 Drainage Easements.

3.3 CURB INLETS AND CATCH BASINS

A. The removal of surface water from curbed pavement is an important component of stormwater control. Gutter flow in streets serves to transport runoff from surface areas to storm inlets or to open drainage channels. The primary function of the street inlet is to provide stormwater runoff flow.

B. Local streets with a width of 28 feet from back of curb to back of curb or less, the flow may spread to a width of 8 feet from face of curb.

C. Local streets with a width greater than 28 feet and up to 38 feet back of curb to back of curb, the flow may spread to a width of 9 feet from face the gutter into the storm sewer. Spread of

water on the pavement for the design storm is considered as the best control for pavement drainage.

1. Maximum spread of flow: Spread calculations are required for all public curb and gutter inlets. The design storm is the 5-year return period event for local roads. The 10-year return period event shall be used as the design storm for collector and arterial roads.
    a. For local and collector streets, a minimum of one lane (10 feet) in each direction (20 feet total), shall remain passable to traffic.
    b. For arterial streets, all lanes of traffic must remain passable during the design event.
2. A standard street spread calculation sheet for inlet design is provided in Appendix C and required for applicable projects.
3. Design Criteria for Curb and Gutter Inlets: The maximum spacing for curb inlets shall not exceed 400 feet unless approved by the County. Curb inlets shall be constructed on the upstream side of sidewalks.

D. Sag or Sump at Adverse Slopes: Double curb and gutter inlets are required at all sag locations.

E. Continuous Grade: Curb inlets shall be located at all points where the maximum pavement encroachment is reached and at the low points of street intersections. No cross-street flow is permitted. The County may require additional inlets at intermediary points if the flow in the gutter at design conditions might create a hazard to vehicular traffic, public safety, or property flooding.

F. Hydraulic analyses used to size and space inlets and catch basins shall be based on the methods presented in (FHWA) Hydraulic Engineering Circular No. 22: "Urban Drainage Design Manual."

3.4 Open Channels/Watercourses

A. All open watercourse designs shall be in accordance with the standards and procedures outlined in the latest edition of ODOT L&D Volume 2, unless otherwise described in this section.

B. Constructed channels shall be shaped or graded to required dimensions and shall be lined with an approved temporary matting based on 5-year return period shear stress per **Table 3-2** as necessary to convey stormwater runoff without allowing channel erosion.

Table 3-2 Temporary Matting Design Parameters

Channel Erosion Protection Mat (ODOT 670)	Allowable Shear Stress (lbs/ft^2)
Type B	1.5
Type C	2
Type E	2.25
Type G	1.75

C. All open channels/watercourses shall be designed with a 6-inch (minimum) diameter perforated underdrain system. Underdrains are to be discharged to storm structures if practicable, or if this is unfeasible, the underdrain is to be daylighted before the termination of the channel. The crown of the underdrain shall be a minimum of 18 inches below the bottom

of the watercourse, including 4 inches of topsoil to the finished grade. The underdrain trench shall be designed in accordance with the Ditch Underdrain detail (see Appendix A).

D. Watercourses that are engineered to be used as bio-swales to help treat water quality should follow the appropriate guidelines outlined in the ODNR Rainwater and Land Development Manual.

E. Parabolic and trapezoidal channel shapes shall be used for open watercourses within development projects. Side slopes shall be 4:1 or less, with a minimum 2-foot bottom width for trapezoidal channels, unless alternative dimensions are approved by the County Engineer. Channel cross sections shall be designed such that erosion and sediment deposition is minimized.

F. Roadside Ditches shall:
   1. Have a minimum bottom width of 2 feet and a maximum side slope of 4:1 except as otherwise approved by the County Engineer.
   2. Minimum roadside ditch grade shall be 1.0%. The roadside ditch grade shall be reduced to 0.5% by approval of the County Engineer.
   3. Be lined per the requirements in **Table 3-3**.

Table 3-3 Roadside Ditch and Shear Stress Design Parameters

Roadside Ditch Design Criteria	
DEPTH OF FLOW	SHEAR STRESS
Return Period Storm	
10-year	5-year

Shear Stress Design Criteria	
LINING TYPE	ALLOWABLE SHEAR STRESS (lbs/ft^2)
Seed (ODOT 659)	0.4
Sod (ODOT 660)	0.1
Turf Reinforcing Mat	
Type 1	3
Type 2	4
Type 3	5
Type 4	6
Rock Channel Protection	
Type B	5
Type C	4
Type D	2

3.5 EXISTING SUBSURFACE DRAINAGE

A. Field tiles that are discovered or intercepted during construction and do not exhibit evidence of conveying illicit discharge shall be reconnected or connected into the proposed stormwater system.

B. Field tiles that exhibit evidence of conveying illicit discharges shall not be connected to the proposed stormwater system and shall be reported upon discovery to the Fairfield County Health Department and the Fairfield County Sanitary Engineer.

C. The design engineer shall contact the Fairfield SWCD to confirm the existence and location of known existing tile systems of record.

D. All visible field tile outlets shall be field located and shown on the stormwater construction drawings.

E. Existing field tiles do not constitute an adequate outlet and shall not be used as an outlet for any development or stormwater facility, unless approved by the County Engineer and Fairfield SWCD.

3.6 COLLECTOR TILE SYSTEMS

A. The County may require a collector tile system for developments without access to public sanitary service and where on-lot wastewater treatment systems are to be constructed (see Fairfield County Subdivision Regulations).

B. Collector tile systems shall be designed per the stormwater standards defined in this Manual.

C. Collector tile system materials shall meet the sanitary standards defined in the Fairfield County Utilities CMS.

D. Testing and inspection requirements shall be in accordance with Specification 611 of the ODOT CMS and include video and mandrel inspection. Pressure testing is not required for collector tile systems.

E. Mainline Design
   1. Sewers shall be a minimum of 8 inches in diameter, unless engineering data warrants a larger size based on specific circumstances.
   2. Sewers shall be designed with a minimum velocity of 3 feet per second when flowing full and a maximum velocity of 10 feet per second unless special provisions are included to protect against displacement by erosion and impact.
   3. Pipe material shall be PVC SDR 35 and constructed in accordance with Fairfield County Utilities sanitary standards and CMS.

F. Cleanout Design
   1. A tee 6 inches in diameter off the pipe from the lot prior to discharging to the mainline sewer shall be provided for future inspection and maintenance purposes.
   2. The cleanout shall be located in an easement or right-of-way and constructed in accordance with Fairfield County Utilities standards and the detail provided in Appendix A.

3.7 FLOOD ROUTING PATH – MAJOR STORM

A. The routing path for the major drainage system is that part of the storm drainage facilities which carry the runoff that exceeds the capacity of the designed stormwater conveyance system.

B. The major drainage system shall have the capacity to carry runoff from a storm with a minimum return period of 100 years.

C. The storm drainage facilities shall be designed to convey the flow of surface waters without damage to persons or property during the 100-year storm.

D. The 100-year floodplain for streams shall be as defined by the Federal Emergency Management Agency (FEMA), U.S. Army Corps of Engineers (USACE), or Ohio Department of Natural Resources (ODNR). Where such determinations have not been made by the listed agencies, the 100-year storm elevation shall be estimated through a hydraulic analysis by a Professional Engineer licensed in Ohio. It is preferred that the hydraulic analysis for the flood routing path be performed in the USACE modeling software HEC-RAS. Other requested methods shall be approved by the County Floodplain Administrator.

E. The system shall ensure drainage at all points along streets and provide positive drainage away from buildings and onsite waste disposal sites.

F. The facilities shall be designed to prevent the discharge of excess runoff onto adjacent properties.

G. The design shall ensure that street pavement is dry for one 10-foot lane on local and collector streets and two 10-foot lanes on arterial streets, except that water may flow 6 inches deep across the crown of local or collector streets at designated locations.

H. The Regional Planning Commission and County Engineer may require a primarily underground system to accommodate frequent floods and a secondary surface system to accommodate larger, less frequent floods.

I. The requirements for the flood routing path shall be in accordance with the latest edition of the Special Purpose Flood Damage Prevention Regulations for Fairfield County.

4 STORMWATER RUNOFF CONTROL CRITERIA

Stormwater runoff generated from onsite areas shall be controlled before it is discharged from the development site. Section 4 provides the criteria for designing stormwater facilities that control stormwater discharges from the development improvements to prevent flooding, streambank erosion, and downstream water quality impairment. Stormwater drainage plans will not be approved until it is demonstrated that the onsite runoff will be controlled with the criteria in Section 4.

4.1 STORMWATER QUANTITY CONTROL REQUIREMENTS (CRITICAL STORM METHOD)

A. The Critical Storm Method shall be used to determine the critical storm for peak rate of runoff control. Storm drainage systems for land being developed, redeveloped, or improved shall be designed so that the peak rate of stormwater runoff after development does not exceed the peak rate of runoff before development, for all storms, from the critical storm up to a 100-year frequency, 24-hour storm, and does not exceed the peak rate of runoff for a one-year storm before development of the land for a one-year storm through the critical storm.

1. The critical storm shall be determined by calculating the volume of runoff from a one-year storm occurring over the area before (pre-development) and after development (post-development). The total volume of runoff from a one-year frequency, 24-hour storm occurring on the area before and after development shall be determined by hydrograph routing methods, the appropriate hydrologic method detailed in Section 2.5. Then determine the percent of increase in volume due to development and using this percentage, determine the critical storm from the following table. If the percentage of increase in volume of runoff is:

Table 4-1: Critical Storm Determination

Equal To Or Greater Than	And Less Than	The Critical Storm For Discharge Limitation Will Be:
10	20	2 years
20	50	5 years
50	100	10 years
100	250	25 years
250	500	50 years
500	-	100 years

2. Storage volume does not have to be provided for off-site upstream runoff except where restricted capacity exits at the downstream discharge point. Flow from the off-site areas will be routed through the development's drainage system at a rate determined in the same manner as the on-site system. Off-site land uses and the associated drainage systems prevailing at the time of development shall be considered as the pre-development condition for the purpose of calculating the flows to be routed through the development.

B. The following conditions may exempt a development from meeting the above design standards.

1. When it is determined by the County Engineer that the release of the peak flows caused by the development will not adversely affect the downstream drainage system. This will be determined from the information supplied for the development and other available information, such as the history of drainage for that area, and the NRCS reports and data.
2. When other arrangements have been made for handling the peak flows from the development which are satisfactory to the County Engineer.

4.2 STORMWATER QUALITY CONTROL REQUIREMENTS

A. The latest editions of the ODNR Rainwater and Land Development Manual and the Ohio EPA Construction General Permit shall be the governing reference for the design, operation, and maintenance of all stormwater quality control facilities within the unincorporated areas of Fairfield County.

B. Stormwater qualitative control must be implemented into sites in accordance with general and specific requirements outlined in Ohio EPA's permit for stormwater discharges associated with construction activity (Ohio EPA Construction General Permit).

C. The design water quality volume for all stormwater control measures shall be as required in the current OPEA Construction General Permit.

D. Methodologies that incorporate infiltration and rainwater reuse and/or harvesting techniques are encouraged.

4.3 STORMWATER CONTROLS

This section outlines criteria for successful design of basins and other structures that control stormwater discharges from development and redevelopment projects to prevent flooding, streambank erosion, and water quality impairment in downstream areas.

The criteria in this section are applicable to public and privately owned facilities. Privately owned facilities may be required to file a maintenance agreement or policy with the County or MS4 community to ensure long term operation. A sample Maintenance Agreement is included in Appendix E.

4.3.1 Basins

A. Basins are frequently used to meet peak flow control (allowable post-development runoff rate) requirements for a site. Their design may also include features to control water quality. In instances where basins are utilized to provide water quantity and water quality controls, peak flow rate and drawdown time criteria for both water quantity and water quality shall be met.

B. General Requirements: the following criteria shall be used to define the layout and geometry of all stormwater quantity and quality detention basins in Fairfield County:

1. Basins shall not be located on uncompacted fill, on slopes 3 (horizontal) to 1 (vertical) or flatter, or where infiltrating groundwater could adversely impact slope stability.
2. Basins shall be designed such that they readily accommodate flow from a site's major flood routing path(s). Overland flow from a site shall be directed to a site's basin(s), to ensure that site runoff is controlled.

3. Basins shall be designed with emergency spillways for storms that exceed the basin capacity. Emergency spillways shall be designed to direct the flow from a 100-year, 24-hour and less frequent storm events to a suitable downstream flood routing path without erosion, scouring, or soil undermining, and to meet applicable Ohio Department of Natural Resources (ODNR) Ohio Dam Safety requirements.
4. Basins shall be designed so that the peak water surface elevation in the basin does not overtop the basin embankment or flood structures around the basin. A minimum "freeboard" of 1 foot shall be maintained below the basin embankment elevation and below the first-floor elevation of structures near the basin.
5. Side slopes within and adjacent to the basin shall be 4 (horizontal) to 1 (vertical) or flatter to prevent bank erosion and minimize safety risks when the basin is full. The maximum cross slope for the vehicle access way shall be two percent (2%).
6. Basins shall be designed to limit migration of groundwater from the basin towards sanitary sewers and building basements. The County shall require that a geotechnical analysis of the area be performed where the basin is proposed, so that groundwater controls may be properly incorporated into the design. If the geotechnical analysis determines that exfiltration from the basin may increase infiltration into sanitary sewers or basements, then the basin design shall include compacted clay or a synthetic liner (note the liner requirement for wet basins in Section 4.3.1.2 below).
7. The design engineer shall determine during preliminary design if basins are subject to ODNR Dam Safety regulatory classifications (Class I through Class IV). All impoundment structures that require a dam safety permit from ODNR (Class I through III impoundment structures) shall provide sufficient design information to demonstrate that dam safety permit requirements will be satisfied, including a description of the fill materials, required compaction, downstream easements, and other features provided to satisfy ODNR dam safety requirements, and to limit seepage through the impoundment structure and protect the integrity of the structure. An as-built certification of the fill compaction shall be provided when construction is complete and ODNR Dam Safety officials have signed off.
8. All inflow pipes shall be designed so the inverts are at or above the normal pool with headwalls or endwalls. Rock channel protection designed according to the latest edition of ODOT L&D Volume 2 shall be used to minimize erosion around the headwall or endwall, as well as along the side slopes of the basin under each inflow pipe or open channel.
9. Channel protection shall be used where the peak flow velocity during the 5-year design storm exceeds the criteria for grass watercourses. Such protection shall extend to the basin's bottom or 2 feet below the normal water elevation of any permanent pool.
10. Woody vegetation shall not be planted or allowed to grow on the embankment or on an auxiliary spillway.
11. Permanent stormwater quantity control basins may be used as temporary sedimentation basins designed to control sedimentation during construction. It shall be required to remove collected sediments, remove the temporary outlet, install the permanent outlet structure as designed. In instances where vegetation is not established, additional measures shall be taken to ensure that the area is stabilized, including providing additional topsoil, additional seeding and mulching, or providing sodding in the areas where sparse ground cover occurs.

12. Debris control structures (trash racks) for both wet and dry basins may be required at the basin outlet if the potential exists for debris to enter the basin through an open watercourse or large diameter inlet pipe. Debris control structures shall be designed using Hydraulic Engineering Circular No. 9, available from the U.S. Department of Transportation, Federal Highway Administration.
13. Basins shall be designed with outlet control structures sized to meet the stormwater quantity control requirements and stormwater quality control requirements.
14. Seepage along any structure that extends through the embankment to the downstream slope shall be controlled using an anti-seep collar or drainage diaphragm. The collar/diaphragm shall be aligned approximately parallel to the centerline of the stormwater basin or approximately perpendicular to the direction of seepage flow, extending horizontally and vertically into the adjacent embankment and foundation to intercept potential cracks, poorly compacted soil zones or other discontinuities associated with the structure or its installation. Appropriate criteria for establishing the minimum horizontal and vertical distances from the surface of the conduit may be obtained from NRCS Technical Release 60 (TR-60) or NRCS Part 628 Dams – National Engineering Handbook, Chapter 45 – Filter Diaphragms, Appendix A.
15. Open channels receiving discharges from basins shall be protected with rock channel protection or other channel armoring as presented in this Manual.
16. Outlet structure shall be sized to achieve the release rates required. Outlets shall be designed to resist plugging by meeting the following criteria.
17. There are no size limitations on orifice outlets; however, the designer must present sufficient information proving that the orifice will not clog.
18. Alternative outlet designs (e.g., V-notch weir, perforated) of smaller orifice diameters may be permitted upon approval of the County Engineer if acceptable design practice is proven for site conditions. Alternative orifice designs shall also include schedules for more frequent operation and maintenance.
19. Basin outlet structures shall be designed to retain floatables, such as debris, oil, and grease within the basin up through and including the 100-year design storm event. Acceptable floatable control devices include perforated pipes, skimmers, baffles, inverted pipes and other devices that the County determines to be suitable.
20. It is required that basins be provided with an emergency drain, where practicable, so that the basin may be emptied if the primary outlet becomes clogged and/or to drain the permanent pool to facilitate maintenance. If an emergency drain is used, the emergency drain shall be designed to drain by gravity and made of approved materials as specified in City of Columbus CMS Item 901. If site conditions prevent gravity flow, basins may be designed to drain by pumping. Basins requiring pumping may be provided with an emergency drain made of ductile iron pipe with mechanical joints and a quick connect coupling extended to the bottom of the basin at a point near the outlet structure. It is suggested that emergency drains have an elbow within the basin to prevent sediment deposition, and a diameter capable of draining the basin within 24 hours. The emergency drain should include an operable gate, plug valve, mud valve, ball valve, or sluice gate, which should be set and locked in the closed position. Valves or gates should be located inside of the riser at a point where they will not normally be inundated and can be operated in a safe manner.

