CITY OF MENTOR
DRAINAGE DESIGN STANDARDS

Project Name:_____Location:_____

Design Engineer:_____Company:_____

Phone Number:_____Fax Number:_____

Owner's Name:_____Address:_____

Phone Number:_____Fax Number:_____

Reviewed by:_____Date:_____

Please check the section(s) that apply to the above project:

1. ____Storm Water Management Plan
2. ____Detention
3. ____Water Quality
4. ____Inspection and Maintenance Agreement
5. ____Water Resource Crossings
6. ____Storm Sewers
7. ____Roadside Ditches
8. ____Drainage for Curb Pavement
9. ____Easements
10. ____Other Drainage Information
11. ____Erosion and Sediment Control

*****Information marked with an asterisk (*) to be noted on the plans.*****

In unique or unusual circumstances where the rigid conformance to these criteria may create adverse conditions to the intent of the City Codes, the City Engineer reserves the right to alter, modify or delete the problem criteria.

1. STORM WATER MANAGEMENT PLAN (Refer to M.C.O. Chapter 1352)

A. Comprehensive storm water management plan to be developed by a registered professional engineer and is required for the following:

1. All commercial, industrial, and institutional developments.

2. Other soil disturbing activities that result in a total land disturbance of one (1) or more acres of land, or less than one (1) acre of land if part of a larger common plan of development or sale disturbing one (1) or more acres of land.

3. Development projects that result in a total land disturbance of less than one (1) acre of land if required by the City Engineer.

B. For Site Description, provide :

1. A description of the nature and type of the construction activity (e.g. residential, shopping mall, highway, etc.).

2. 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).

3. A description of prior land uses at the site.

4. An estimate of the impervious area and percent of imperviousness created by the soil-disturbing activity at the beginning and at the conclusion of the project.

5. Existing data describing the soils throughout the site.

6. If available, the quality of any known pollutant discharges from the site.

7. The location and name of the immediate water resource(s) and the first subsequent water resource(s).

8. The areal (plan view) extent and description of water resources at or near the site that will be disturbed or will receive discharges from disturbed areas of the project.

9. A description of the current condition of water resources.

10. TMDL best management practices that reduce phosphorus, nitrogen, bacteria, total suspended solids and promote habitat for the Chagrin River Watershed and reduce phosphorus, bacteria and flow for the Grand River Watershed. Demonstrate that appropriate storm water control measures have been selected to address these TMDLs. Examples of BMPs to be used:

    a. Impervious surface reduction/on-site infiltration increase (all the above).
    b. Riparian/buffer protection (all the above).
    c. Conservation development practices (habitat).
    d. Construction site erosion and sediment control practices (TSS, phosphorus, nitrogen).
    e. Storm drain stenciling (TSS, phosphorus, nitrogen, habitat, bacteria).
    f. On site protected areas to be marked in the field prior to construction (TSS, phosphorus, nitrogen, habitat, flow).
    g. 50’ vegetative buffer between water resource and disturbed area (TSS, phosphorus, nitrogen, habitat, flow).
    h. Retrofit storm water management systems to treat WQv and/or increase

infiltration (TSS, habitat, flow).

C. For Site Plan Sheet Show:

1. Limits of soil-disturbing activity on the site.

2. Soils types for the entire site, including locations of unstable or highly erodible soils.

3. Existing and proposed one-foot (1') contours. This must include a delineation of drainage watersheds expected before, during, and after major grading activities as well as the size of each drainage watershed in acres.

4. Water resource locations including springs, wetlands, streams, lakes, water wells, etc., and associated setbacks on or within 200 feet of the site, including the boundaries of wetlands or streams and first subsequent named receiving water(s) the applicant intends to fill or relocate for which the applicant is seeking approval from the Army Corps of Engineers and/or Ohio EPA.

5. Existing and planned locations of buildings, roads, parking facilities, and utilities.

6. The location of any in-stream activities including stream crossings.

7. The locations of any easements or other restrictions placed on the use of the property.

8. The locations for each proposed post-construction storm water management practice.

9. Sublot numbers if the project is a subdivision.

10. The point of discharge to the City's storm sewer system.

11. Existing and proposed drainage patterns.

12. Details associated with the storm water management practices.

    a. Include location and size, detail drawings, maintenance requirements during and after construction, and design calculations.

    b. Details shall be drawn to scale and shall show volumes and sizes of contributing drainage areas.

13. Indicate phase, if applicable of the overall development plan.

14. Provide Ohio EPA NPDES Permit Number and other applicable state and federal permit numbers, if available, or status of various permitting requirements if final approvals have not been received.

15. Provide location, including complete site address and sublot number if applicable.

16. Provide a list of all contractors and subcontractors and their names, addresses, and phone numbers involved with the implementation of the stormwater management plan along with a signed acknowledgement that they have reviewed and understand the requirements and responsibilities of the stormwater

management plan.

17. Company name and contact information as well as contact name, addresses, and phone numbers for the following:

    a. The Professional Engineer who prepared the storm water plan.

    b. The site owner.

D. Provide maintenance agreement for storm water management facilities. Refer to agreement template form (http://cityofmentor.com/departments/engineering-building/) prepared by the City of Mentor and Section 1352.08 D. 7.