4.3.1.1 Dry Basins

A. The following shall apply to the design of dry basins for stormwater quantity control:
   1. Dry basins shall be designed, constructed, and maintained for a maximum 48-hour detention period after the design storm and shall remain completely dry between storm events.
   2. Dry basins shall be designed to drain toward the outlet or micropool in order to minimize standing water and saturated soil conditions that impede maintenance and mowing of the facility.
   3. Dry basins that will be publicly maintained shall include a paved low flow channel from each inlet pipe or open channel to the basin's outfall. Paved low flow channels are recommended for privately maintained basin facilities. The maintenance plan for dry basins that do not include a paved low flow channel shall describe how the basin will be maintained and drain efficiently. Low flow channels shall be designed per the following requirements:
      a. Bottom width – minimum width shall be 6 feet (to allow access for maintenance equipment),
      b. Side slopes – shall not be steeper than 4 (horizontal) to 1 (vertical),
      c. Channel slope – minimum slope toward the basin outlet shall be 0.5% for channels with paved bottoms, and
      d. Channel depth – minimum depth of channel shall be 1 foot.
   4. The bottom and side slopes of the channel shall be 6-inch (minimum) thick concrete reinforced with steel reinforcement per ODOT CMS 509 to accommodate temperature stresses and composed of air-entrained Class C concrete per ODOT CMS 499; weep holes shall be designed in the concrete side walls.
   5. The minimum bottom width for dry basins, other than the low flow channel, shall be 12 feet to allow for vehicular access for maintenance. The basin bottom shall be sloped to drain, and such slopes shall be sufficient to mitigate against "flat spots" developing due to construction errors and soil conditions. The minimum transverse slope for the bottoms of such facilities shall be 2.0%.
   6. Dry basins shall be provided with topsoil and shall be seeded and mulched to prevent erosion per ODOT CMS 653 and 659, and Chapter 5 of this Manual. Grasses seeded within the basin should be able to survive 48 hours under water. Jute and Excelsior matting shall be used as required to stabilize slopes and prevent erosion.
   7. A perforated pipe underdrain shall be provided beneath basins that are not constructed with a bottom channel. The underdrain shall have a minimum grade of 0.5%. The perforated pipe shall have a minimum diameter of 4 inches. A granular backfill of crushed No. 57 aggregate shall be provided up to a minimum of 4 inches above the outside diameter of the pipe.

4.3.1.2 Wet Basins

A. The following shall apply to the design of wet basins for stormwater quantity control:
   1. The depth of wet basins shall be no more than 12 feet below the basin's normal water elevation. The County may approve deeper ponds that are to be privately owned and operated where practices (e.g., aeration) are proposed to prevent thermal stratification.

2. A compacted clay or synthetic liner shall be required for all wet basins. Liners shall be designed in accordance with the latest edition of the ODNR Rainwater and Land Development Manual.
3. The minimum bottom width of wet basins shall be 12 feet.
4. The perimeter of all permanent pool areas deeper than 4 feet shall be surrounded by a safety bench that extends at least 8 feet and no more than 15 feet outward from the normal water edge, as illustrated below in **Figure 4-1**. The portion of the bench within 8 feet of the shoreline shall have an average depth of 6 inches below the permanent pool. The remainder of the bench shall be no more than 15 inches below the permanent pool to enhance public safety, and to limit growth of dense vegetation in a manner that allows waves and mosquito predators to pass through the vegetation. The maximum slope of the bench shall be 10 (horizontal) to 1 (vertical).

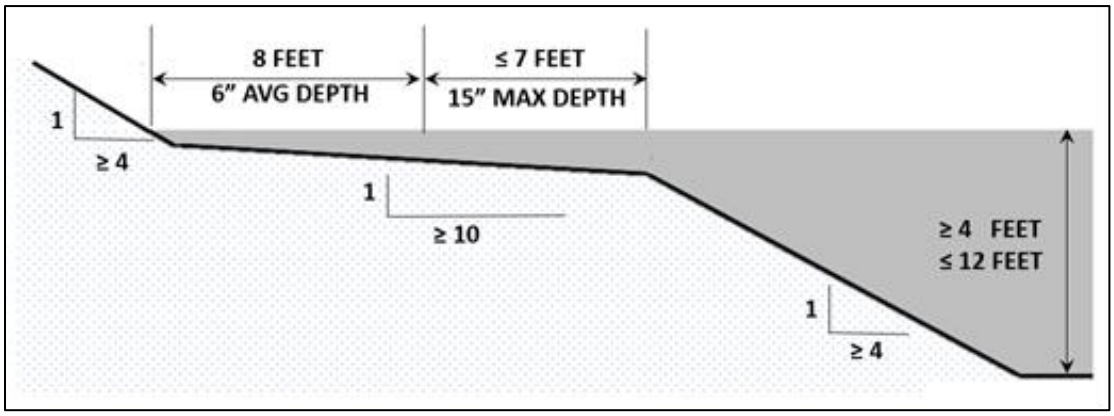

Figure 4-1: Wet Basin Dimensions

5. Side slopes for wet basins shall be a minimum of 4 (horizontal) to 1 (vertical) from the maintenance berm, or top of embankment down to the aquatic bench, and from the aquatic bench to the bottom of the basin.
6. At a minimum, wet basins shall be provided with topsoil, seeded, and mulched (per ODOT CMS 653 and 659 and Section 5 of this Manual) in all areas that are above the basin's permanent pool. Appropriate species shall be specified in areas along the perimeter of the basin at elevations higher than the permanent pool that are periodically inundated after storms. A Landscape Plan shall be submitted to Regional Planning showing proposed planting species and locations.
7. Growth of aquatic vegetation shall be restricted to the periphery of wet basins. The presence of a mechanical aerator, such as a fountain in the middle of the pond, may be used to make the site more attractive, deter the growth of unwanted vegetation, and make the habitat more suitable for fish. Maintenance of such mechanical aerators, or other similar features shall be the responsibility of the owner, or Homeowner's Association.
8. Wet basins and stormwater wetlands shall not be constructed any closer than 10,000 feet from a public-use airport (i.e., a publicly or privately owned airport open to public use) serving turbine-powered aircraft, or 5,000 feet from a public-use airport serving piston-powered aircraft as recommended by the Federal Aviation Administration (FAA), Advisory Circular Number 150/5200-33. As an alternative, dry basins and green roofs

are stormwater best management practices that do not maintain a permanent pool of water and are not as likely to attract large numbers of waterfowl.

4.3.2 Bioretention

A. Bioretention practices are stormwater basins that utilize soil media, mulch, and vegetation to treat runoff and improve water quality for small drainage areas. Bioretention BMPs provide effective treatment for many runoff quality problems including reduction of total suspended solids, heavy metals, organic compounds, bacteria, and nutrients by promoting settling, adsorption, microbial breakdown, and nutrient assimilation by plants.

B. A bioretention area consists of a depression that allows shallow ponding of runoff and gradual percolation through a soil media, after which it either infiltrates through undisturbed soils or enters the storm sewer system through an underdrain system. Bioretention BMPs are sized for common storm events (water quality volume) with runoff volumes from larger events typically designed to bypass the BMP.

C. Bioretention BMP design shall be based on the latest edition of the ODNR Rainwater and Land Development Manual.

4.3.3 Parking Lot Storage

A. Parking lot storage is a stormwater quantity control measure allowing shallow ponding within paved portions of the parking lot during the design storm event. Controlled release features are incorporated into the surface drainage system of the parking lot. Parking lot storage is a convenient multi-use structural control method where impervious parking lots are planned.

B. Ponding in parking or traffic areas shall be designed for a maximum ponding depth of 4 inches for all storms up to and including the 100-year event. Flood routing or overflow to a designed conveyance system must occur after the maximum depth is reached.

C. Runoff from specific graded areas within a parking lot shall be controlled by orifices. The release rate of the flow from a parking lot storage facility shall meet the allowable post-development runoff criteria presented in Section 4.1. The outlet device shall be at least a 4-inch diameter single orifice for water quantity control; however, alternative outlet designs (e.g., V-notch weir, perforated) of smaller diameter that are required to fully meet design criteria may be permitted upon submittal of an adequate maintenance plan and County Engineer approval.

D. A site with a parking lot storage facility shall employ a separate water quality treatment BMP that meets the water quality treatment criteria. This BMP may be located either downstream of the parking lot or integrated into the medians, landscaping, or other pervious areas of the parking lot.

4.3.4 Underground Storage

A. Underground storage is a stormwater quantity control measure that includes a series of underground pipes or chambers and has a designated release feature to control stormwater discharge. The construction, maintenance, and operation costs associated with underground storage methods for stormwater control tend to make this method a costly option.

B. Underground storage facilities shall not be used in instances where the County is to own, operate, or maintain the facility.

C. If underground storage is to be used, a plan for long term maintenance of the facility shall be provided to the County Engineer's Office, including a Health and Safety Plan for confined space entry. The County Engineer will not take ownership, nor be responsible for maintenance of underground storage structures.

D. The release rate of the flow from an underground storage facility shall meet the calculated allowable post-development runoff rate detailed in Section 4.1.

E. A site with an underground storage facility shall employ a separate water quality BMP that meets all of the water quality treatment criteria.

4.3.5 Other Stormwater Controls

The stormwater control measures described above in Section 4.3 are the preferred measures by the County for controlling stormwater. However, the County follows the stormwater control measure criteria of the Ohio EPA Construction General Permit and the ODNR Rainwater and Land Development Manual. It is recognized that other measures included in these references may be applicable. The additional stormwater control measures allowed by the County, with approval by the County Engineer on a project-by-project basis, include infiltration trenches, green roof technologies, permeable pavement, sand filters, and vegetated swales. Stormwater control measures shall meet all required quantity and quality criteria of this Manual, the Ohio EPA Construction General Permit, and the ODNR Rainwater and Land Development Manual.

5 EROSION AND SEDIMENT CONTROL

An Erosion and Sediment Control Plan shall be submitted and approved prior to any land disturbing activities on development areas involving earth disturbance of one acre or more or when part of a larger development area. Final construction drawings which are a portion of a larger preliminary plan shall submit an Erosion and Sediment Control Plan regardless of disturbed acreage. Coverage through the latest Ohio EPA Construction General Permit is required prior to any land disturbing activities beginning for construction. Erosion and sediment controls or Best Management Practices (BMPs) must meet the requirements of the latest Ohio EPA Construction General Permit and be implemented in accordance with the standards and specifications in the ODNR Rainwater and Land Development Manual (latest edition with updates).

All temporary and permanent erosion and sediment control practices shall be designed and constructed to minimize maintenance requirements. They must be maintained and repaired as needed to assure continued performance of their intended function throughout the maintenance period. The person or entity responsible for continued maintenance of permanent and temporary erosion controls shall be identified to the satisfaction of the Fairfield County Regional Planning Commission prior to any land disturbing activities.

Erosion and Sediment Control Plans shall be in accordance with Section 6.3.3 of this Manual. The Regional Planning Commission shall accept or reject all Erosion and Sediment Control Plans for projects that are subject to review and approval of the Regional Planning Commission. The County Engineer shall accept or reject all Erosion and Sediment Control Plans for projects that are not subject to review and approval of Fairfield County Regional Planning Commission.

6 STORM DRAINAGE PLAN REQUIREMENTS

All design calculations and/or modeling results related to storm infrastructure design, detailed design drawings, and technical specifications corresponding to the storm infrastructure improvements shall be submitted to the County Engineer for review and approval. All design calculations and/or modeling results related to storm infrastructure design, detailed design drawings, and technical specifications corresponding to the storm infrastructure improvements shall also be submitted to the Regional Planning Commission for projects that are subject to the approval of the Regional Planning Commission. After completion of construction, record drawings shall be prepared and submitted to the County Engineer and/or the Regional Planning Commission for review and approval. Section 6 describes the required submittals and their requirements.

6.1 GENERAL REQUIREMENTS

A. Whenever any changes are contemplated for any natural watercourse within Fairfield County, the plans must also be approved by Fairfield SWCD as well as the US Army Corps of Engineers or Ohio EPA where required.

B. All sediment and erosion control plans and post-construction BMPs must also be approved by Fairfield SWCD with concurrence from the County Engineer and County Sanitary Engineer.

C. A Post-Construction Stormwater Management Plan shall be prepared for all developments covered by these regulations which require improvements to more than one acre of land or when part of a larger development area. The Post-Construction Stormwater Management Plan shall conform to any and all standards defined in the Ohio EPA Construction General Permit. The Notice of Intent, as well as a copy of the Post-Construction Stormwater Management Plan shall be provided to the County Engineer, County Sanitary Engineer and Fairfield SWCD as part of the Erosion and Sediment Control Plan submittal (Section 6.3.3).

6.2 PRELIMINARY STORM DRAINAGE PLAN

A. Fairfield County requires that a preliminary storm drainage plan be filed with the Regional Planning Commission and the County Engineer. This item shall consist of the following:
   1. The preliminary storm drainage plan is to be prepared on a 22-inch by 34-inch sheet(s) on a scale not to exceed 1 inch = 200 feet.
   2. Project name and location.
   3. Owner and design engineer names and contact information.
   4. Topographic tributary area(s) for the site with acreages.
      a. If there is offsite tributary area to the proposed project area, a separate storm drainage plan sheet showing the entire drainage area is required and shall include at least a 50-foot buffer beyond the property line.
   5. Development site layout.
   6. Existing field tiles and drainage ditches.
   7. Approximate arrangement of the drainage system and streets.
   8. Origin and proposed destination of stormwater.
   9. The proposed drainage facilities including proposed basin locations.
   10. Proposed pre-development runoff coefficients and post-development runoff coefficients.
   11. Critical storm calculation and calculated flows for the pre-development 1-year through 100-year events.

12. Required detention volumes for 1-year, critical, and 100-year events.
13. Anticipated permits applicable to the project.
14. Wetlands delineated in accordance with the federal and/or state agency with jurisdictional authority. The U.S. Army Corps of Engineers, Huntington District, is the agency with jurisdictional authority over wetland area delineation and all delineations by the developer must be approved prior to approval of construction plans.
15. The approximate flood plain limits of drainage ways.

B. The design engineer is encouraged to contact FEMA or the local floodplain administrator for assistance in determining the flood plain limits and watershed areas.

6.3 FINAL STORM DRAINAGE PLAN

6.3.1 Stormwater Management Report

A. Three copies of the Stormwater Management Report shall be submitted to the Regional Planning Commission for projects that are subject to review and approval of the Regional Planning Commission or shall be submitted to the County Engineer for projects that are not subject to review and approval of Fairfield County Regional Planning Commission.

B. Calculation Requirements
Calculations shall be provided for all of the stormwater conveyance and stormwater control facilities required by the Manual and shall be stamped and sealed by a Professional Engineer licensed in Ohio. Calculations shall be organized and presented in a manner that demonstrates compliance with the County's stormwater management requirements. Calculations shall include, but are not limited to, impervious area calculations, storm sewer calculations, culvert calculations, open channel/watercourse calculations, flood routing calculations, stormwater detention calculations, BMP calculations, as applicable. The report shall also include a summary of any software used in designing the stormwater conveyance systems and/or stormwater controls. Appendix C includes standard conveyance calculation sheets to be submitted in the appendices of the Stormwater Management Report. The following calculation tables are standard calculation tables to be included in the body of the Stormwater Management Report.

1. Summary table for drainage area conditions for all onsite and offsite basins and for both the pre- and post-development conditions. The sub-basin name designation shall match what is shown on the storm drainage plan.

Sub-Basin Name	Soil Type	Cover Description	CN	Area (acres)	CN*Area
	$CN_{composite} = \frac{\sum (CN*Area)}{\sum Area}$				

2. Summary table for the critical storm determination

Project Area (acres)		
1-Year, 24-Hour Rainfall (inches)		
	Pre-Developed Condition	**Post-Developed Condition**
Curve Number		
Runoff , Q (inches)		
Total Runoff Volume (cubic feet)		
Percent Increase in Runoff		
Critical Storm		

3. Summary table of pre-developed condition peak flows.

Storm Event (24-Hour)	**Pre-Developed Condition (Onsite) Peak Flow Rate (cfs)**	**Pre-Developed Condition (Offsite) Peak Flow Rate (cfs)**	**Pre-Developed Condition (Combined) Peak Flow Rate (cfs)**
1-Year			
2-Year			
5-Year			
10-Year			
25-Year			
50-Year			
100-Year			

4. Summary table of allowable release rates for the basin.

Storm Event (24-Hour)	**Allowable Release Rate (Onsite) Based on Critical Storm (cfs)**	**Pre-Developed Condition (Offsite) Peak Flow Rate (cfs)**	**Total Allowable Release Rate (cfs)**	**Post-Developed Condition Basin Release Rate (cfs)**
1-Year				
2-Year				
5-Year				
10-Year				
25-Year				
50-Year				
100-Year				

5. Summary table of the required basin volumes and peak water surface elevations.

Storm Event (24-Hour)	Water Surface Area (acres)	Peak Water Surface Elevation (feet)	Detention Storage Volume (acre-feet or cubic feet)
1-Year			
2-Year			
5-Year			
10-Year			
25-Year			
50-Year			
100-Year			

C. Maintenance Plan Requirements
The maintenance plan for the water quality BMPs on development sites shall define the specific maintenance requirements for each type of control facility designated for the site. Privately owned facilities may be required to file a maintenance agreement or policy to ensure long term operation. A sample Maintenance Agreement is included in Appendix E. The standard inspection checklist forms for BMPs to be used shall use those in the latest edition of the City of Columbus Inspection and Maintenance Guidance for Stormwater Control Practices.

D. Subsurface Investigation Reports
A copy of subsurface investigation reports and recommendations performed as part of the stormwater design process shall be included in the Stormwater Management Report. Subsurface reports submitted with the Stormwater Management Report must be prepared and signed by a Professional Engineer licensed in Ohio and experienced in geotechnical engineering.

E. Non-County Submittals/Permits
A copy of the applications for the following permits/approvals that shall be included in the Stormwater Drainage Plan may include, but are not limited to:
1. Notice of Intent (NOI) for coverage under the Ohio Environmental Protection Agency Construction General Permit and a copy of the stormwater pollution prevention plan prepared under the NOI permit.
2. Dam permits as issued by the Ohio Department of Natural Resources (ODNR) for pond embankments meeting ODNR dam criteria.
3. Industrial NPDES Stormwater Permit application to Ohio Environmental Protection Agency
4. 401 Water Quality Certification Permits issued by the Ohio Environmental Protection Agency
5. 404 Permits for impacts to regulated streams and wetlands issued by the United States Army Corps of Engineers.

6.3.2 Stormwater Construction Drawings

A. The final construction drawings and specifications for stormwater improvements shall be prepared and signed Professional Engineer licensed Ohio.

B. Three full size sets of construction drawings and specifications shall be submitted to the County Engineer, the Regional Planning Commission, and Fairfield SWCD for review and approval for projects that are subject to review and approval of the Regional Planning Commission or shall be submitted to the County Engineer and Fairfield SWCD for projects that are not subject to review and approval of Fairfield County Regional Planning Commission. The submission shall also include a digital copy of the construction drawings and specifications in PDF format.

C. All plan sheets shall be full size (22-inch by 34-inch).

D. The drawings shall include, but not limited to, a title sheet, general notes, estimate of quantities, plan and profiles, construction details and cross sections, maintenance of traffic (if applicable), and an Erosion and Sediment Control Plan (separate sheets – see Section 6.3.3).

E. Spaces shall be provided on the title sheet for the approval signatures of the Fairfield County Engineer, County Sanitary Engineer, Regional Planning Commission (if applicable), Fairfield SWCD, and other possible appropriate County Officials, with approval dates.

F. When the proper County officials have affixed their signatures to the construction drawings, such drawings become the property of the County; however, the owner/developer and/or the owner's designated representative shall correct the drawings to conform to the "as built" conditions.

G. All elevations shall be on the current Fairfield County datum (per Section 1.15) and a complete description, location, and elevation of the Benchmark used shall be shown on the plans. Identify at least two temporary benchmarks on-site as well as permanent benchmark used.

H. Easements with dimensions and appropriate bearings shall be on the final construction drawings, as appropriate and applicable. Adjacent offsite easements shall also be included on the drawings.

I. The proposed work shall be shown in both plan and profile on the same sheet and in sufficient detail to clearly show all work to be done.

J. In general, the horizontal scale shall be between 1 inch equals 50 feet and 1 inch equals 20 feet, and the vertical scale shall be 1 inch equals 5 feet or 1 inch equals 10 feet, except when larger scales are necessary to show details or special work.

K. The plan view shall show existing and proposed right-of-ways, property lines and easements, utilities, as well as the existing or other proposed improvements to or features of, the land in the area of the improvement.

L. The plan view shall be oriented so that the north arrow is toward the top or left margin of the plan sheet.

M. Storm sewer and/or culvert profiles are required for all publicly maintained storm sewers and culverts, identifying all utility crossings and other pertinent engineering and construction information. The storm sewer and/or culvert profiles, at minimum, shall state the size, slope, pipe material, and class of proposed pipe.

N. All open watercourses that are to be constructed or modified with the project shall be profiled and include the following:
   1. Profile of the top of bank on both sides where difference in elevation exists
   2. Profile of flow line (invert) of streambed.

3. Profile of the computed water elevation.
4. Where land included is subject to flood, cross-sections, topography, and spot elevations are required.

O. The plans shall include details and/or cross sections of inlets, open watercourses, culverts, BMPs, and wet/dry basins, as applicable. Appropriate dimensions and flow calculations shall also be furnished.

6.3.3 Erosion and Sediment Control Plan

A. Erosion and Sediment Control Plans shall meet the minimum requirements of the Ohio EPA, the Fairfield SWCD, and this Manual.

B. An Erosion and Sediment Control Plan developed to meet the requirements of the Ohio EPA, the Fairfield SWCD, and this Manual shall contain information listed below explaining how the standards and criteria will be met. Said plan shall be submitted as separate sheet(s) within all improvement plans and the SWP3. Any person seeking approval of a land disturbance proposal, on a map rendered from a base derived from the site final stormwater construction drawings or site grading plan, at a scale not to exceed 1" = 100', shall provide the following information.

1. A description of the nature and the type of construction activity.
2. The boundary lines and approximate acreage.
3. Total area of the site and the area of the site that is expected to be disturbed (i.e., grubbing, clearing, excavation, filling or grading, including off-site borrow areas).
4. A description of prior land uses at the site.
5. The name and/or location of the immediate receiving stream or surface water(s), the first subsequent named receiving water(s) and the extent and description of wetlands or other special aquatic sites at or near the site which will allow disturbed, or which will receive discharges from disturbed areas of the project.
6. Location of the land disturbance area and its general surroundings including but not limited to:
    a. Vicinity map indicating north arrow, scale, and other information necessary to easily locate the site.
    b. Off-site areas susceptible to sediment deposits or to erosion caused by accelerated runoff from the land disturbance area, such as ponds and streams.
    c. Off-site areas affecting potential accelerated runoff and erosion control.
7. Existing topography of the land disturbance area and adjacent to it within 200 feet of the boundaries including the location of existing buildings, structures, utilities, water bodies, sewers, drainage facilities, vegetative cover, paved areas (streets, roads, sidewalks, etc.), and other significant natural or man-made features.
8. A topographic map shall contain an appropriate contour interval to clearly portray the conformation and drainage pattern of the area including at least a 50-foot buffer beyond the property line. The maximum contour interval shall be based on field verified 1 foot contour interval mapping completed by a Professional Surveyor licensed in Ohio, unless a design exception is approved by the County Engineer. A delineation of drainage watersheds expected before and after major grading activities as well as the size of each drainage watershed in acres.
9. A current soil map (latest edition of the Fairfield County Soil Survey – USDA NRCS), if central sewers are proposed or a supplemental soil map, if on-site wastewater treatment

systems are proposed, as well as a description of the soil limitations for the proposed use. Soil types and depth to bedrock shall be depicted for all areas of the site including locations of unstable or highly erodible soils.

10. Proposed use of the land disturbance area including present development and ultimate utilization with detail on final soil cover, both vegetative and impervious.
11. All proposed earth disturbance including:
    a. Areas of excavation, grading, filling, installation of utilities, removal or destruction of topsoil, and spreading of earth material and including a time schedule of such operation.
    b. The proposed final elevations and slopes.
    c. Kinds of utilities and proposed area of installation.
    d. Proposed paved and covered areas in square feet.
    e. Proposed kind of cover on areas not covered by buildings, structures, or pavement. Description shall be in such terms as: lawn, turfgrass, shrubbery, trees, forest cover, riprap, mulch, permanent water, restored wetlands, etc.
12. Proposed use including present development and future utilization with detail on soil cover both vegetative and impervious.
13. Provisions for erosion control during construction (temporary) and during the life of the development (permanent). Such provisions shall include a time schedule and sequence of operations with an estimated time exposure and include the number, types, dimensions, and locations of all runoff, erosion, or sediment control devices to be utilized either temporarily or permanently on the area of land disturbance. Also, the location of areas likely to require temporary stabilization during development.
14. Provisions for management of stormwater: Provisions should be made for both on-site and off-site tributary areas, including control of accelerated on-site runoff to a stable receiving outlet, the site conditions around points of all surface water discharge from the site, and velocities of the 10-year flow at outfalls.
15. Design computations for structural measures for erosion and sediment pollution control.
16. Description of measures that will be undertaken to prevent pollution of existing streams during construction activities and after construction is complete. If unpreventable, the following must be provided:
    a. Description of mitigation measures to repair damage to the stream channels if the stream channel must be disturbed.
    b. Justification for earth disturbance within the stream channel.
17. Existing and proposed locations of buildings, roads, parking facilities, and utilities.
18. Sediment and stormwater management basins noting their sediment settling volume and contributing area.
19. Areas designated for storage or disposal of solid, sanitary and toxic wastes, including dumpster areas, areas designated for cement truck washout, and vehicle fueling.
20. The location of designated construction entrances where the vehicles will access the construction site.
21. The location of any in-stream activities including stream crossings.
22. Proposed construction sequence describing the relationship between the implementation and maintenance of controls, including permanent and temporary stabilization, and the various stages or phases of earth disturbance and construction. The sequence of construction shall, as a minimum, include a schedule and time frame for the following activities:

a. Clearing and grubbing for those areas necessary for installation of perimeter controls.
b. Construction of perimeter controls;
c. Remaining clearing and grubbing;
d. Basin Install;
e. Road grading;
f. Grading for the remainder of the site;
g. Utility installation and whether storm drains will be used, protected, or abandoned after construction;
h. Final grading, landscaping, or stabilization; and
i. Removal of temporary controls.

23. Seeding mixtures and rates, lime and fertilizer application rates, and kind and quantity of mulching for both temporary and permanent vegetative control measures. Details on proposed methods and schedules of providing temporary and permanent stabilization, pertaining to seeding and/or mulching shall be included.
24. Provisions for maintenance of control facilities including easements to ensure short term erosion and sediment pollution control.
25. Map reference data including title, bar scale, north point, legend and date on all plan maps.
26. Statement identifying the name, address, and telephone number of the person(s) preparing the plan, the owner of the property where the grading is proposed, and the developer and/or person responsible for the development area.
27. A statement indicating that the owner or owner's designated representative will notify the Fairfield SWCD 72 hours (3 working days), excluding weekends and holiday before commencing any earth disturbing activity. At the time this notice is given, the owner or owner's designated representative shall identify the site manager.
28. A certification that all earth disturbance, construction, and development will be done pursuant to the plan.
29. A place to show the name, phone number, fax number, and address for person(s) responsible for the installation, maintenance, and removal of all temporary and permanent erosion and sediment pollution control devices.
30. The plan shall contain all documentation and permits levied by other natural resource agencies, including but not limited to:
    a. Certified wetland delineations;
    b. Permits for the US Army Corps of Engineers jurisdictional streams, wetlands, and waterways;
    c. Ohio Environmental Protection Agency (EPA) National Pollution Discharge Elimination System (NPDES) permit; and/or
    d. Floodplain permit.
31. For subdivided developments where the sediment and erosion control plan does not call for centralized sediment control capable of controlling multiple individual lots, a detailed drawing of a typical individual lot showing standard lot erosion and sediment control practices. This does not remove the responsibility to designate specific erosion and sediment control practices in the sediment and erosion control plan for critical areas such as steep slopes, stream banks, and drainage swales.

C. Contractor Responsibilities - At a minimum, procedures in an Erosion and Sediment Control Plan shall provide that all controls on the site are inspected at least once every seven calendar days and within 24 hours after any storm event greater than ½ inch of rain per 24-hour period. The contractor shall keep records of compliance to assure that the control practices are functional and to evaluate whether the erosion and sediment control is adequate and properly implemented in accordance with the schedule proposed. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of or the potential of pollutants entering the drainage system. Erosion and sediment control measures identified in the sediment and erosion control plan shall be observed to ensure that they are operating correctly. Discharge locations shall be inspected to ascertain whether erosion and sediment control measures are effective in preventing significant impacts to the receiving waters. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site vehicle tracking.

D. If periodic inspections or other information indicates a control has been used inappropriately or incorrectly, the contractor must replace or modify the control for site conditions.

1. When practices require repair or maintenance: If the inspection reveals that a control practice needs repair or maintenance, with the exception of a sediment basin, it must be repaired or maintained within 48 hours of the inspection. Sediment settling basins must be repaired or maintained within seven days of the inspection.
2. When practices fail to provide their intended function: If the inspection reveals that a control practice fails to perform its intended function and that another, more appropriate control practice is required, the sediment and erosion control plan must be amended, and the new control practice must be installed within seven days of the inspection.
3. When practices depicted on the sediment and erosion control plan are not installed: If the inspection reveals that a control practice has not been implemented in accordance with the schedule contained on the plan, the control practices must be implemented prior to the next storm event, which produces runoff from the site, but in no case later than seven days from the date of inspection. If the inspection reveals that the planned control practice is not needed, the record must contain a statement of explanation as to why the control practice is not needed.

E. The developer shall inform all contractors and subcontractors who will be involved in the implementation of the Erosion and Sediment Control Plan. The developer shall maintain a written document containing the signatures of all contractors and subcontractors involved in the implementation of the Erosion and Sediment Control Plan as proof acknowledging that they reviewed and understand the conditions and responsibilities of the Erosion and Sediment Control Plan. The written document shall be created and signatures shall be obtained prior to work on the construction site.

6.3.4 Easements

A. When it is required to convey subsurface drainage or surface water outside the limits of the proposed improved area in order to discharge into an approved adequate outlet, it shall be the responsibility of the owner to obtain easements or rights-of-way for construction and maintenance of said drainage course. These easements shall be submitted to the County Engineer and recorded prior to approval of the final stormwater construction drawings.

B. All drainage easements shall be shown on the final plat, the final approved/signed stormwater construction drawings, and the record drawings. The drainage easements shall be recorded for public use, and the maintenance of such drainage courses shall be the responsibility of the property owners receiving direct benefit therefrom. For any easement shown on the final stormwater construction drawings that contains a storm sewer, flood routing path, basin, and/or other stormwater structure(s), the stormwater structure rights are senior to the rights of any other public or private utility or interest utilizing the easement. Should access be granted for a utility, the disturbed area must be restored to its original condition. Any cost associated with the damage, repair, replacement, or relocation of any buried or above ground facility or structure that is necessary to allow the maintenance, repair, or replacement of the storm sewer, shall be the responsibility of the owner of said utility, facility, or structure. When maintenance, repair or replacement of a storm sewer causes the removal of any trees, plantings, landscaping, fence, driveway, or any other feature located within the easement, the replacement and cost of said items shall be responsibility of the owner of the underlying property or homeowner's association if applicable. Drainage easement widths and requirements shall conform to Section 1.13 Drainage Easements.

6.3.5 Record Drawings

A. Upon completion of construction, three sets of full size (22-inch by 34-inch) record drawings and digital copies of record drawings in AutoCAD and PDF formats shall be furnished to the County Engineer, the Regional Planning Commission, and Fairfield SWCD as applicable.

B. It is the responsibility of the owner and/or or owner's designated representative to furnish accurate record drawings that reflect the as-built conditions.

C. The record drawings must be clearly noted as record drawings with their submission date.

D. The record drawings submittal shall also include a geodatabase or shapefiles (ESRI ArcGIS) of all constructed stormwater infrastructure with survey grade accuracy (post-construction). The data shall be submitted on the same coordinate system and vertical datum used on the approved construction drawings and outlined in Section 1.15 Survey Standards. It is the responsibility of the owner and/or or owner's designated representative to furnish accurate GIS data with accurate post-construction survey data.

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Appendices

Appendix A **Miscellaneous Stormwater Details**

Concrete Washout
Ditch Underdrain
Inspection Well
Construction Entrance
Wet Basin Water Volume/Quality Control Structure
Dry Basin Water Volume/Quality Control Structure
Frye Flow Sediment Control Catch Basin
Frye Flow Sediment Control Curb & Gutter
Drop Inlet Sediment Barrier – Silt Fence
Sediment & Erosion Control – Silt Fence
Float Skimmer
Sediment & Erosion Control – Rock Check Dam
Sediment & Erosion Control – Straw Wattle

Appendix B **Design Exception Request Form**

Appendix C **Standard Calculation Sheets**

Appendix D **General Notes for Erosion and Sediment Control Plan**

Appendix E **Post-Construction BMP Inspection and Maintenance Agreement Form**

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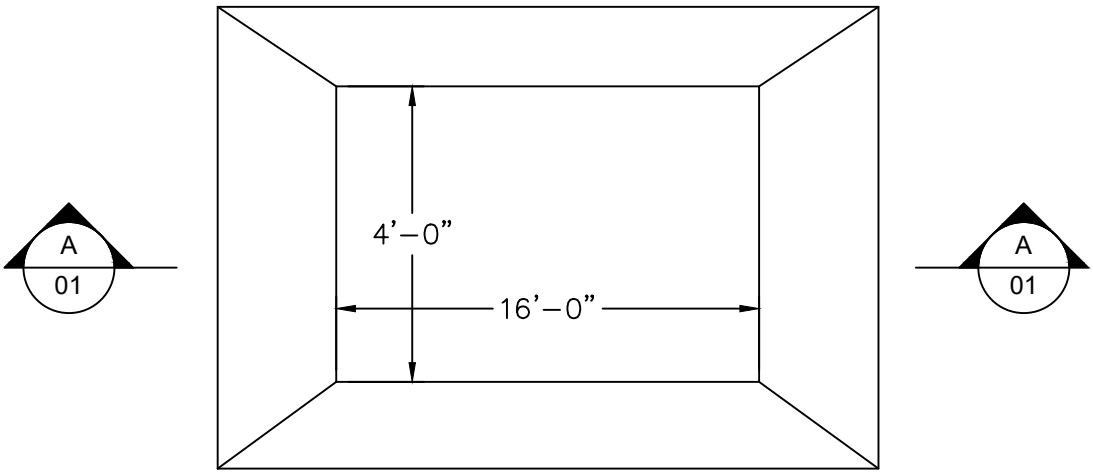
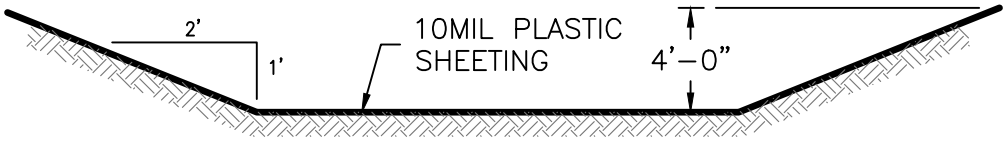
APPENDIX A

MISCELLANEOUS STORMWATER DETAILS



- PLAN VIEW
N.T.S.



A SECTION VIEW
N.T.S.

NOTES:

1. CONCRETE WASHOUT AREA(S) SHALL BE INSTALLED PRIOR TO CONCRETE PLACEMENT ON SITE. THE CONCRETE WASHOUT AREA SHALL BE ENTIRELY SELF–CONTAINED.