E. Calculations Required:

1. Submit calculations for projected stormwater runoff flows, volumes, and timing into and through all stormwater management practices for flood control, channel protection, and water quality. Provide copy of calculations in pdf format for review.

2. Calculations shall be completed for both pre-development and post-development land use conditions and shall include the underlying assumptions and hydrologic and hydraulic methods and parameters used.

3. Calculations shall include critical storm determination and demonstrate that the runoff from upped watershed areas has been considered in the calculations.

F. Performance Standards:

1. Stormwater system shall be designed to prevent structure flooding during the 100-year, 24-hour storm event.

2. Maintain to the extent possible pre-development runoff patterns, flows and volumes.

3. Design stormwater management practices in accordance with the most current edition of *Rainwater and Land Development*.

4. Residential lots created by subdivision of property shall have functional access to a rear yard drain. Downspouts shall not be directly connected to the storm sewer system.

5. Stormwater facilities shall not be constructed in water resources.

6. Concentrated runoff to wetlands shall be converted to diffuse flow before the runoff enters the wetlands. Applicant shall attempt to match the pre-development hydroperiods and hydrodynamics that support the wetland.

2. STORMWATER DETENTION (Refer to Mentor Code of Ordinances, Chapter 1352.09 D.)

A. The peak discharge rate of runoff from the Critical Storm and all more frequent storms occurring under post-development conditions shall not exceed the peak discharge rate of runoff from a 1-year, 24-hour storm occurring on the same development drainage area under pre-development conditions.

B. Storms of less frequent occurrence (longer return periods) than the Critical Storm, up to the 100-year, 24-hour storm shall have peak runoff discharge rates no greater than the peak runoff rates from equivalent size storms under pre-development conditions. The 1, 2, 5, 10, 25, 50, and 100-year storms shall be considered in designing a facility to meet this requirement.

C. Development Size:_____Acres*_____Mi^2

D. Method to determine detention storage volume:

1. Curve number based hydrologic method that generates hydrographs, or other hydrologic method approved by the City Engineer.

2. Storm routing calculations are required to confirm that proposed detention facility meets the City's standard criteria. Calculations to include:

a. Overall Drainage Plan of the site showing existing and proposed grading, runoff flow paths, proposed drainage facilities and contributing areas including offsite areas draining to the drainage system. Indicate ground cover conditions and predominant soil types with Hydrologic Soil Group per the Lake County Soil Survey.

b. Plan View, typical cross-section and pertinent details of the proposed detention facility and its primary and emergency outlet control structure(s).

c. Detention Storage Capacity vs. Water Surface Elevation Rating Table.

d. Outlet Control Discharge vs. Water Surface Elevation Rating Table, including assumptions and calculations used to determine existing drainage system hydraulic gradient or water surface elevation at the outlet control structure discharge.

e. Inflow-Outflow Hydrographs, either in tabular or graphical form for one (1) year storm, CRITICAL STORM and all storms exceeding CRITICAL STORM up to the 100-year storm. The required inflow hydrographs shall include both pre-developed and post-developed conditions.

24-Hour Critical Storm

If the Percentage of Increase in Volume of Runoff is:		The Critical Storm will be:
Equal to or Greater Than:	and Less Than:	
----	10	1 year
10	20	2 year
20	50	5 year
50	100	10 year
100	250	25 year
250	500	50 year
500	---	100 year

For example, if the percent increase between the pre- and post-development runoff volume for a 1-year storm is 35%, the Critical Storm is a 5-year storm. The peak discharge rate of runoff for all storms up to this frequency shall be controlled so as not to exceed the peak discharge rate from the 1-year frequency storm under pre-development conditions in the development drainage area. The post-development runoff from all less frequent storms need only be controlled to meet pre-development peak discharge rates for each of those same storms.

f. The assumptions and/or calculations utilized in determining the inflow hydrographs.

g. Rainfall Depth – Use the Precipitation-Frequency Data Server provided by NOAA, Atlas 14 Point Precipitation Frequency Estimates, Mentor, Ohio.

h. Hydraulic Gradient Calculations for the proposed storm sewer system based on the CRITICAL STORM design year and other storm design year frequencies as may be required by the City Engineer.

E. Critical Storm (yr): 1 2 5 10 25 50 100 (circle one)

F. Detention Volume: _____AC-Ft. Required _____Ac-Ft. Provided*

G. Maximum Outflow:

1. Outlet Control Device_____

2. 1-year pre-developed rate _____cfs.

3. High Water Level (HWL) at critical storm*_____Discharge*_____

4. High Water Level (HWL) at 100 year storm*_____

(Also include max. discharge for storm frequencies exceeding critical storm up to 100-year storm. * Include 2-, 5-, 10-, 25-, 50-, and 100-year storm frequencies as applicable.)_____

_____

H. Detention/Retention Facilities

1. Drainage basins, specify type_____

a. Soil name and type at basin_____

i. Will liner be required for basin? If so, specify_____

b. Minimum static water depth 4’ Proposed Depth_____

c. Side slopes shall be equal or flatter than 3:1. Proposed Side Slope_____

d. Minimum bottom slopes:

Paved surface 1% Paved Channel 0.5% Grassed Surface 2%

Proposed bottom surface/slope_____

e. Outflow control device:_____

f. Provisions for flows above critical storm:

i. Basin shall accommodate flows up to the 100 year storm.

ii. 100 year storm High water Elevation_____

iii. Provide emergency overflow. Elevation of emergency overflow_____

g. Will basin be used as a temporary sediment basin during construction?