2. THE CONTRACTOR SHALL SUBMIT THE DESIGN, LOCATION AND SIZING OF THE CONCRETE WASHOUT AREA(S) WITH THE PROJECT'S EROSION AND SEDIMENTATION CONTROL PLAN.

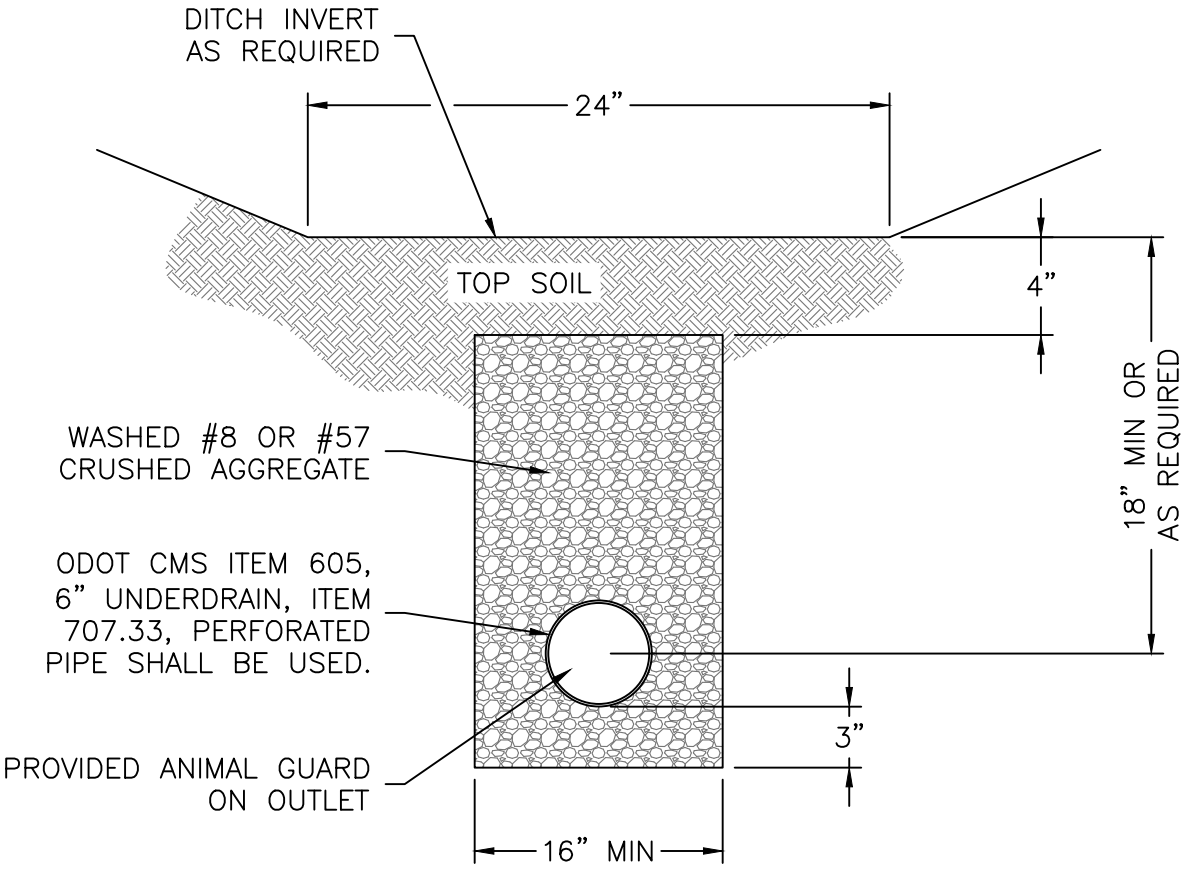
   LOCATION: WASHOUT AREA(S) ARE TO BE LOCATED AT LEAST 50 FEET FROM ANY STREAM, WETLAND, STORM DRAINS, OR OTHER SENSITIVE RESOURCE.

   SIZE: THE WASHOUT MUST HAVE SUFFICIENT VOLUME TO CONTAIN ALL LIQUID AND CONCRETE WASTE GENERATED BY WASHOUT OPERATIONS INCLUDING, BUT NOT LIMITED TO, OPERATIONS ASSOCIATED WITH GROUT AND MORTAR.

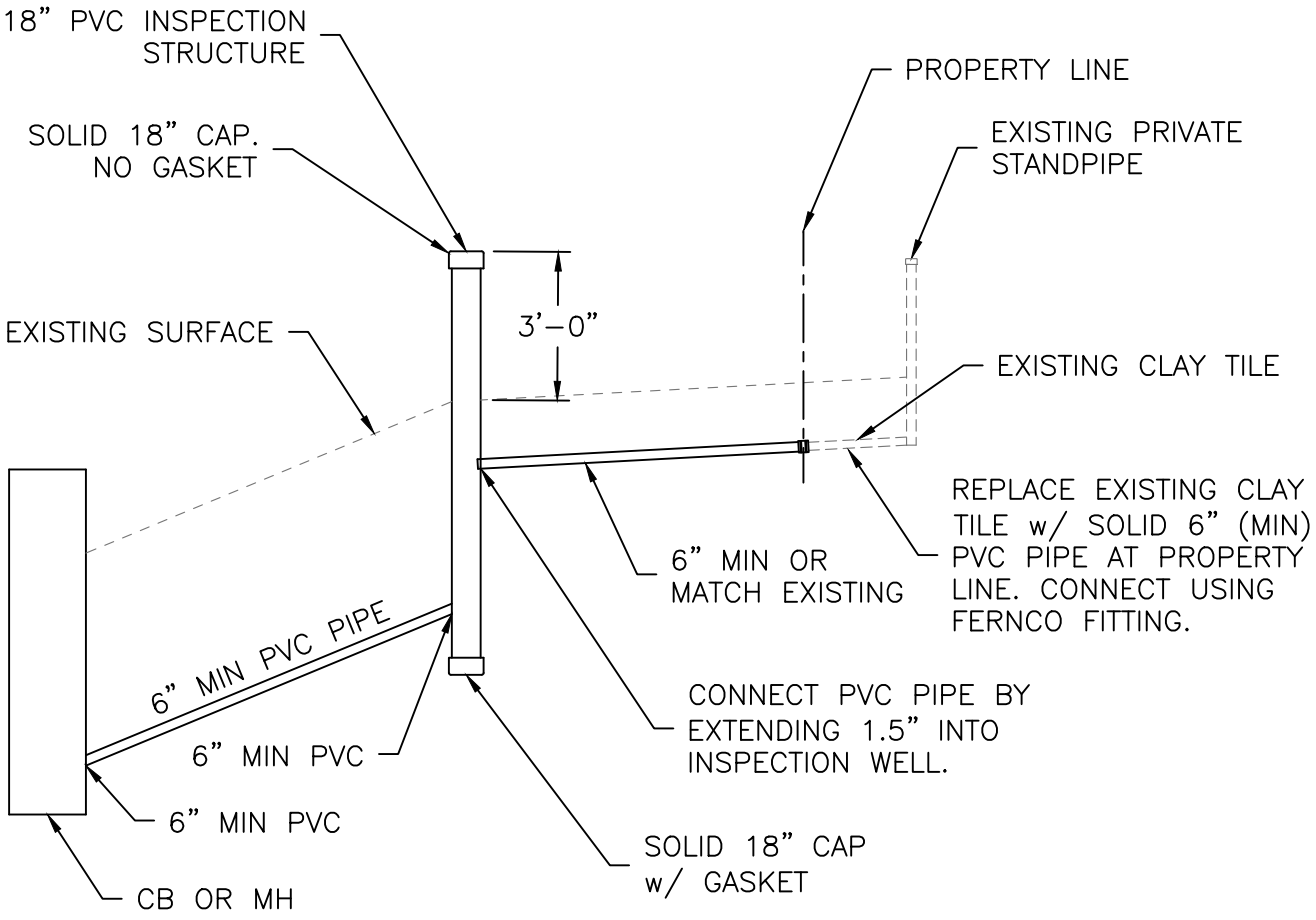
3. WASHOUT AREA(S) ARE TO BE INSPECTED AT LEAST ONCE A WEEK FOR STRUCTURAL INTEGRITY, ADEQUATE HOLDING CAPACITY AND CHECKED FOR LEAKS, TEARS, OR OVERFLOWS. WASHOUT AREA(S) SHOULD BE CHECKED AFTER HEAVY RAINS.

4. HARDENED CONCRETE WASTE SHOULD BE REMOVED AND DISPOSED OF WHEN THE WASTE HAS ACCUMULATED TO HALF OF THE CONCRETE WASHOUT'S HEIGHT. ALL CONCRETE WASTE SHALL BE DISPOSED OF IN A MANNER CONSISTENT WITH ALL APPLICABLE LAWS, REGULATIONS, AND GUIDELINES.

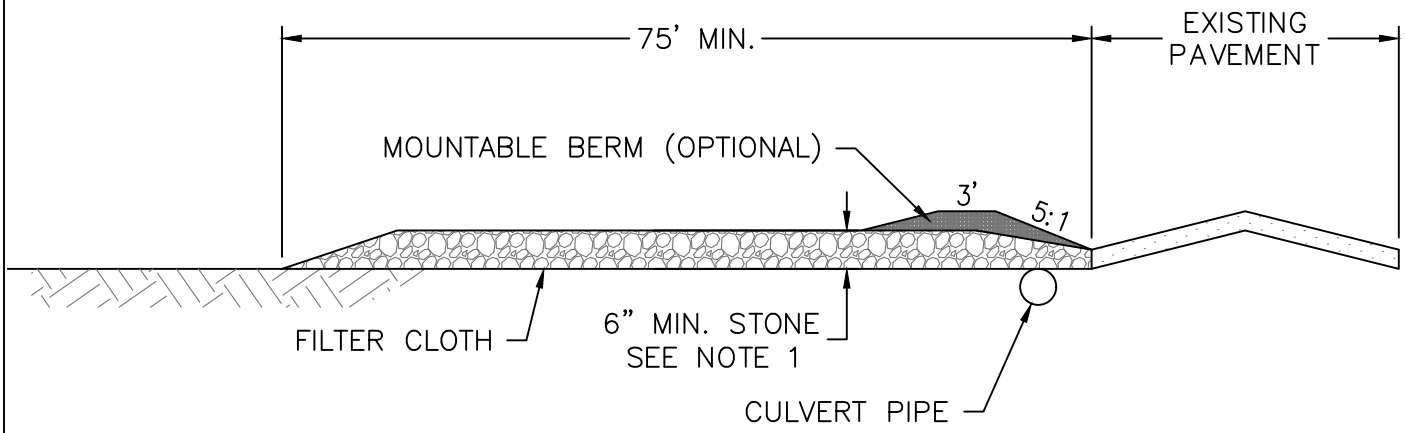
APPROVED	CONCRETE WASHOUT	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–01 / SHT NO. 1/1



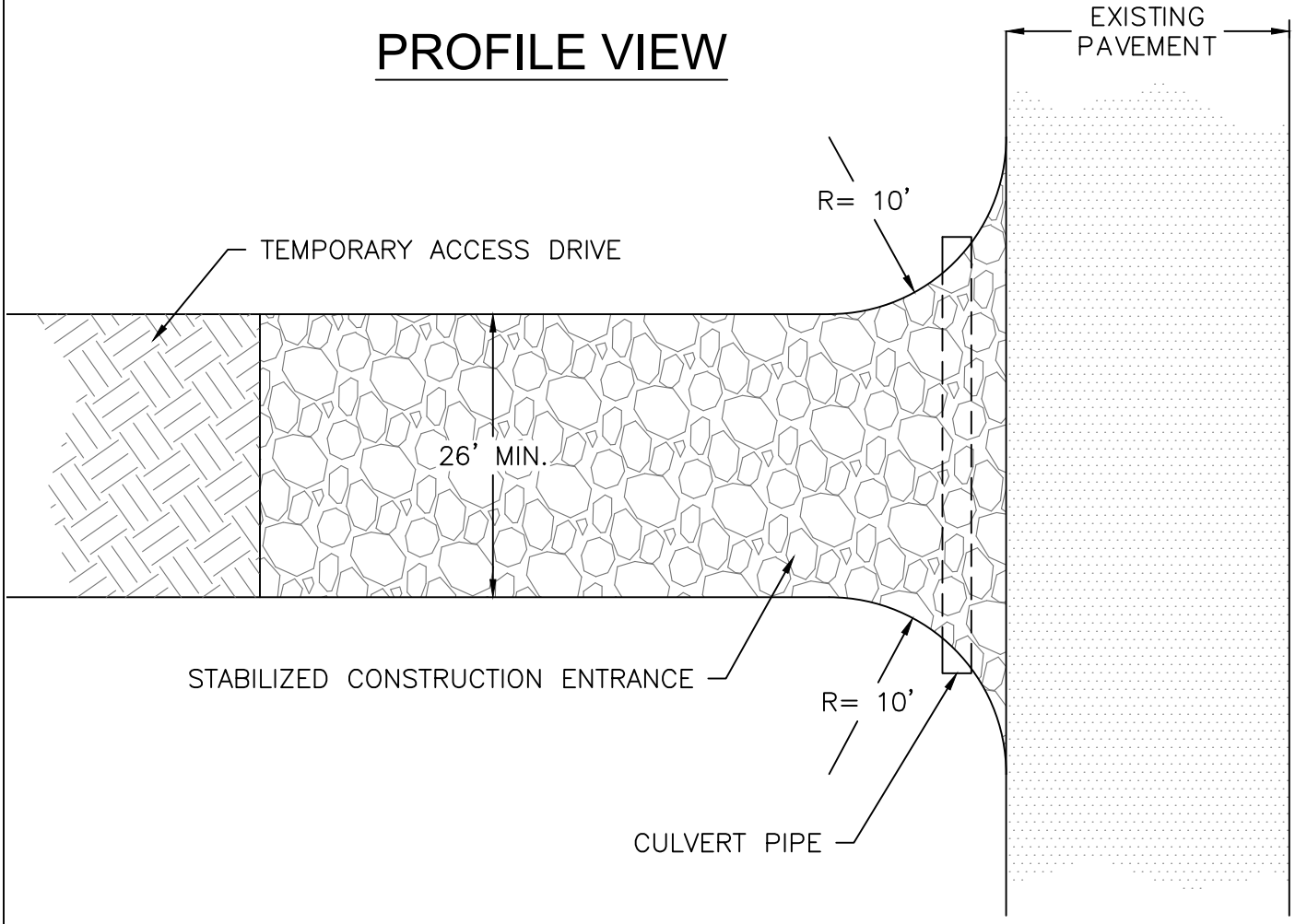
APPROVED	DITCH UNDERDRAIN	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–02 / SHT NO. 1/1



APPROVED	INSPECTION WELL	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.-03 / SHT NO. 1/1



PROFILE VIEW



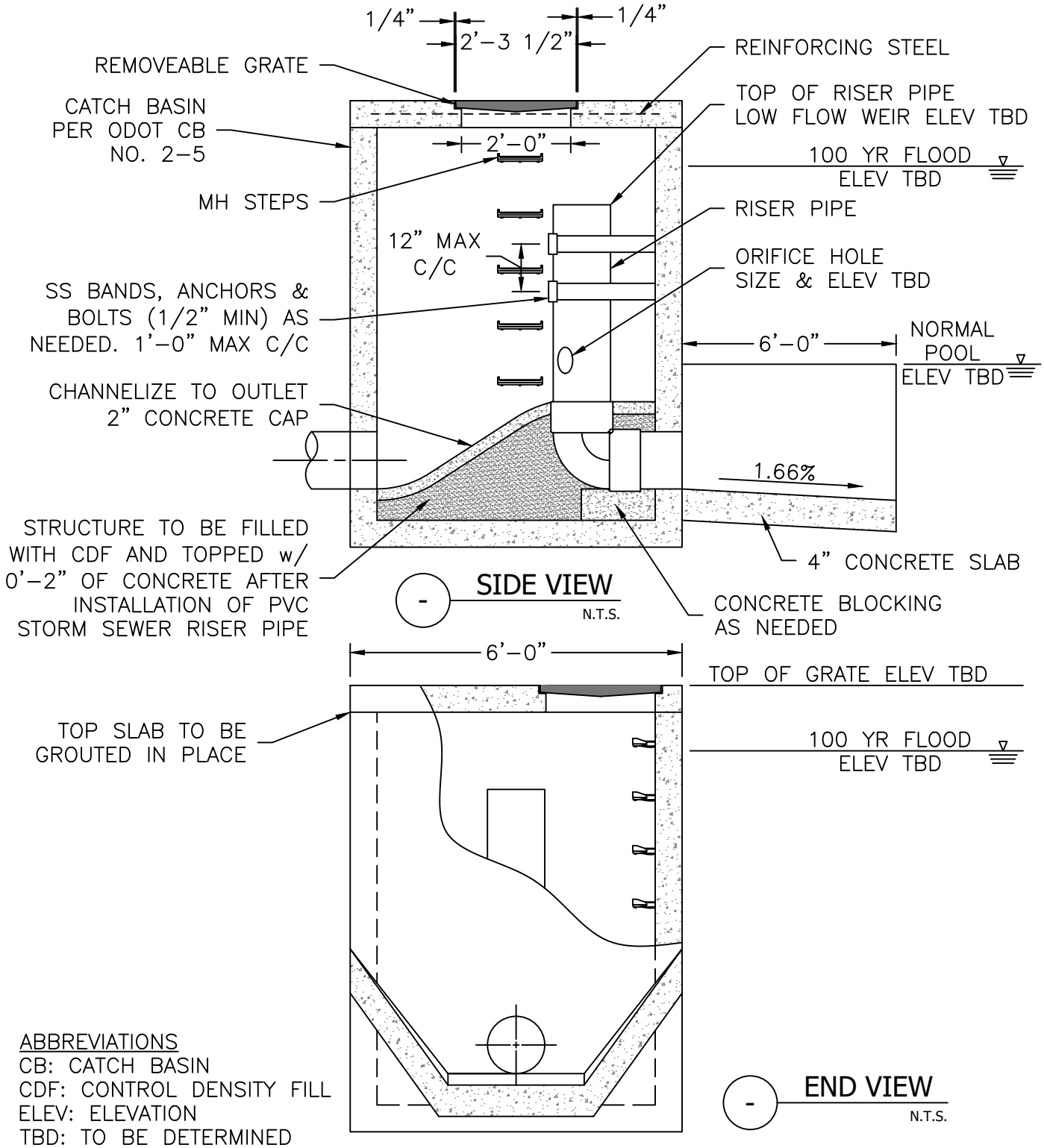
PLAN VIEW

APPROVED	CONSTRUCTION ENTRANCE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–04 / SHT NO. 1/2

CONSTRUCTION SPECIFICATIONS

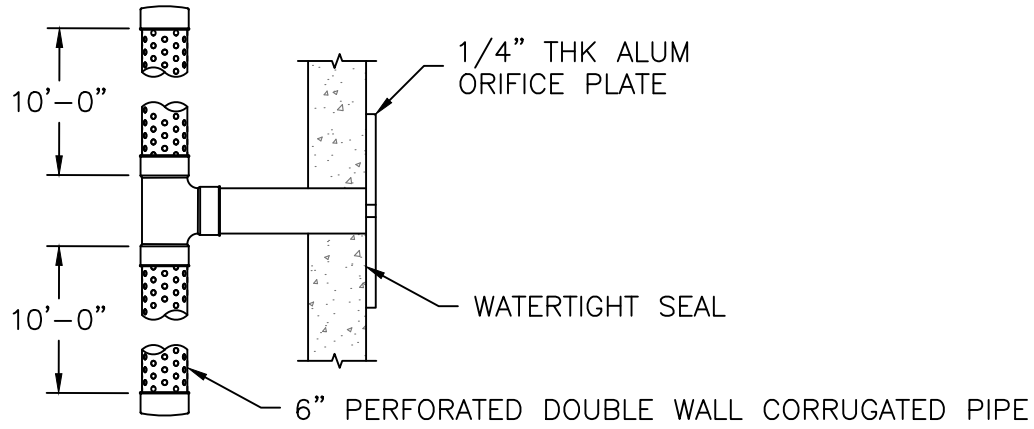
1. STONE SIZE – USE 2" STONE, OR RECYCLED OR RECLAIMED CONCRETE (NO METAL) OF EQUIVALENT SIZE.
2. LENGTH – 75' MIN.
3. THICKNESS – NOT LESS THAN SIX (6) INCHES.
4. WIDTH – TWENTY SIX (26) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. FILTER CLOTH – PLACE OVER THE ENTIRE AREA OF DRIVE PRIOR TO PLACING STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ON THE PUBLIC RIGHT-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND, AND CLEAN OUT AND/OR REPAIR OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHT-OF-WAYS MUST BE REMOVED IMMEDIATELY.
8. WASHING – WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHT-OF-WAYS. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
10. PRIOR TO RESTORATION, REMOVE AND DISPOSE OF ALL CONSTRUCTION ENTRANCE MATERIALS AND RESTORE THE AREA TO THE PRE-EXISTING GRADE AND DRAINAGE CONDITION.

APPROVED	CONSTRUCTION ENTRANCE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.-04 / SHT NO. 2/2



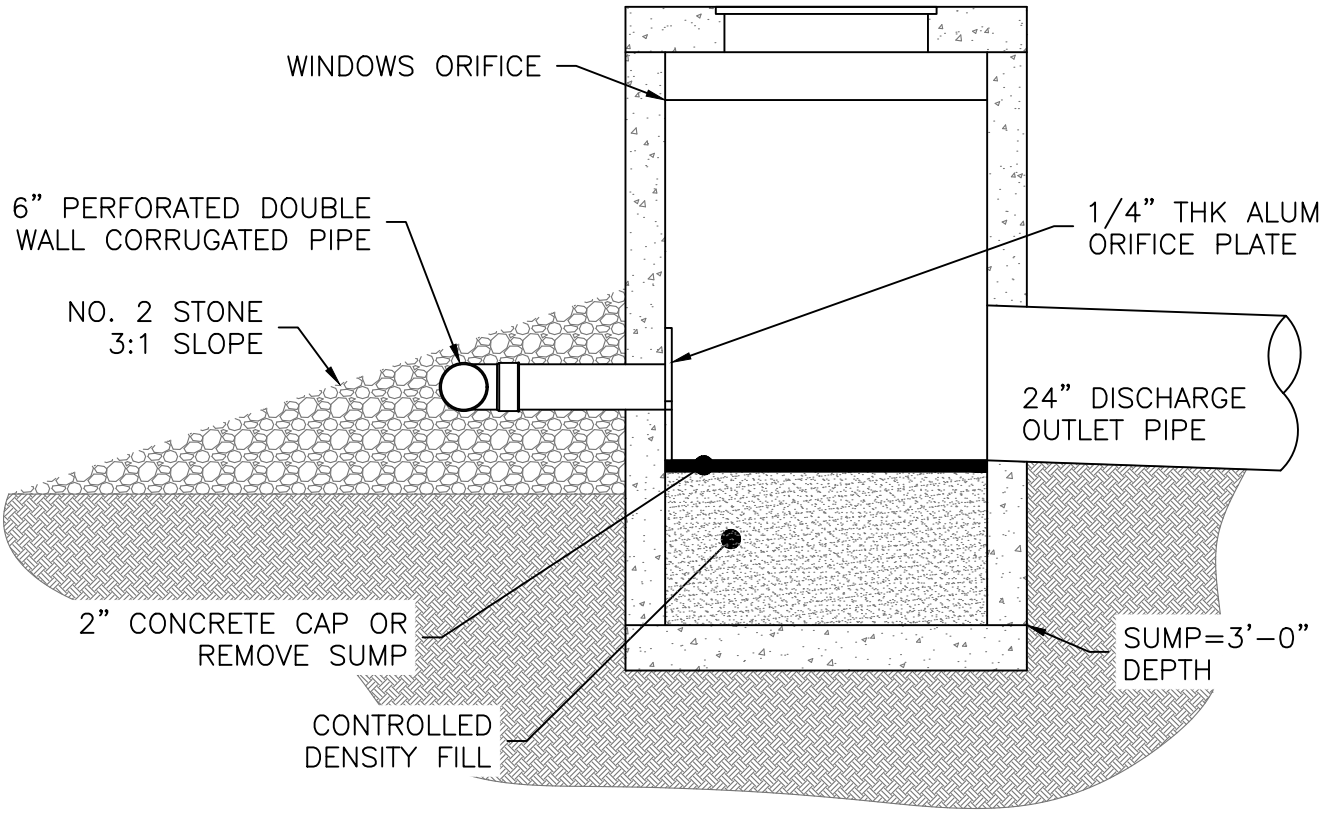
ABBREVIATIONS
CB: CATCH BASIN
CDF: CONTROL DENSITY FILL
ELEV: ELEVATION
TBD: TO BE DETERMINED
YR: YEAR

APPROVED	WET BASIN WATER VOLUME/QUALITY CONTROL STRUCTURE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.-05 / SHT NO. 1/1



- ENLARGED DETAIL - PROTECTED OUTLET

N.T.S.



- PROTECTED OUTLET

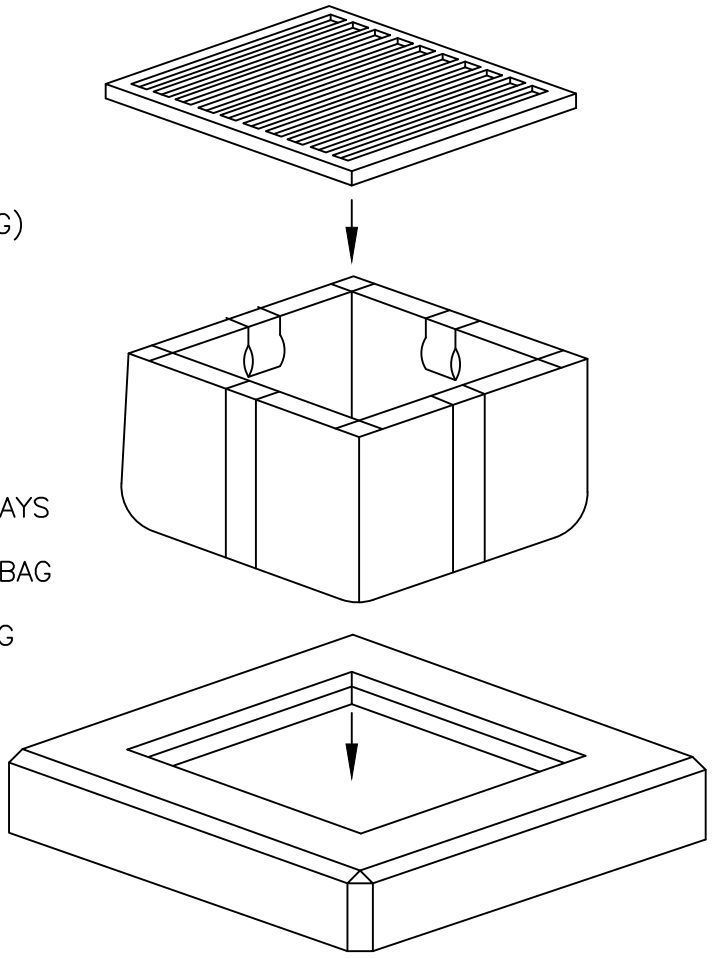
N.T.S.

NOTE
A FIXED VERTICAL SEDIMENT DEPTH MARKER SHALL BE INSTALLED IN THE FOREBAY, DETENTION BASIN, AND MICRO POOL TO MEASURE SEDIMENT DEPOSITION OVER TIME.

APPROVED	DRY BASIN WATER VOLUME/QUALITY CONTROL STRUCTURE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.-06 / SHT NO. 1/1

INSTALLATION
1. REMOVE GRATE
2. INSTALL BAG
   (BAG RESTS ON LIP OF CASTING)
3. REINSTALL GRATE

MAINTENANCE
1. REMOVE GRATE
2. BAG CAN BE CLEANED SEVERAL WAYS
   A. PICK UP BAG AND DUMP IT
   B. SHOVELING DEBRIS OUT OF BAG
   C. VAC–UNIT
3. SHAKE LOOSE DEBRIS OUT OF BAG OR RINSE WITH WATER
4. REINSTALL BAG
5. REINSTALL GRATE



AVAILABLE FROM:
FRYE FLOW SYSTEMS
P.O. BOX 622
GRANVILLE, OHIO 43023
PH.: 740–788–9150
FAX: 740–788–9185

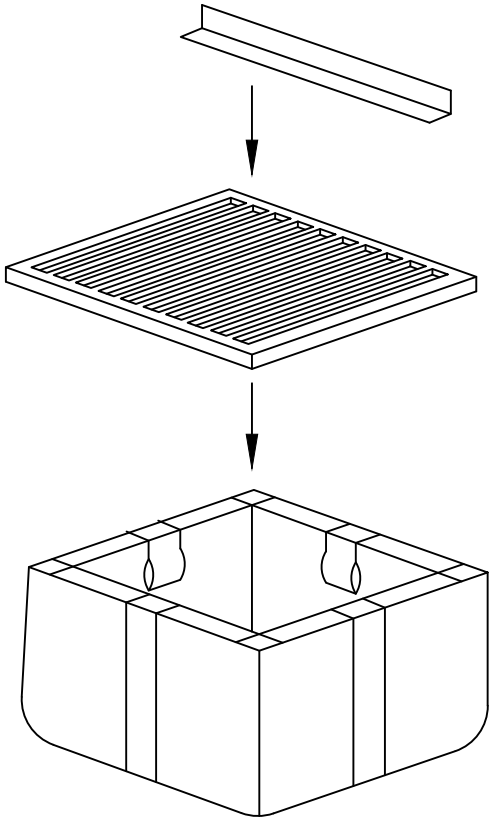
- FRYE FLOW SYSTEMS CATCH BASIN SEDIMENT CONTROL

N.T.S.

APPROVED	FRYE FLOW SEDIMENT CONTROL CATCH BASIN	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–07 / SHT NO. 1/1

INSTALLATION

1. REMOVE GRATE
2. INSTALL BAG
   (BAG RESTS ON LIP OF CASTING)
3. REINSTALL GRATE
4. INSTALL BONNET GUARD WITH TABS BETWEEN GRATE & BONNET CASTING

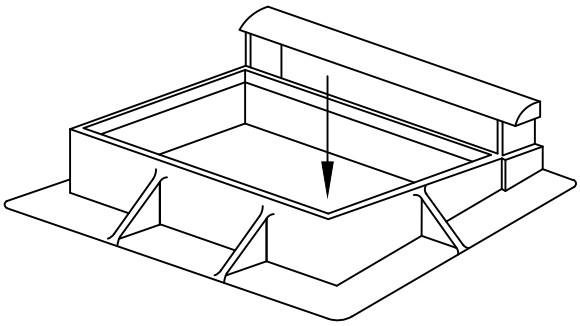


MAINTENANCE

1. REMOVE THE BONNET GUARD
2. REMOVE GRATE
3. BAG CAN BE CLEANED SEVERAL WAYS
   A. PICK UP BAG AND DUMP IT
   B. SHOVELING DEBRIS OUT OF BAG
   C. VAC–UNIT
4. SHAKE LOOSE DEBRIS OUT OF BAG OR RINSE WITH WATER
5. REINSTALL BAG
6. REINSTALL GRATE
7. REINSTALL BONNET GUARD

AVAILABLE FROM:

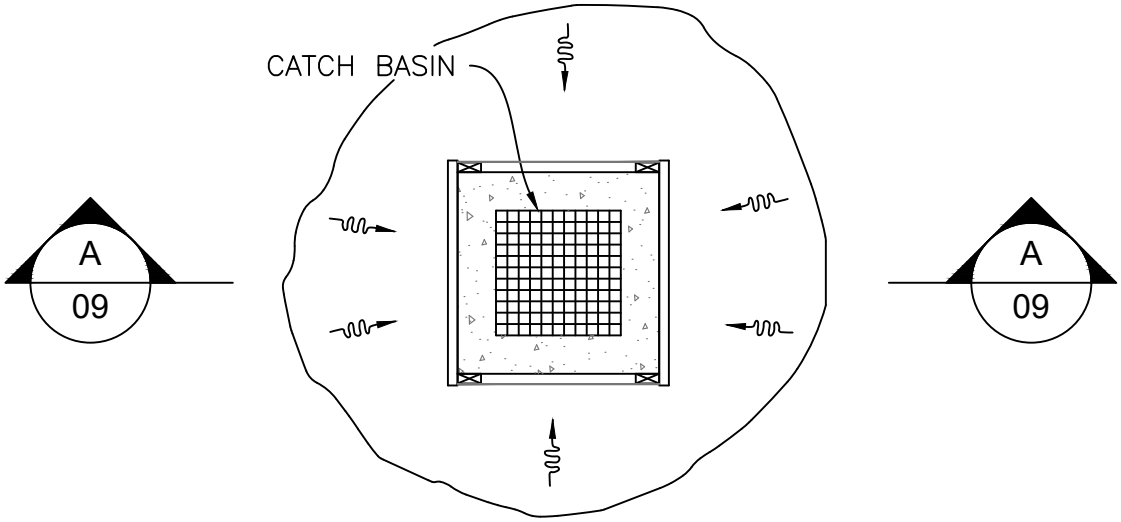
FRYE FLOW SYSTEMS
P.O. BOX 622
GRANVILLE, OHIO 43023
PH.: 740–788–9150
FAX: 740–788–9185



- FRYE FLOW SYSTEMS CURB & GUTTER INLET SEDIMENT CONTROL

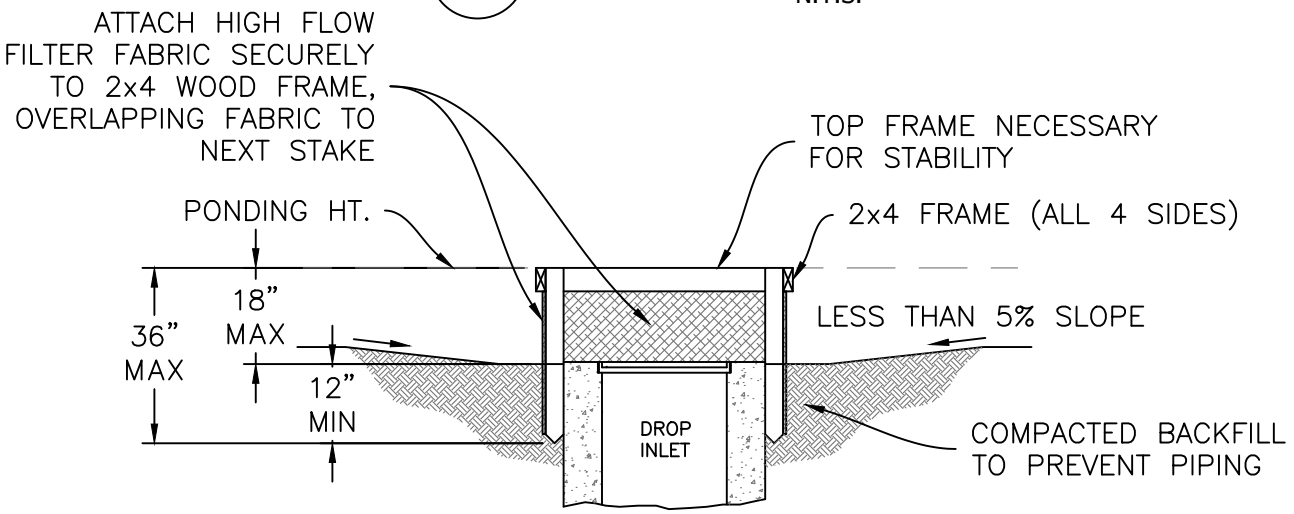
N.T.S.