_____

If yes, provide calculations to determine additional volume needed to store sediment. (Minimum storage capacity: 67 cy/acre of watershed area to basin.)

2. Underground Storage Tanks

a. Access – opening shall be provided for inspection/maintenance. Opening to be properly secured to minimize unauthorized entry and safety hazards.

b. Outflow control device _____

c. Overflow provisions for flows above design storm

i. Description_____

ii. Capacity/Design Year_____

iii. Design High water Elevation_____

d. Draining – Include provisions for completely draining tank. Minimum slope of tank bottom is 0.5%.

Draining provision _____

_____

_____

3. Parking Lot Storage

a. Maximum water depth 5” Proposed Depth_____

b. Storage to be located in least used portion of parking lot.

c. Overflow provisions for flows above design storm

i. Description_____

ii. Capacity/Design Year_____

iii. Design High water Elevation_____

d. The area of the parking lot designated for ponding shall be clearly marked with signs, pavement markings or other appropriate methods to discourage parking during potentially wet weather.

4. Infiltration/Recharge Systems

a. Name and type of soil _____
(soil borings required to verify type of soil)

i. Permeability Rate from Laboratory Soils Analysis or from Field Percolation Tests (indicate rate and method of confirmation).

_____

_____

b. Type of System_____

i. Dimensions_____

c. Overflow provisions for flows above design storm

i. Description_____

ii. Capacity/Design Year_____

iii. Design High water Elevation_____

3. WATER QUALITY

A. WQv Calculation

1. WQv = C X 0.75 X A/12 where

a. C = runoff coefficient appropriate for storms less than 1 inch.

Runoff Coefficients Based on the Type of Land Use

Land Use	Runoff Coefficient
Industrial & Commercial	0.8
High Density Residential (>8 dwellings/acre)	0.5
Medium Density Residential (4 to 8 dwellings/acre)	0.4
Low Density Residential (<4 dwellings/acre)	0.3
Open Space and Recreational Areas	0.2
Where land use will be mixed, the runoff coefficient should be calculated using a weighted average. For example, if 60% of the contributing drainage area to the storm water treatment structure is Low Density Residential, 30% is High Density Residential, and 10% is Open Space, the runoff coefficient is calculated as follows (0.6)(0.3)+(0.3)(0.5)+(0.1)(0.2) = (0.35)	

Alternatively, C may be calculated as follows:

$C=0.858i^3 - 0.78i^2 + 0.774i+0.04$ where i = fraction of drainage area that is impervious.

b. A = area draining into the storm water practice in acres.

c. WQv = water quality volume in acre-feet.

B. Best Management Practices Table

Best Management Practice	Drain Time of WQv
Infiltration Basin or Trench[1]	48 hours
Permeable Pavement – Infiltration[1]	48 hours
Permeable Pavement – Extended Detention	24 hours
Dry Extended Detention Basin[2]	48 hours
Wet Extended Detention Basin[3]	24 hours
Constructed Wetland (above permanent pool)[4]	24 hours
Bioretention Area/Cell[5,6]	24 hours
Sand & Other Media Filtration[5]	24 hours
Pocket Wetland[7]	24 hours

[1]Practices that are designed to fully infiltrate the WQv (basin, trench, permeable pavement) shall empty within 48 hours to provide storage for the subsequent storm events.
[2]Dry basins must include a forebay and micropool each sized at 10% of the WQv.
[3]Provide both a permanent pool and an EDv above the permanent pool, each sized at 0.75*WQv.
[4]Extended detention shall be provided for the WQv above the permanent water pool.
[5]The surface ponding area (WQv) shall completely empty within 24 hours so that there is no standing water. Shorter draw down times are acceptable as long as design criteria in Ohio's Rainwater and Land Development manual have been met.
[6]This would include Grassed Linear Bioretention which was previously called Enhanced Water Quality Swale.
[7]Pocket wetlands must have a wet pool equal to the WQv, with 25% of the WQv in a pool and 75% in marshes. The EDv above the permanent pool must be equal to the WQv.

1. Practices to be designed to facilitate sediment removal, vegetation management, debris control, etc.

2. Outlet for extended detention facility shall not be smaller than 2.5" in diameter (unless protected) and must not discharge more than the first half of the WQv or the EDv in less than one third of the drain time. The EDv is the volume of stormwater runoff that must be detained by a structural post-construction BMP.

   a. EDv = 75% of WQv for wet extended detention.

   b. EDv= 100% WQv for dry extended detention.

C. Redevelopment Projects

1. A project site is considered to be redevelopment if the runoff coefficient stays the same or is reduced. If the runoff coefficient increases, then the site is considered to be a new development.

2. Provide either a 20% net reduction of the site impervious area, or provide treatment for at least 20% of the WQv or a combination of the two. A 1:1 credit towards the 20% net reduction of impervious area can be obtained through the use of green roofs.

3. Where projects are a combination of new development and redevelopment, the total water quality volume that must be treated shall be calculated by a weighted average based on acreage, with the new development at 100 percent water quality volume and redevelopment at 20 percent.

D. Sediment Storage

1. An additional volume equal to 20% of the WQv shall be incorporated into the storm water BMP for sediment storage. Incorporate this volume into sections of the BMP where pollutants will accumulate.

E. Alternative Post-Construction BMPs

1. Applicant to show that alternative BMP is equivalent in pollutant removal and runoff flow/volume reduction

2. Demonstrate equivalency by showing:

a. Alternative BMP has minimum TSS removal efficiency of 80% using the Level II TARP testing protocol.

b. WQv discharge rate reduced to prevent stream bed erosion

c. Entire WQv is recharged to groundwater

d. Development creates less than 1 acre impervious surface

e. Development project is a redevelopment project with an ultra-urban setting where 100% of project area is already impervious surface and discharges to an existing storm sewer.

3. Sites greater than 5 acres require prior approval from Ohio EPA for alternative post-construction BMPs.

4. INSPECTION AND MAINTENANCE AGREEMENT

A. The Inspection and Maintenance Agreement required for storm water management practices shall be a stand alone document between the City of Mentor and the applicant and shall contain the following information and provisions:

1. A schedule for regular maintenance of the storm water management system and a description of routine and non-routine maintenance tasks to ensure continued performance of that system.

2. Identification of the responsible party (landowner(s), organization, or public entity) responsible for long-term maintenance, including repairs, of the storm water management practices.

3. Provisions that the responsible party shall maintain storm water management practices in accordance with this chapter.

4. Provisions that the City of Mentor has the authority to enter upon the property to conduct inspections as necessary to verify that the storm water management practices are being maintained and operated in accordance with this chapter.

B. Alteration or termination of these stipulations is prohibited. The applicant must provide a

draft of this Inspection and Maintenance Agreement as part of the Comprehensive Storm Water Management Plan submittal.

C. Typical City of Mentor Inspection and Maintenance agreement template available at http://cityofmentor.com/departments/engineering-building/

5. WATER RESOURCE CROSSINGS, ODOT Type A Conduits

A. Design: (Refer to Mentor Code of Ordinances, Section 1352.09 B. 6.)

1. Culverts other than bridges shall be able to convey the stream's flow for a minimum 25-year, 24-hour storm for watersheds up to 250 acres and a 50-year, 24-hour storm for watersheds greater than 250 acres.

2. Bridges, open bottom arches or spans are the preferred crossing technique.

3. 25% of the culvert or closed bottom crossing cross sectional area or a minimum of 1 foot of box culverts and pipe arches must be embedded below the channel bed.

4. Minimum inside diameter of pipes to be used for crossings shall be 18 inches.

5. Maximum slope shall be a slope that produces a 10 fps velocity under design flow conditions

   a. Erosion protection and/or energy dissipaters required to properly control entrance and outlet velocities.

6. All culvert installations shall be designed with consideration for the tailwater of the receiving facility or water resource. The tailwater elevation used shall be based on the design storm frequency.

7. Headwalls are required at all culvert inlets or outlets to and from open channels or lakes.

8. Bridges shall be designed in accordance with the current standards of the Ohio Dept. of Transportation.

B. Maximum allowable headwater for design storm:

1. 2' below edge of pavement for drainage areas greater than 1,000 acres.

2. 1' below edge of pavement for drainage areas less than 1,000 acres.

3. 2' below lowest ground elevation adjacent to an occupied building for a 50-year storm.

C. Method used to estimate design discharge (Q):

1. "Estimation of Peak – frequency Relations, Flood Hydrographs, and Volume – Duration – Frequency Relations of Ungaged Small Urban Streams in Ohio" – U.S. Geological Survey, Open – File Report 93-135.

2. Rational Method (Q=CiA), for drainage areas less than 6 acres if there is no defined channel.

D. Topographic information used to delineate drainage areas:_____

E. Manning's "n" used for smooth conduit: 0.013
corrugated conduit: 0.022

F. Entrance loss coefficient ke:

1. Concrete pipe: HW-4 headwall 0.20 Full headwall 0.20

G. Minimum cover from top of pipe to subgrade for:

1. Rigid Pipe 12" 2. Flexible Pipe 24"

H. Maximum cover:

1. Rigid Pipe _____ 2. Flexible Pipe _____

I. Name and type of soil at outlet: _____

J. Headwall type HW-4B preferred Proposed _____

K. Other pertinent design information _____

_____

6. STORM SEWER, ODOT TYPE 'B' AND TYPE 'C' CONDUITS:

A. Design frequency (just full) _____
(2 year duration – minimum)

B. Hydraulic gradient shall:

1. Stay below the gutter flow line of the overlying roadway for 10-year, 24-hour frequency storm.

2. Stay below the top of drainage structures outside the roadway for 10-year, 24-hour frequency storm.

3. The above is based on:

a. Manning's "n" = 0.015 for storm sewers 60" in diameter and under.

b. Manning's "n" = 0.013 for larger storm sewers.

c. The intensity "i" for the last sewer run shall be used to locate the hydraulic gradient for the continuous sewer system.