APPROVED	FRYE FLOW SEDIMENT CONTROL CURB & GUTTER	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–08 / SHT NO. 1/1



- PLAN VIEW

N.T.S.



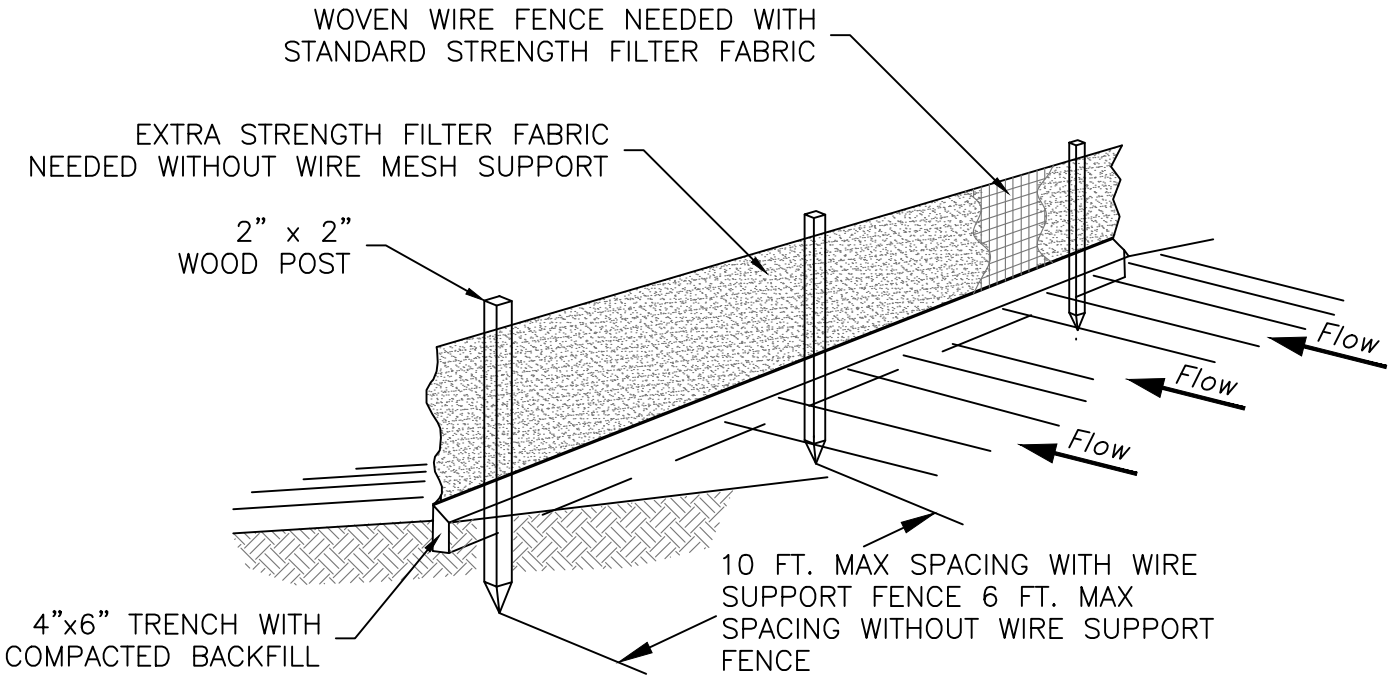
A SECTION VIEW

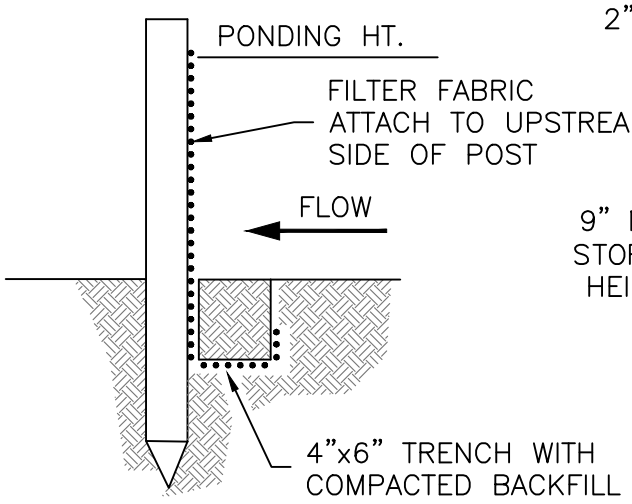
N.T.S.

NOTES

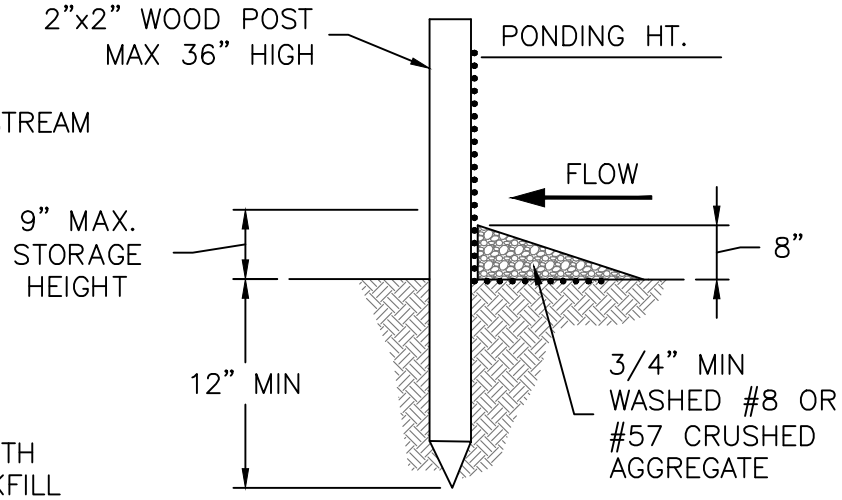
1. DROP INLET SEDIMENT BARRIERS ARE TO BE USED FOR SMALL, NEARLY LEVEL DRAINAGE AREAS (LESS THAN 5%)
2. USE 2"x4" WOOD OR EQUIVALENT METAL STAKES (3' MINIMUM LENGTH).
3. INSTALL 2"x4" WOOD TOP FRAME TO INSURE STABILITY.
4. THE TOP OF THE FRAME (PONDING HEIGHT) MUST BE WELL BELOW THE GROUND ELEVATION DOWNSLOPE TO PREVENT RUNOFF FROM BYPASSING THE INLET. A TEMPORARY DIKE ON THE DOWNSLOPE OF THE STRUCTURE MAY BE NECESSARY.

APPROVED	DROP INLET SEDIMENT BARRIER SILT FENCE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–09 / SHT NO. 1/1





TRENCH DETAIL



INSTALLATION WITHOUT TRENCHING

NOTES:
1. SILT FENCE SHALL BE PLACED ON SLOPE CONTOURS TO MAXIMIZE PONDING EFFICIENCY.
2. INSPECT AND REPAIR FENCE AFTER EACH STORM EVENT AND REMOVE SEDIMENT WHEN NECESSARY. (9" MAX. RECOMMENDED STORAGE HEIGHT).
3. REMOVED SEDIMENT SHALL BE DEPOSITED TO AN AREA THAT WILL NOT CONTRIBUTE SEDIMENT OFF-SITE AND CAN BE PERMANENTLY STABILIZED.

APPROVED	SEDIMENT & EROSION CONTROL SILT FENCE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.-10 / SHT NO. 1/2

NOTES

SILT FENCE: THIS SEDIMENT BARRIER UTILIZES STANDARD STRENGTH OR EXTRA STRENGTH SYNTHETIC FILTER FABRICS. IT IS DESIGNED FOR SITUATIONS IN WHICH ONLY SHEET OR OVERLAND FLOWS ARE EXPECTED.

1. THE HEIGHT OF A SILT FENCE SHALL NOT EXCEED 36–INCHES (HIGHER FENCES MAY IMPOUND VOLUMES OF WATER SUFFICIENT TO CAUSE FAILURE OF THE STRUCTURE).
2. THE FILTER FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OR JOINTS. WHEN JOINTS ARE NECESSARY, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT A SUPPORT POST, WITH A MINIMUM OF 6 INCH OVERLAP, AND SECURELY SEALED.
3. POSTS SHALL BE SPACED A MAXIMUM OF 10 FEET APART AT THE BARRIER LOCATION AND DRIVEN SECURELY INTO THE GROUND (MINIMUM OF 12–INCHES). WHEN EXTRA STRENGTH FABRIC IS USED WITHOUT THE WIRE SUPPORT FENCE, POST SPACING SHALL NOT EXCEED 6 FEET.
4. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 4–INCHES WIDE AND 6–INCHES DEEP ALONG THE LINE OF POSTS AND UPSLOPE FROM THE BARRIER.
5. WHEN STANDARD STRENGTH FILTER FABRIC IS USED, A WIRE MESH SUPPORT FENCE SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 1–INCH LONG, TIE WIRES OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2–INCHES AND SHALL NOT EXTEND MORE THAN 36–INCHES ABOVE THE ORIGINAL GROUND SURFACE.
6. THE STANDARD STRENGTH FILTER FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 8–INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT EXTEND MORE THAN 36–INCHES ABOVE THE ORIGINAL GROUND SURFACE. FILTER FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
7. WHEN EXTRA STRENGTH FILTER FABRIC AND CLOSER POST SPACING ARE USED, THE WIRE MESH SUPPORT FENCE MAY BE ELIMINATED. IN SUCH A CASE, THE FILTER FABRIC IS STAPLED OR WIRED DIRECTLY TO THE POSTS WITH ALL OTHER PROVISIONS OF ITEM NO. 6 APPLYING.
8. THE TRENCH SHALL BE BACKFILLED AND SOIL COMPACTED OVER THE FILTER FABRIC.
9. SILT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.

MAINTENANCE

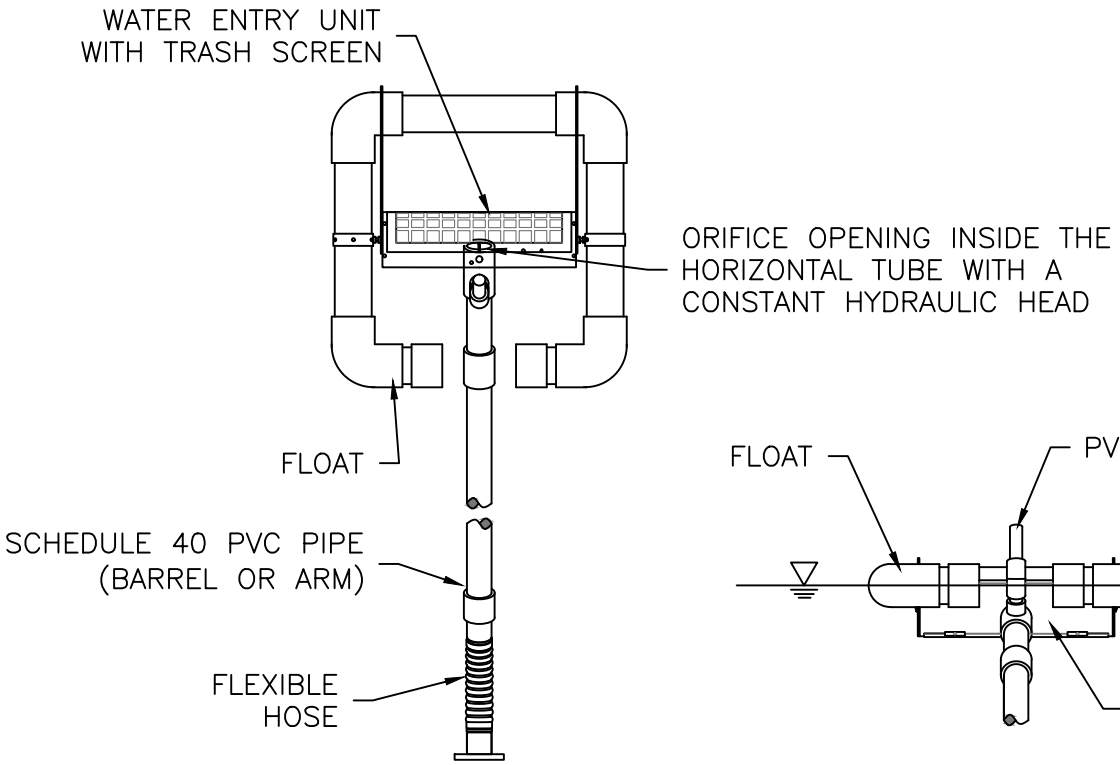
SILT FENCES AND FILTER BARRIERS SHALL BE INSPECTED IMMEDIATELY AFTER EACH RAINFALL AND AT LEAST DAILY DURING PROLONGED RAINFALL. ANY REQUIRED REPAIRS SHALL BE MADE IMMEDIATELY.

SHOULD THE FABRIC ON A SILT FENCE OR FILTER BARRIER DECOMPOSE OR BECOME INEFFECTIVE PRIOR TO THE END OF THE EXPECTED USABLE LIFE AND THE BARRIER IS STILL NECESSARY, THE FABRIC SHALL BE REPLACED PROMPTLY.

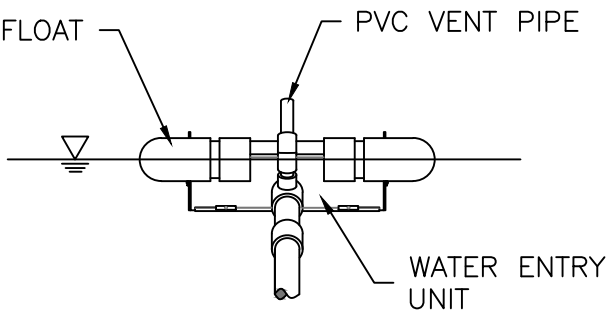
SEDIMENT DEPOSITS SHOULD BE REMOVED AFTER EACH STORM EVENT. THEY MUST BE REMOVED WHEN DEPOSITS REACH APPROXIMATELY ONE–HALF THE HEIGHT OF THE BARRIER.

ANY SEDIMENT DEPOSITS REMAINING IN PLACE AFTER THE SILT FENCE OR FILTER BARRIER IS NO LONGER REQUIRED SHALL BE DRESSED TO CONFORM WITH THE EXISTING GRADE, PREPARED AND SEEDED.

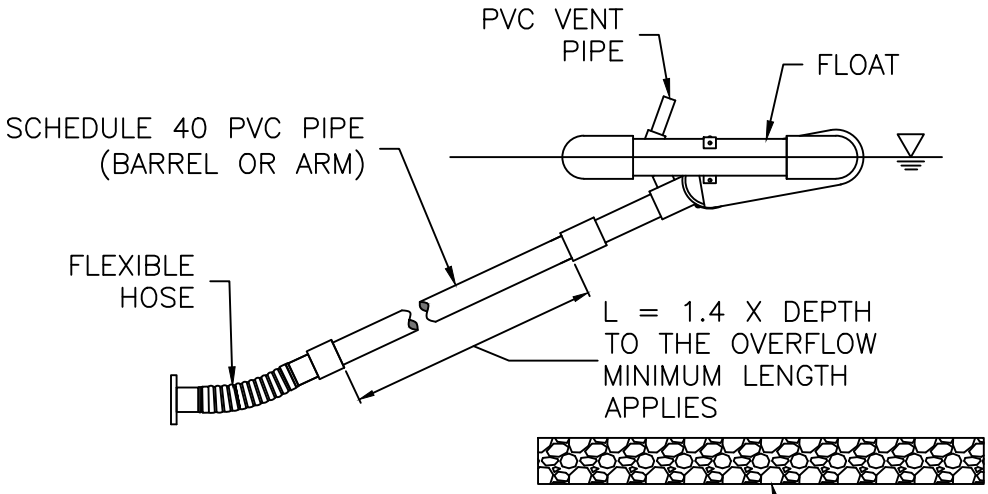
APPROVED	SEDIMENT & EROSION CONTROL SILT FENCE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–10 / SHT NO. 2/2



TOP VIEW
N.T.S.



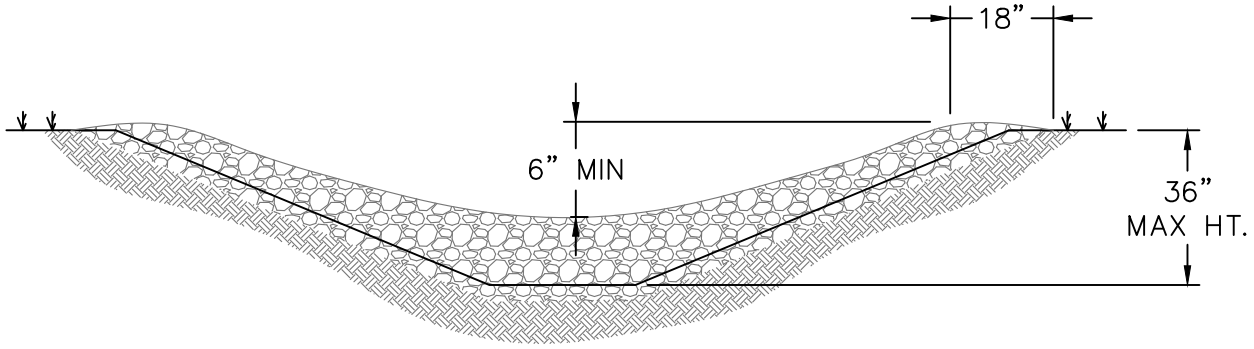
END VIEW
N.T.S.



SIDE VIEW
N.T.S.