C. Method used to estimate peak or design discharge, "Q"

1. Rational Method (Q = ciA). Intensity tables included in attached Table II.

2. Coefficient of runoff "c" for:

a. Pavement and paved shoulders: 0.9

b. Berms and slopes 4:1 or flatter: 0.5

c. Berms and slopes steeper than 4:1: 0.7

d. Residential (Single Family) 0.3 – 0.5

e. Residential (Multi-Family) 0.4 – 0.7

f. Woods 0.3

g. Cultivated 0.3 – 0.6

3. Minimum time to:

a. First ditch catch basin: 15 minutes

b. First pavement inlet or catch basin: 10 minutes

D. Minimum Pavement Grade

1. 0.6% desirable minimum

2. 0.4% absolute minimum

3. 0.6% minimum machine controlled grade in cul-de-sacs, etc.

E. Minimum cover over sewers:

1. Reinforced or extra strength pipe

a. Types 'B' and 'C' conduit 12" from top of pipe to subgrade

2. Standard strength pipe

a. Type 'C' conduit 18" from top of pipe to subgrade

3. Thermoplastic Pipe

a. 24" from top of pipe to subgrade

F. Velocity for design flow:

1. 3.0 fps desirable minimum using the "just full" Manning's equation.

2. 2.5 fps absolute minimum using the "just full" Manning's equation.

3. Velocity dissipation devices shall be placed at discharge locations and along the length of the outfall to reduce erosion.

G. Maximum length between manholes or suitable cleanout points:

1. Under 36" diameter 300'

2. 36" and over 500'

H. Minimum pipe size under pavement: 12"

I. Note on plan that when existing private drains (field tile) are cut by proposed sewers or ditches they are to be connected to proposed system.

J. Tailwater of the receiving facility shall be considered in the storm sewer design. The tailwater elevation used shall be based on the design storm frequency.

K. Headwalls required at all storm sewer inlets/outlets to and from open channels/lakes.

L. Other pertinent design information:

_____

_____

7. ROADSIDE DITCHES

A. Method used to estimate peak or design discharges "Q": Rational method (Q = ciA)

B. Design frequency storm to determine:

1. Depth of flow 10 years
2. Velocity Determination 5 years

C. Method to estimate time of flow to ditch: _____

_____

D. Name and type of soil at ditch _____

1. Allowable velocities for:
   a. Seeded lining: 1.5 to 4.5 fps
   b. Sod, jute or other temporary lining 3.0 to 6.0 fps

E. Manning's "n" for:

1. Seeded lining 0.03
2. Sod, jute or other temporary lining 0.04
3. Rock channel protection 0.06

F. Ditch configuration

1. Roadway: trapezoidal
2. Minimum Depth 18"

G. Specify type of ditch catch basin:

1. _____
2. _____

H. Longitudinal slope of ditches in cut sections to follow road grade whenever possible.

1. 2.0% desirable minimum

2. 0.5% absolute minimum

I. Minimum width of ditch lining:

1. Sod 7.5'

2. Temporary 7.5' for matting

J. Design frequency depth of ditch shall not exceed:

1. 12" below edge of pavement

K. Other pertinent design information_____

8. DRAINAGE FOR CURBED PAVEMENTS

A. Controls for the determination of inlet or catch basin spacing:

1. Design frequency using Rational Method _____ (5 year minimum)

2. Time to first inlet or catch basin/method:

a. Time _____ (10 minute minimum)

b. Method _____

3. Maximum spread of flow into traveled lane, design speed <45mph:

a. Two-lane 6 feet

b. Four-lane 8 feet

c. For design speeds >45mph, follow ODOT L&D Volume 2, Drainage Design Procedures.

d. Maximum depth of flow at curb 3¼ inches

e. Roughness coefficient:

i. Reinforced concrete pavement 0.015

ii. Asphalt concrete pavement 0.015

iii. Paved shoulders 0.015

B. Type of inlet or catch basin ** proposed for:

1. Continuous grades _____

2. Sags _____

C. Inlet lip of curb opening inlet to be depressed 2 inches below normal gutter.

A local depression of ½ inch to be used to determine spacing of combination grade and curb opening catch basins.

D. Other pertinent design information

_____

_____

** Storm inlets and catch basin grates shall be of a type designed to permit safe crossing by bicycles.

9. EASEMENTS

A. Easements shall be included with the inspection and maintenance agreement submitted with the storm water management plan.

B. Easements shall be approved by the City Engineer prior to approval of the final plat.

C. Shall be recorded with the County and on all property deeds.

D. Easement width between right of way and storm water management practice to be no less than 20 feet wide.

1. Add additional width as needed around the storm water management practice to permit inspection and maintenance.

E. Easements across lots or along rear lot lines shall be a minimum of ten feet in width.

F. City owned easements shall have restrictions against the construction of buildings, fences, walls, and other structures that may prevent the free flow of storm water or the passage of inspectors and maintenance equipment. Changes of the final grade shall also be restricted.

G. Where a subdivision is traversed by a water course, drainage way, channel, storm conduit, or stream, there shall be provided to the City an area wide drainage easement conforming substantially to the lines of the water course and containing additional width as needed.

H. Easements shall be determined as follows:

1. All storm drainage structures shall be placed on appropriate drainage easements with area wide facilities placed on City owned easements and local service facilities placed on homeowner, owner, or homeowner's association owned easements.

a. Area wide facilities have one or more of the following characteristics:

i. Dedicated public street drainage is dependent upon the area wide facility.

ii. The area wide facility receives upland flows from a defined channel.

iii. The area wide facility serves more than 12 sublots and is more elaborate than a rear yard swale.

iv. The area wide facility is a lake, pond, or basin which is designed to retain substantial storm water beyond the development in which the facility is contained

v. Is an addition to or an improvement of an existing area wide facility.

b. Local service facilities shall include all other facilities not meeting the above area wide drainage facility criteria.

10. OTHER DRAINAGE INFORMATION

A. Floodplain

1. Does site contain a Special Flood Hazard Area as designated by the Federal Emergency Management Agency's report entitled "The Flood Insurance Study for the City of Mentor"?

   If yes, indicate Flood Zone(s) _____
   (Permit Application Form FP-I must be completed)

   a. 100-year base flood elevation*_____ (Include note on plans that the lowest habitable floor elevation (including basements) must be 1.5 feet above 100-year base flood elevations).

2. Does site contain or adjoin a stream or natural swale?_____

   If yes, watercourse name _____ Drainage Area_____

   a. Method used to estimate 100-year peak discharge "Q", U.S. Conservation Service's, TR-20 based hydrology software.

   b. 100-year flood elevation* to be determined by backwater analysis _____ (Include note on plans that the lowest habitable floor elevation (including basements) must be 1.5 feet above 100-year base flood elevations).

B. Wetlands

1. Per Mentor Code of Ordinances, Sections 1133.05 and 1113.02, preliminary site plan and/or plat shall include the location of any jurisdictional wetlands on the site as delineated by an expert acceptable to the U.S. Army Corps of Engineers.

2. Per Mentor Code of Ordinances, Sections 1113.03 and 1133.06, submittal of final site plan and/or plat shall include proof of compliance with State and Federal regulations concerning Ohio EPA NPDES Permits, Ohio EPA Isolated Wetlands Permits, and compliance with Section 401 and 404 of the Clean Water Act as required in Section 1352.07 and 1353.07 of the Mentor Code of Ordinances for the proposed development / subdivision and associated building construction.

C. Residential Construction

1. Downspouts shall outlet onto splashblocks.*

2. If basements will be proposed, information concerning ground water elevations shall be provided. Proposed minimum basement grades shall be shown on overall site plan and shall be 16" above groundwater elevation.

D. Water Well Protection

1. If a subdivision is in close proximity to existing water wells, the location of wells shall be investigated per Section 1117.06. Information is required to determine potential impact of the installation of underground facilities within the subdivision on groundwater serving said wells. In areas of close proximity, groundwater flow barriers may be required in trenches.

11. STORM WATER POLLUTION PREVENTION PLAN, SWP3 (Refer to MCO 1353)

A. Required for:

1. Soil disturbing activities consisting of 1 or more contiguous acres of land.

2. Development areas less than one acre are required to prepare an Abbreviated SWP3 in conformance with Section 1353.10 of the Mentor Code of Ordinances as required by the City Engineer. The plan shall be submitted with the building permit application.

a. An Abbreviated SWP3 is not required for landscaping disturbances of less than 1 Acre of land made upon a single family residential lot on which there exists a dwelling

b. An Abbreviated SWP3 is not required for construction related disturbances of less than one-tenth (1/10) of an acre of land made upon a single family residential lot on which there exists a dwelling.

B. Plan Requirements:

1. Site Description. The SWP3 shall provide:

a. A description of the nature and type of the construction activity (e.g. residential, shopping mall, highway, etc.).

b. 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 offsite borrow areas).

c. An estimate of the impervious area and percent of imperviousness created by the soil disturbing activity. Include a calculation of the runoff coefficients for both the pre-construction and post-construction site conditions.

d. Existing data describing the soil and, if available, the quality of any known pollutant discharge from the site such as that which may result from previous contamination caused by prior land uses.

e. A description of prior land uses at the site.

f. An implementation schedule which describes the sequence of major soil disturbing operations (i.e., grubbing, excavating, grading, utilities and infrastructure installation) and the implementation of erosion and sediment controls to be employed during each operation of the sequence.

g. The location and the name of the immediate receiving stream or surface water(s) and the first subsequent receiving water(s).

h. The areal (plan view) extent and description of wetlands or other special aquatic sites at or near the site which will be disturbed or which will receive discharges from disturbed areas of the project. For discharges to the City's MS4, the point of discharge to the MS4 and the location where the MS4 ultimately discharges to a stream or water resource must be indicated.

i. For discharges to a MS4, the point of discharge to the MS4 and the location where the MS4 ultimately discharges to a water resource shall be indicated.

j. List TMDLs applicable for the site and demonstrate that appropriate BMPs have been selected to address these TMDLs. Mentor has TMDLs for phosphorus, nitrogen, habitat, bacteria, and flow.

k. For subdivided developments where the SWP3 does not call for a centralized sediment control capable of controlling multiple individual lots, a detail drawing of a typical individual lot showing standard individual lot erosion and sediment control practices.

l. Location and description of any storm water discharges associated with dedicated asphalt and dedicated concrete plants associated with the development area and the best management practices to address pollutants in these storm water discharges.