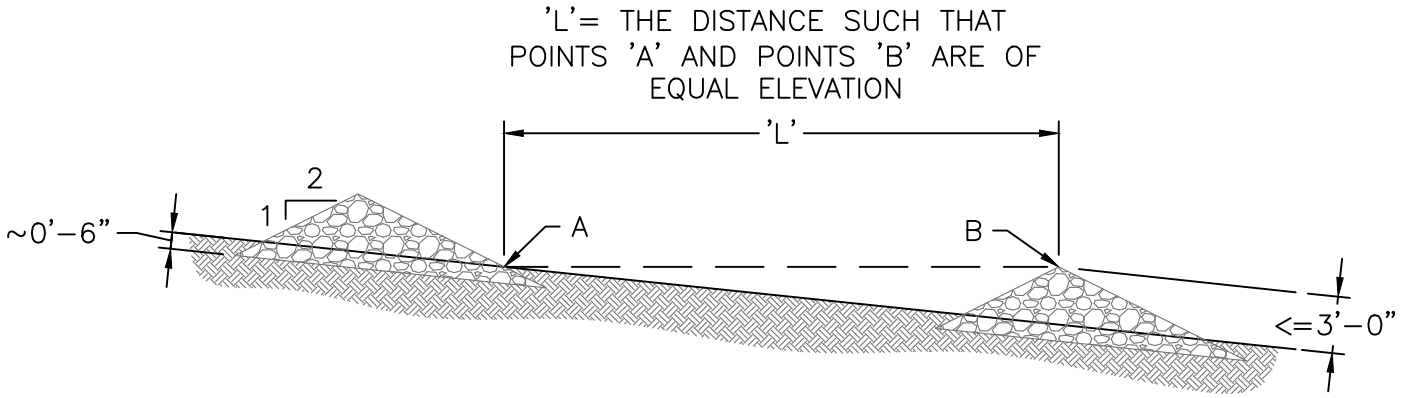
NOTE
PROPOSED SKIMMER SHALL BE A FAIRCLOTH SKIMMER AND SIZING SHALL BE PER THE MANUFACTURER'S RECOMMENDATIONS.

APPROVED	FLOAT SKIMMER	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–11 / SHT NO. 1/1



- VIEW LOOKING UPSTREAM

N.T.S.



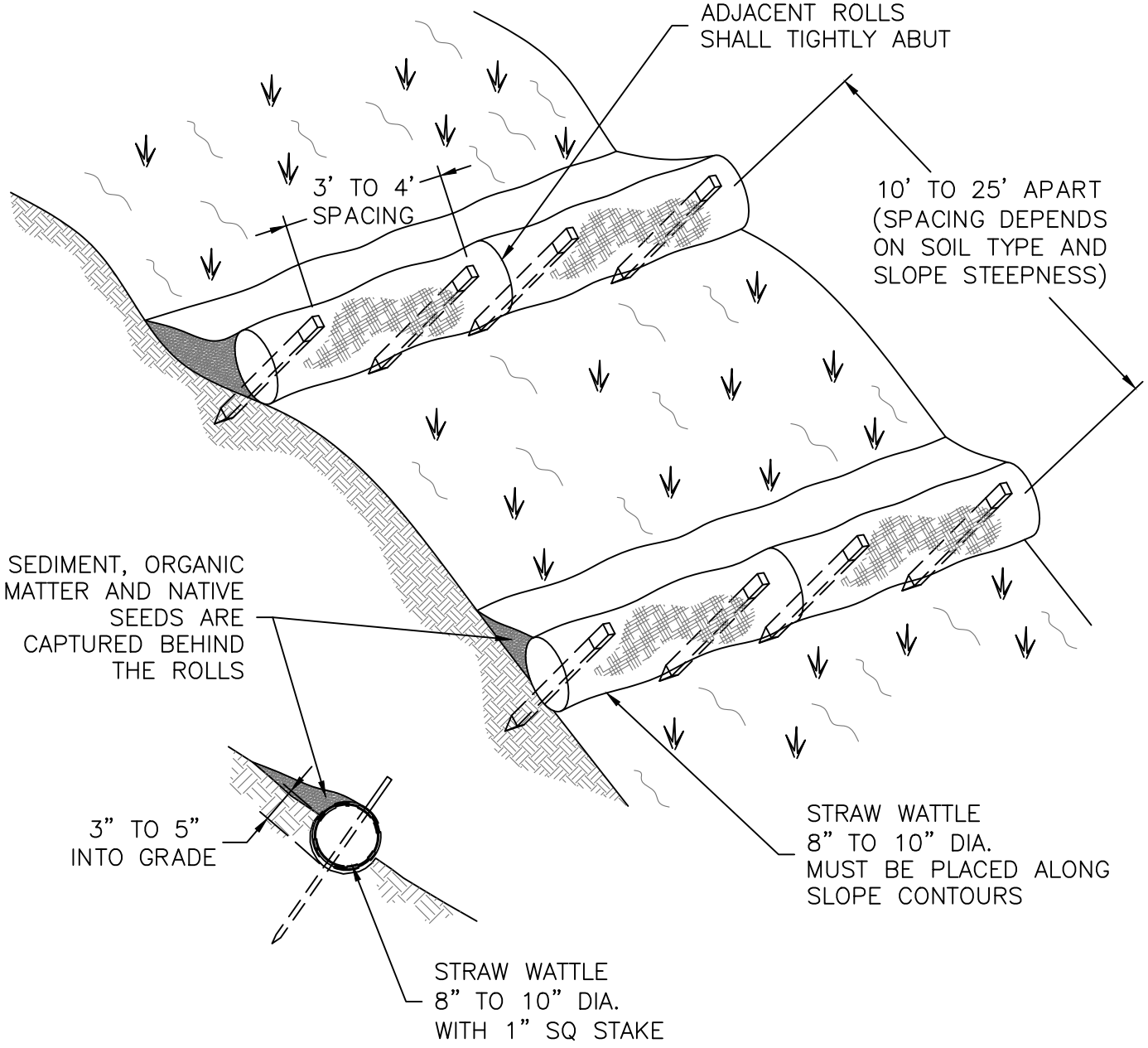
- SECTION - SPACING OF CHECK DAMS

N.T.S.

APPROVED	SEDIMENT & EROSION CONTROL ROCK CHECK DAM	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.-12 / SHT NO. 1/2

1. THE CHECK DAM SHALL BE CONSTRUCTED OF 4–8 INCH DIAMETER STONE, PLACED SO THAT IT COMPLETELY COVERS THE WIDTH OF THE CHANNEL. ODOT TYPE D STONE IS ACCEPTABLE, BUT SHOULD BE UNDERLAIN WITH A GRAVEL FILTER CONSISTING OF ODOT NO. 3 OR 4 OR SUITABLE FILTER FABRIC.
2. MAXIMUM HEIGHT OF CHECK DAM SHALL NOT EXCEED 3.0 FEET.
3. THE MIDPOINT OF THE ROCK CHECK DAM SHALL BE A MINIMUM OF 6 INCHES LOWER THAN THE SIDES IN ORDER TO DIRECT ACROSS THE CENTER AND AWAY FROM THE CHANNEL SIDES.
4. THE BASE OF THE CHECK DAM SHALL BE ENTRENCHED APPROXIMATELY 6 INCHES.
5. SPACING OF CHECK DAMS SHALL BE IN A MANNER SUCH THAT THE TOE OF THE UPSTREAM DAM IS AT THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
6. A SPLASH APRON SHALL BE CONSTRUCTED WHERE CHECK DAMS ARE EXPECTED TO BE IN USE FOR AN EXTENDED PERIOD OF TIME, A STONE APRON SHALL BE CONSTRUCTED IMMEDIATELY DOWNSTREAM OF THE CHECK DAM TO PREVENT FLOWS FROM UNDERCUTTING THE STRUCTURE. THE APRON SHOULD BE 6 IN. THICK AND ITS LENGTH TWO TIMES THE HEIGHT OF THE DAM.
7. STONE PLACEMENT SHALL BE PERFORMED EITHER BY HAND OR MECHANICALLY AS LONG AS THE CENTER OF CHECK DAM IS LOWER THAN THE SIDES AND EXTENDS ACROSS ENTIRE CHANNEL.
8. SIDE SLOPES SHALL BE A MINIMUM OF 2:1

APPROVED	SEDIMENT & EROSION CONTROL ROCK CHECK DAM	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–12 / SHT NO. 2/2



NOTE:
STRAW ROLL INSTALLATION REQUIRES THE PLACEMENT AND SECURE STAKING OF THE ROLL IN A TRENCH, 3" TO 5" DEEP, DUG ON CONTOUR. RUNOFF MUST NOT BE ALLOWED TO RUN UNDER OR AROUND ROLL.

APPROVED	SEDIMENT & EROSION CONTROL STRAW WATTLE	FAIRFIELD COUNTY ENGINEER
APPROVAL DATE		SWDM STANDARD CONSTRUCTION DWG.
REVISION DATE		DRAWING NO. St.–13 / SHT NO. 1/1

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APPENDIX B

DESIGN EXCEPTION REQUEST FORM

FAIRFIELD COUNTY DESIGN EXCEPTION REQUEST FORM

Submit to Fairfield County Engineer for Processing

I.D. NUMBER
_____
Assigned by County Engineer's Office.

Date:_____

☐ Check here if this is a resubmitted request

Project Name & Location:

Project Description:

List SWDM Section and Title for which a D.E. is requested:

Provide a detailed description of D.E. along with justification and any effects on other requirements:

List Documents Attached. Include appropriate plans, typical sections, cross sections, alignments, and/or details.

Engineer of Record

Engineer of Record Name & P.E. Registration #		
Title:	Date:	
Company Name:		
Company Address:		
City:	State:	Zip:
Email Address:	Phone:	

Disposition of Review by County Engineer:

☐ **Denied** ☐ **More information necessary**

Reason for Denial or Description of Additional Information Needed:

Approved by Fairfield County Engineer

County Engineer Name:	Date:
Comments:	

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APPENDIX C

STANDARD CALCULATION SHEETS

STORM SEWER DESIGN CALCULATION SHEET

Design Engineer:
Insert Contact Information
Insert PE Stamp

Project Name:
Fairfield County, Ohio
Submittal Date:

Sheet #/#

Structure		Drainage Area Calculations				Time of Conc. (min)		Flow Calculations		Pipe Data								Structure Elevations			
MH or CB No. and Type	Station	Drainage Area (acres)	Cumulative Drainage Area	Runoff Coefficient, C or Curve Number, CN	Cumulative C*A or CN*A	Inlet Time (min)	System Time (min)	Rainfall Intensity (in/hr)	Runoff, Q (cfs)	Pipe Length (ft)	Pipe Diameter (in)	Slope (ft/ft)	Design	Full Capacity	Full Capacity (cfs)	Minor Losses	Friction Losses	Upstream Invert (ft)	Downstream Invert (ft)	Top of Casting (ft)	Cover (ft)

INLET SPACING DESIGN CALCULATION SHEET

Design Engineer:
Contact Information
Insert PE Stamp

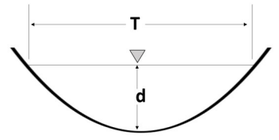
Project Name:
Fairfield County, Ohio
Submittal Date:

Sheet #/#

Inlet Structure		Gutter Discharge Design Frequency _____					Gutter Discharge Allowable Spread _____								Inlet Discharge			Comments
MH or CB No. and Type	Station	Drainage Area (acres)	Runoff Coefficient, C	Time of Concentration, Tc	Rainfall Intensity (in/hr)	Runoff, Q (cfs)	Long Slope (ft/ft)	Cross Slope (ft/ft)	Prev. Bypass Flow (cfs)	Total Gutter Flow (cfs)	Depth (in)	Grate or Gutter Width, W (in)	Spread, T (in)	W/T	Inlet Type	Intercept Flow (cfs)	Bypass Flow (cfs)	

PARABOLIC DITCH DESIGN CALCULATION SHEET

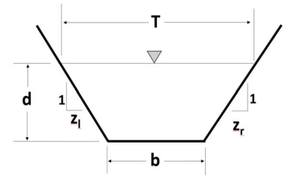
PROJECT NAME: _____
DITCH LOCATION: _____
DESIGN FLOW RP: _____
SHEAR DESIGN RP: _____



CHANNEL STATION		PARABOLIC X-SEC		CHANNEL FLOWS / CHANNEL VELOCITY				CHANNEL SLOPE	PROTECTION TYPE	ALLOWABLE SHEAR	DESIGN SHEAR	ELEVATION @ SHEAR DESIGN DEPTH	WIDTH @ SHEAR DESIGN DEPTH	ELEVATION @ 100 YR DEPTH	WIDTH @ 100 YR DEPTH
		top width (T)	depth (d)	Q_{stream}	$Q_{sub\ area}$	Q_{total}	v_{stream}								
FROM	TO	(feet)	(feet)	cfs	cfs	cfs	fps	%		(lbs/ft^2)	(lbs/ft^2)		(feet)		(feet)

TRAPEZOIDAL DITCH DESIGN CALCULATION SHEET

PROJECT NAME: _____
DITCH LOCATION: _____
DESIGN FLOW RP: _____
SHEAR DESIGN RP: _____



* left & right looking downstream

CHANNEL STATION		TRAPEZOIDAL GEOMETRY				CHANNEL FLOWS / CHANNEL VELOCITY				CHANNEL SLOPE	PROTECTION TYPE	ALLOWABLE SHEAR	DESIGN SHEAR	ELEVATION @ SHEAR DESIGN DEPTH	WIDTH @ SHEAR DESIGN DEPTH (T)	ELEVATION @ 100 YR DEPTH	WIDTH @ 100 YR DEPTH
		bottom width (b)	side slope right* (z_r)	side slope left* (z_l)	depth (d)	Q_{stream}	$Q_{sub\ area}$	Q_{total}	v_{stream}								
FROM	TO	feet	z:1	z:1	feet	cfs	cfs	cfs	fps	%		(lbs/ft^2)	(lbs/ft^2)		(feet)		(feet)

Time of Concentration (T_C) or Travel Time (T_t) Calculation Sheet
Fairfield County, OH

Project _____ Engineer _____

Location _____ Date _____

Circle One: Present Developed _____

Circle One: T_c T_t through subarea _____

NOTES: Space for as many as two segments per flow type can be used for each worksheet. Include a map with watershed boundaries and flow path(s) with the report. Label segment ID on map/plan.

Sheet Flow (Applicable to T_C only)	Segment ID					
1. Surface Description						
2. Manning's roughness coeff., n						
3. Flow Length, L (total 100 ft dev. conditions only)	ft					
4. Two-yr 24-hr rainfall, P_2	in					
5. Land slope, s	ft/ft					
6. Compute T_t: $T_t = \frac{0.007(nL)^{0.8}}{(\sqrt{P_2})(S^{0.4})}$	hr		+		=	
Shallow Concentrated Flow	Segment ID					
7. Surface description						
8. Flow length, L	ft					
9. Watercourse slope, s	ft/ft					
10. Average velocity, V	ft/s					
11. Compute T_t, $Tt = \frac{L}{3600\ V}$	hr		+		=	
Channel Flow	Segment ID					
12. Cross-sectional flow area, A	ft^2					
13. Wetted perimeter, P_w	ft					
14. Hydraulic radius, $r = \frac{A}{P_w}$	ft					
15. Channel slope, s	ft/ft					
16. Manning's roughness coeff., n						
17. Velocity, $V = \frac{1.49R^{\frac{2}{3}}S^{\frac{1}{2}}}{n}$	ft/s					
18. Flow length, L	ft					
19. Compute T_t, $Tt = \frac{L}{3600\ V}$	hr		+		=	
20. Watershed or subarea T_c (\ T_t from 6, 11, 19)						

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APPENDIX D

GENERAL NOTES FOR EROSION AND SEDIMENT CONTROL PLAN

General Notes for Erosion and Sediment Control Plan
Fairfield County Stormwater Design Manual
Appendix D

Sediment and Erosion Control Notes:

1. All erosion and sediment control shall be performed according to: SWPPP and detail plans; the latest Ohio EPA authorization for construction activity under the "national pollutant discharge elimination system" (NPDES); any and all required permits, reports, and related documents. See Ohio EPA Permit No. OHC000005 (or latest renewal) for SWPPP rules and regulations. All contractors and subcontractors must become familiar with all of the above.
2. Contractor shall implement best management practices as required by the SWPPP. Additional best management practices shall be implemented as dictated by conditions and grade changes to the site at no additional cost to owner throughout all phases of construction.
3. Contractor shall minimize clearing and disturbance to the environment to the maximum extent possible or as required by the general permit. Every effort shall be made to preserve the natural riparian setback adjacent to streams or other surface water bodies.
4. Sediment basins and perimeter sediment barriers shall be implemented as the first step of grading within 7 days from the start of clearing and grubbing and shall continue to function until the slope development area is restabilized. Sediment basins shall be implemented for all areas remaining disturbed for over 14 days.
5. Temporary soil stabilization of disturbed areas by means of temporary vegetation, mulching, geotextiles, sod, preservation of existing vegetation, and other approved techniques to be applied as follows:
   - Within two 2 days of any area within 50 feet of a stream not at final grade remaining dormant for over 14 days.
   - Within 7 days of any area that will be dormant for more than 14 days.
   - Prior to the onset of winter weather for areas that will be idle over winter. For residential subdivisions, disturbed areas must be stabilized at least 7 days prior to transfer of permit coverage for individuals.
6. Permanent soil stabilization of disturbed areas by means of vegetation, landscape type mulching, matting, sod, rip rap, and other approved landscaping techniques to be applied as follows:
   - Within 7 days of any area that will be dormant for 1 year or more.
   - Within 2 days of any area within 50 feet of a stream at final grade. Within 7 days for any other area at final grade.
7. Temporary seeding, mulching, and fertilizer specifications:
   - Seeding: Annual ryegrass at 2.02 pounds/1,000 S.F.
   - Mulching: Straw material shall be unrotted small grain straw applied at a rate of 2 tons/acre, or 80-100 pounds/1,000 S.F. Mulch materials shall be relatively free of all kinds of weeds and shall be free of prohibitive noxious weeds. Mulch shall be spread uniformly by hand or mechanical means and shall be crimped or applied with a tackifier. From November 01 thru March 15 increase the rate of straw mulch to 2 tons/acre.
   - Fertilizer: Apply fertilizer at half the rate of permanent application and as per state DOT specifications. If project conditions prevent fertilizing the soil, then this item may be waived.
8. Permanent seeding shall be in accordance with ODOT standard specifications.