m. A copy of the OEPA permit requirements (attaching a copy of the current Ohio EPA NPDES Construction General Permit is acceptable).

n. A cover page or title identifying the name and location of the site, the name and contact information of all construction site operators, the name and contact information for the person responsible for authorizing and amending the SWP3, preparation date, and the estimated dates that construction will start and be complete.

o. A log documenting grading and stabilization activities as well as amendments to the SWP3, which occur after construction activities commence.

p. Site map showing:

    i. Limits of soil disturbing activity of the site, including off site spoil and borrow areas that are not addressed by a separate Ohio EPA Notice of Intent (NOI) and associated SWP3.

    ii. Soils types depicted for all areas of the site, including locations of unstable or highly erodible soils.

    iii. Existing and proposed 1 foot contours. This must include a delineation of drainage watersheds expected during and after major grading activities as well as the size of each drainage watershed in acres.

    iv. Surface water locations including springs, wetlands, streams, lakes, water wells, etc., on or within 200 feet of the site, including the boundaries of wetlands or stream channels and first subsequent named receiving water(s) the applicant intends to fill or relocate for which the applicant is seeking approval from the Army Corps of Engineers and/or Ohio EPA.

v. Existing and planned locations of buildings, roads, parking facilities, and utilities.

vi. The location of all erosion and sediment control practices, including the location of areas likely to require temporary stabilization during the course of site development.

vii. Sediment and storm water management basins, including their sediment settling volume and contributing drainage area.

viii. The location of permanent stormwater management practices to be used to control pollutants in stormwater after construction operations have been completed.

ix. Areas designated for the storage or disposal of solid, sanitary and toxic wastes, including dumpster areas, areas designated for cement truck washout, and vehicle fueling.

x. The location of designated stoned construction entrances where the vehicles will ingress and egress the construction site.

xi. The location of any in-stream activities including stream crossings.

q. A description of the controls appropriate for each construction operation and the applicant must implement such controls. The SWP3 must clearly describe for each major construction activity the: (a) appropriate control measures and the general sequence during the construction process under which the measures will be implemented; and (b) which contractor is responsible for implementation.

r. A soils engineering report, if required by the City Engineer, based on adequate and necessary test borings with the information listed below

i. Data regarding the nature, distribution, strength, and erodibility of existing soils.

ii. If applicable, data regarding the nature, distribution, strength, and erodibility of the soil to be placed on the site.

iii. Conclusions and recommendations for grading procedures.

iv. Conclusions and recommended designs for interim soil stabilization devices and measures, and for permanent soil stabilization after construction is completed.

v. Design criteria for corrective measures when necessary.

vi. Opinions and recommendations covering the stability of the site.

C. Compliance with State and Federal Regulations: All SWP3 submittals are required to show proof of compliance with State and Federal Regulations as noted below:

1. Ohio EPA NPDES Permits: Proof of compliance shall be the applicant's Notice of Intent (NOI) number from Ohio EPA, a copy of the Ohio EPA Director's Authorization Letter for the NPDES Permit, or a letter from the site owner certifying and explaining why the NPDES Permit is not applicable.

2. Section 401 of the Clean Water Act: Proof of compliance shall be a copy of the Ohio EPA Water Quality Certification application tracking number, public notice, project approval, or a letter from the site owner certifying that a qualified professional has surveyed the site and determined that Section 401 of the Clean Water Act is not applicable.

3. Ohio EPA Isolated Wetland Permit: Proof of compliance shall be a copy of Ohio EPA's Isolated Wetland Permit application tracking number, public notice, project approval, or a letter from the site owner certifying that a qualified professional has surveyed the site and determined that Ohio EPA's Isolated Wetlands Permit is not applicable.

4. Section 404 of the Clean Water Act: Proof of compliance shall be a copy of the U.S. Army Corps of Engineers Individual Permit application, public notice, or project approval, if an Individual Permit is required for the development project. If an Individual Permit is not required, the site owner shall submit proof of compliance with the U.S. Army Corps of Engineer's Nationwide Permit Program. This shall include one of the following:

   a. A letter from the site owner certifying that a qualified professional has surveyed the site and determined that Section 404 of the Clean Water Act is not applicable.

   b. A site plan showing that any proposed fill of waters of the United States conforms to the general and special conditions specified in the applicable Nationwide Permit.

D. Performance Standards:

1. CONTRACTOR RESPOSIBILITY: A written document containing the signatures of all contractors and subcontractors involved in the implementation of the SWP3 acknowledging that they reviewed and understand the conditions and responsibilities of the SWP3 shall be maintained at the job site. The document shall be created and signatures shall be obtained prior to commencement of work on the construction site.

   a. The SWP3 shall be amended whenever there is a change in design, construction, operation or maintenance, which has a significant effect on the potential for the discharge of pollutants to surface waters of the State or if the SWP3 proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with the construction activity.