9. Slopes shall be left in a roughened condition during the grading phase to reduce runoff velocities and erosion. All slopes 3:1 or greater than 3:1 shall be fertilized, seeded, and curlex blankets by American Excelsior Company, North American Green, Inc. Or an approved equal as specified in the plans shall be installed on the slopes.
10. Ohio EPA SWPPP regulations requires that a sediment trap or pond be sized to provide at least 201 cubic yards (67 cy for dewatering and 134 cy for sediment storage) of storage per acre of total contributing area. Maximum depth of sediment settling pond shall be equal or less than 5-feet with a length to width ratio greater than or equal to 2:1)
11. Outlet structures in sedimentation basins shall be maintained in operational conditions at all times. Sediment must be removed from basins and or traps when the design capacity has been reduced by 40% (approximately one-half of pond depth).
12. No solid (other than sediment) or liquid waste, including building materials, shall be discharged in storm water runoff.
13. All toxic wastes, hazardous wastes and non-sediment pollutants must be disposed of in accordance with local, state, and federal guidelines. Wash out of cement trucks should occur in designated pit or diked areas, where washings can be removed and properly disposed off-site when they harden. Storage tanks should also be located in pit or diked areas. In addition, sufficient oil and grease absorbing materials and flotation booms to clean and contain fuel and chemical spills must be kept on site. No toxic or hazardous wastes shall be disposed into storm drains, septic tanks or by burying, burning or mixing the wastes.
14. Containers shall be available for disposal of debris, trash, hazardous or petroleum wastes. All containers must be covered and leak-proof. All waste material shall be disposed of at facilities approved for the pertinent material.
15. Rubbish, trash, garbage, litter, or other such materials shall be disposed into sealed containers. Materials shall be prevented from leaving the site through the action of wind or storm water discharge into drainage ditches or waters of the state.
16. Bricks, hardening concrete and soil waste shall be free from contamination which may leach constituents to waters of the state.
17. Clean construction wastes that will be disposed into the property shall be subject to any local prohibitions from this type of disposal.
18. All construction and demolition debris (C&DD) waste shall be disposed of in an Ohio EPA approved C&DD landfill as required by Ohio revised code 3714. Construction debris may be disposed of on-site, but demolition debris must be disposed in an Ohio EPA approved landfill. Also, materials which contain asbestos must comply with air pollution regulations (see Ohio administrative code 3745-20).
19. Area shall be designated for mixing or storage of compounds such as fertilizers, lime asphalt, or concrete, these designated areas shall be located away from watercourses, drainage ditches, field drains, or other stormwater drainage area.
20. Equipment fueling & maintenance shall be in designated areas only. These designated areas shall be located away from watercourses, drainage ditches, field drains, or other stormwater drainage area.
21. A spill prevention control and countermeasure (SPCC) plan must be developed for sites with one above-ground storage tank of 660 gallons or more, total above-ground storage of 1,330 gallons, or below-ground storage of 4,200 gallons of fuel.
22. All designated concrete chute or washout areas shall be located away from watercourses, drainage ditches, field drains or other stormwater drainage areas.

23. If there is a potential for high ground water at this site, contractor is responsible for designing and implementing a plan to control both surface and ground water during the course of construction.
24. Discharge of water with potential sediment from the site shall be through a filter bag, sump pit, or other sediment removal device.
25. All contaminated soil must be treated and/or disposed in an Ohio EPA approved solid waste management facility or hazardous waste treatment, storage or disposal facilities (TSDFs).
26. If the site contains contaminated soil, the following shall be used to prevent contamination from being released:
    - Berms, trenches and pits to collect contaminated runoff and prevent discharges.
    - Pumping runoff into a container for on-site treatment or transport to an appropriate treatment/disposal facility.
    - Covering areas of contamination with tarps or other methods that prevent storm water from coming into contact with the material.
27. In the event of an accidental spill, immediate action will be undertaken by the general contractor to contain and remove the spilled material. All hazardous materials, including contaminated soil and liquid concrete waste, will be disposed of by the contractor in the manner specified by federal, state and local regulations and by the manufacturer of such products. As soon as possible, the spill will be reported to the appropriate agencies. As required under the provisions of the clean water act, any spill or discharge entering waters of the United States will be properly reported. The general contractor will prepare a written record of any spill and associated clean-up activities of petroleum products or hazardous materials in excess of 1 gallon or reportable quantities, whichever is less.
28. The contractor shall contact the Ohio EPA at 800.282.9378, the local fire department, and the local EMA in the event of a petroleum spill (>25 gallons) or the presence of sheen.
29. Open burning is not permitted on the site.
30. Dust control using approved materials must be performed at all times. Dust suppressants shall not be applied near catch basins for storm sewers or other drainage ways. The use of motor oils and other petroleum based or toxic liquids for dust suppression is prohibited.
31. Appropriate measures must be taken to ensure that all proper air pollution permits are obtained.
32. Process wastewaters (equipment washing, leachate associated with on-site waste disposal, and concrete wash-outs) shall be collected and disposed of properly.
33. Sanitary and water PTI forms shall be filed with the Ohio EPA as required.
34. Protected storage areas shall be used for industrial and construction materials in order to minimize the exposure of such materials to stormwater.
35. All control measures stated in the SWPPP shall be maintained in fully functional condition until temporary or permanent stabilization of the site is achieved. All erosion and sediment control measures shall be inspected by a qualified person in accordance with the contract documents or the applicable permit, whichever is more stringent, and repaired accordingly and according to these notes.
36. Inspections of BMPS shall be performed by qualified persons provided by the permittee and the inspection logs are to become a part of this plan. Inspections records shall be signed by the inspector and will be kept for 3 years after the notice of termination is submitted.
37. Inspections shall be conducted at least once in every 7 calendar days and within 24 hours after any storm event greater than 0.5 inches of rain per 24-hour period, from the beginning of construction through the final inspection prior to the notice of termination.

38. Non-sediment pond BMPS to be repaired within 3 days of inspection and sediment pond BMPS within 10 days of inspection. BMPS not meeting the intended function shall be replaced within 10 days of inspection. Missing BMPS shall be installed within 10 days of inspection.
39. If the site is stabilized and will be dormant for a long period of time, less frequent inspections may be requested of the Ohio EPA via a waiver request.
40. Inlet protection devices and controls shall be repaired or replaced when they show signs of undermining and or deterioration.
41. All seeded areas shall be checked regularly to ensure that a good standing of grass is maintained. Areas should be fertilized, watered, and reseeded as needed.
42. Silt fences, inlet protection, silt dikes and pervious logs shall be repaired to their original condition if damaged. Sediment accumulation must be removed when sediment height reaches one-half the height of the silt fence, inlet protection, silt dike, and pervious log.
43. Minimize off-site sediment tracking of vehicles by the use of stone material in all construction entrances, along with regularly scheduled sweeping/good housekeeping. Stabilized construction entrances to be properly maintained and in good working order at all times; this may require periodic top dressing of the stone as conditions demand.
44. If the action of vehicles traveling over the stabilized construction entrance does not sufficiently remove most of the dirt and mud, then the tires must be washed before vehicles enter a public road. Provisions must be made to intercept the water and trap the sediment before it is carried off the site.
45. All materials spilled, dropped, washed, or tracked onto the roadways or into the storm sewers must be removed immediately.
46. The temporary parking and storage area shall be kept in good condition (suitable for parking and storage). This may require periodic top dressing of the temporary parking as conditions demand.
47. Contractors and subcontractors will be responsible for removing all sediment from the site, including detention ponds, and storm sewer systems. Sediment deposition during site stabilization must also be removed.
48. All rip rap must be placed over geotextile filter.
49. Stone construction entrance to be maintained by contractor until site has been paved or is no longer required.
50. All catch basin grates are to be protected with inlet bags after they are installed. They should be routinely cleaned and maintained.
51. Rock check dams should be routinely cleaned once sediment begins to appear on the upstream side of the rock.
52. On-site and off-site stockpile and borrow areas shall be protected from erosion and sedimentation by the use of best management practices. These areas must be shown in the site map and permitted in accordance with general permit requirements.
53. Contractor to delineate stockpile location on plans to be kept on site during construction.
54. Construct stockpiles in accessible locations that do not interfere with natural drainage. Install appropriate sediment controls to trap sediment such as silt fence immediately adjacent to the stockpile or sediment traps or basins downstream of stockpile. Stockpile side slopes shall not exceed a ratio of 2:1.
55. If stockpile is stored for more than 14 days, it should be temporary seeded, or covered with a tarp.

56. All construction shall be stabilized at the end of each day; this includes backfilling of trenches for utility construction and placement of gravel or asphalt for road construction.
57. The last layer of soil, including topsoil should be compacted to 80% - 85% of the maximum standard proctor density, in areas outside the parking lot that will receive vegetation. This is particularly important in cut slope and embankment areas. In pavement and island areas, it is recommended that the soil be compacted to 98% and 95% of the maximum standard proctor density respectively; the last compacted layer may be scarified to improve the soil growth characteristics.
58. The post construction water quality requirements of Ohio EPA permit OHC000005 (or latest renewal) shall be met by the water quality basins.
59. All water from dewatering activities shall be processed through a BMP prior to leaving the site.
60. Snow fences shall be erected around any trenches that remain open for more than 24 hours.

General Land Conservation Notes:

1. Any disturbed areas that will be denuded for more than 14 days but less than one year shall have temporary soil stabilization applied to the disturbed are within 7 days of the most recent disturbance. For residential subdivisions, disturbed areas must be stabilized at least 7 days prior to transfer of permit coverage for the individual lot(s). Any disturbed areas within 50 feet of a surface water of the state and not at final grade shall have temporary soil stabilization applied to the area within 2 days of the most recent disturbance if the area will remain idle for more than 14 days. Any areas that will lie dormant for one year or more or at final grade shall have permanent soil stabilization applied to the area within seven days of the most recent disturbance or of reaching final grade. Any areas within 50 feet of a surface water of the state and at final grade shall have permanent soil stabilization applied to the area within 2 days of reaching final grade.
2. All structural erosion and sediment control practices shall be placed prior to or as the first step in grading for all sites.
3. All storm sewer, sanitary sewer, water main and service trenches shall be mulched and seeded within 14 days after back fill if installation is through stabilized areas. No more than 500 feet of trench will be open at any one time.
4. Electric power, telephone, CATV and gas supply trenches shall be compacted seeded and mulched within 14 days after back fill, if installation is through stabilized areas.
5. All temporary diversions, sediment basin embankments and earth stockpiles shall be seeded and mulched for temporary vegetative cover within 7 days after grading. Straw, hay mulch or equivalent is required.
6. All storm sewer inlets shall be protected by sediment traps (inlet protection) which will be maintained and modified as required as construction progresses.
7. Any disturbed area not stabilized with seeding, sodding, paving or built upon by November 1, or areas disturbed after that date, shall be mulched immediately with hay or straw at the rate of 2 tons/acre and over-seeded thru March 15. Straw mulch shall be crimped or applied with a tackifier.
8. At the completion of construction, all temporary sediment controls shall be removed and all denuded areas shall be stabilized.
9. HOA shall maintain and keep record of any maintenance/inspections of common areas.

APPENDIX E

POST-CONSTRUCTION BMP INSPECTION AND MAINTENANCE AGREEMENT FORM

Post-Construction Stormwater Management/BMP Facilities Maintenance Agreement

THIS AGREEMENT ("Agreement")**,** made and entered into this _____ day of _____, 20___, by and between [*INSERT OWNER LEGAL ENTITY*] hereinafter called the "Landowner", and the [*INSERT COUNTY/TOWNSHIP ENTITY*] hereinafter called the "Township".

WHEREAS, the Landowner is the owner of certain real property described as _____ as recorded by deed in the recorder's office of Fairfield County, Ohio, Deed Book _____ Page _____, hereinafter called the "Property".

WHEREAS, the Landowner is proceeding to build on and develop the Property; and

WHEREAS, the Site Plan/Development known as _____, a copy of which Plan is attached hereto and incorporated herein as Exhibit A **(**hereinafter called the "Plan"), which is expressly made a part hereof, as approved or to be approved by the Township, provides for detention of stormwater within the confines of the Property; and

WHEREAS, the Township and the Landowner, its successors, and assigns, agree that the health, safety, and welfare of the residents of [*INSERT NAME OF TWP*] Township require that on-site stormwater management/BMP facilities be constructed and maintained on the property; and

WHEREAS, the Township requires that on-site stormwater management/BMP facilities as shown on the Plan be constructed and adequately maintained by the Landowner, its successors and assigns.

NOW, THEREFORE, in consideration of the foregoing premises, the mutual covenants contained herein, and the following terms and conditions, the parties hereto agree as follows:

1. The on-site stormwater/BMP facilities shall be constructed by the Landowner, its successors, and assigns, in accordance with the plans and specifications identified in the plan.
2. The Landowner, its successors and assigns, shall adequately maintain the stormwater management/BMP facilities. This includes all pipes and channels built to convey stormwater to the facility, as well as structures, improvements, and vegetation provided to control the quantity of the stormwater. Adequate maintenance is herein defined as good working condition so that these facilities are performing their design functions as set forth in the Plan and which, at a

minimum, complies with all applicable federal, state, and local permits (including, but not limited to, any applicable permit to install and any applicable NPDES permit), statutes, rules, regulations, ordinances, and any other applicable mandate or authority. The Annual Inspection Report form (latest date form available) is to be used to establish and describe what good working condition is acceptable to the Township; provided, however, the Township shall not impose any obligations other than those established within this Agreement.

3. The Landowner, its successors and assigns, shall (a) continuously maintain the Property in accordance with the Plan and (b) inspect the stormwater management/BMP facility and submit Inspection Reports annually before June 1st. The purpose of the inspection is to assure safe and proper functioning of the facilities. The inspection shall cover the entire facilities, berms, outlet structures, pond areas, access roads, etc. Any material and workmanship deficiencies shall be noted in the Annual Inspection Report and all repairs shall be completed within thirty (30) days of their discovery as set forth in the Landowner's Annual Inspection Report or through a reasonable request from the Township. If the Landowner indicates to the Township that repairs cannot occur within this thirty (30) day period, then the Landowner shall draft a written repair schedule and receive written approval from the Township for said repair schedule, which shall not be unreasonably withheld.
4. The Landowner, its successors and assigns, hereby grant permission to the Township, its authorized agents and employees, to enter upon the Property during normal business hours and to inspect the stormwater management/BMP facilities. The purpose of the inspection is, among other things, to follow-up on reported deficiencies and/or respond to a citizen complaint. The Township shall provide the Landowner, its successors and assigns, copies of the inspection findings and a directive to commence with the repairs, if necessary.
5. The Landowner shall be the designated entity for stormwater inspection and maintenance of the Property. Routine and non-routine maintenance tasks that shall be undertaken by the Landowner in connection with the Property are set forth in Exhibit B, attached hereto and incorporated herein. A schedule of the Landowner's inspection and maintenance of the Property which shall be followed by the Landowner set forth in Exhibit C, is attached hereto and incorporated herein. Easements and agreements, if any, are set forth in Exhibit A, attached hereto and incorporated herein (no such easements or agreements if they are not attached as Exhibit A). A map showing all access and maintenance easements, if any are set forth in Exhibit A, attached hereto and incorporated herein (no such access or maintenance agreements if they are not attached as Exhibit A).

6. In the event the Landowner, its successors and assigns, fails to maintain the stormwater management/BMP facilities in good working condition as set forth herein and as reasonably acceptable to the Township, the Township or the Township's Designee may enter upon the Property, after providing reasonable notice to the Landowner, and take whatever steps are necessary in its judgment to correct the deficiencies identified in the Annual Inspection Report and to charge the costs of such repairs to the Landowner, its successors and assigns. This provision shall not be construed to allow the Township to erect any structure of permanent nature on the land of the Landowner outside the easement for the stormwater management/BMP facilities. It is expressly understood and agreed that the Township is under no obligation to routinely maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Township.
7. The Landowner, its successors and assigns, will perform the work necessary to continuously maintain and to keep these facilities in good working order as appropriate. In the event the Township pursuant to this Agreement, performs work of any nature reasonably required to ensure compliance with this Agreement, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner, its successors and assigns, shall reimburse the Township upon demand, within ninety (90) days of receipt thereof for all reasonable costs incurred by the Township hereunder or a pre negotiated payment schedule. Failure to pay such costs shall result in a lien being placed on such Property.
8. This Agreement imposes no liability of any kind whatsoever on the Township and the Landowner agrees to hold the Township harmless from any liability in the event the stormwater management/BMP facilities fail to operate properly.
9. The current Landowner shall promptly notify the Township in writing when the Landowner transfers any of the Landowner's responsibilities for the stormwater management/BMP facilities. The Landowner shall supply the Township with a copy of any document of transfer.
10. Upon execution, this Agreement shall be recorded, at the Landowner's expense, among the land records of Fairfield County, Ohio and shall constitute a covenant running with the land, and shall be binding on the Landowner, its administrators, executors, assigns, heirs and any other successors in interests.
11. The term "Landowner" shall mean only the owner at the time in question of the Property, so that in the event of any transfer or transfers of title to the Property, the transferor shall be and hereby is relieved and freed of all obligations of Landowner under this Agreement accruing after such transfer, and it shall be deemed, without further agreement, that such transferee has assumed

and agreed to perform and observe all obligations of Landowner herein during the period it is the holder of an interest in the Property.

IN WITNESS WHERE OF, the Landowner, its successors and assigns, has caused this Stormwater Management/BMP Facilities Maintenance Agreement to be signed in its name by a duly authorized person.

_____
Company/Corporation/Partnership Name

By:_____

_____
(Print Name)

_____
(Print Title)

The foregoing Agreement was acknowledged before me this _____ day of _____, 20____, by

_____
Notary Public Signature

My commission Expires:_____

Notary Seal

[*INSERT NAME OF TWP*] Township Board of Trustees

_____

_____

_____The foregoing Agreement was acknowledged before me this _____ day of _____, 20____.

Approved as to Form:

_____ _____
Township Attorney Date