2. NON-STRUCTURAL PRESERVATION MEASURES: Preserve the existing natural condition to the maximum extent practicable.

3. EROSION CONTROL PRACTICES: The SWP3 shall make use of erosion controls that are capable of providing cover over disturbed soils. Provide specifications/details of control practices used in the SWP3. Provide specifications/details for site restoration in the SWP3. Refer to the following tables for stabilization time frames:

Table 1: Permanent Stabilization

Area requiring permanent stabilization	Time frame to apply erosion controls
Any areas that will lie dormant for one year or more.	Within 7 days of the most recent disturbance.
Any areas within 50 feet of a surface water of the State and at final grade.	Within 2 days of reaching final grade.
Any other areas at final grade.	Within 7 days of reaching final grade within that area.

Table 2: Temporary Stabilization

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed area within 50 feet of a surface water of the State and not at final grade.	Within 2 days of the most recent disturbance if that area will remain idle for more than 14 days.
For all construction activities, any disturbed areas that will be dormant for more than 14 days but less than one year, and not within 50 feet of a surface water of the State.	Within 7 days of the most recent disturbance within the area. For residential subdivisions, disturbed areas must be stabilized at least seven days prior to transfer of permit coverage for the individual lot(s)
Disturbed areas that will be idle over winter.	Prior to the onset of winter weather.
Note: Where vegetative stabilization techniques may cause structural instability or are otherwise unobtainable, alternative stabilization techniques must be employed. These techniques may include mulching or erosion matting.	

4. RUNOFF CONTROL PRACTICES: Consider rock check dams, pipe slope drains, or diversions to redirect flow away from disturbed areas where practical.

5. PERMANENT STABLIZATION OF CONVEYANCE CHANNELS: Undertake special measures to stabilize channels and outfalls and prevent erosive flows. Refer to *Rainwater and Land Development.*

6. SEDIMENT CONTROL PRACITCES

   a. Provide details for all structural practices that store runoff. **Refer to *Rainwater and Land Development* for standard details.** All practices must be able to pond water to be considered functional.

   b. Sediment control structures shall be functional throughout the course of earth disturbing activity. Implement prior to initiation of grading and within 7 days from the start of grubbing. They shall continue to function until the up-slope development area is restabilized.

   c. Sediment Ponds

      i. Required for concentrated runoff, runoff that exceeds the design capacity of silt fence, inlet protection, or other sediment barriers and all areas that disturb 10 or more acres of common drainage area.

      ii. The sediment settling pond shall be dewatered at the pond surface using a skimmer or equivalent device.

      iii. Provide both a sediment storage zone and dewatering storage zone.

         1. 67 cy (1800 cu-ft)/acre for dewatering zone.

         2. 1000 cu-ft/acre required for sediment storage.

iii. 48 hour draw down time for basins serving 5 acres or more.

iv. Depth of dewatering zone less than or equal to 5 feet.

v. Minimum 2:1 length to width ratio. 4:1 ratio recommended.

vi. Remove sediment from basin when the sediment storage zone is full.

vii. Consider public safety in design.

c. Silt Fence (or other devices to control sheet flow runoff)

i. Install on level contour.

ii. Shall be capable of ponding water.

iii. Maximum drainage area to silt fence as defined in the following table and may receive storm water runoff from areas up to 10 acres:

Table 3: Maximum Drainage Area to Silt Fence

Maximum Drainage Area (acres) to 100 linear feet of silt fence	Range of Slope for a drainage area (%)
0.5	<2%
0.25	≥ 2% but < 20%
0.125	≥ 20% but < 50%

d. Inlet Protection

i. Mandatory to prevent sediment laden water from entering storm inlets.

ii. Shall be capable of ponding water.

iii. Straw or hay bales are not acceptable.

iv. Inlets receiving drainage from 1 or more acres will require a sediment settling pond.

e. Off Site Tracking of Sediment and Dust Control

i. Construction entrance for site is required. Must comply with specification found in *Rainwater and Land Development.*

ii. Streets adjacent to the construction site to be cleaned daily or more frequently if needed. Catch basins nearest to construction entrances to be cleaned weekly and protected from sediment, if feasible without posing public safety hazard.

iii. Silt fence or construction fence around perimeter of development area to ensure traffic adheres to designated construction entrances.

iv. Designated wheel washing areas may be required. No surfactants or detergents may be used to wash vehicles.

v. Use water trucks or temporary site stabilization for dust control.

f. Surface Waters of the State Protection

i. A 50 foot undisturbed natural buffer shall be provided around surface waters of the state unless infeasible. Buffer area shall be delineated in the field with construction fencing or silt fence prior to earth disturbing activity.

ii. If it is infeasible to maintain an undisturbed 50-foot natural buffer, comply with stabilization methods for disturbances within 50 feet of a surface water.

iii. Temporary stream crossings shall be constructed if streams will be crossed by construction equipment during construction. Stream crossings shall be designed as specified in the most current version of *Rainwater and Land Development.*

iv. Structural sediment controls shall not be used in streams or water resources.

v. Number of stream crossings for development site to be minimized.

vi. Temporary crossings shall be constructed if water resources or wetlands will be crossed by construction vehicles.

vii. Construction of bridges, culverts or sediment control structures shall not place soil or debris into or close to water resources or wetlands such that it may slough, slip or erode.

viii. Concentrated storm water runoff to wetlands shall be converted to diffuse flow

g. Non Sediment Pollutant Control

i. Provide a covered dumpster for garbage and other waste materials.

ii. Provide a designated concrete truck washout area. Identify washout area with signage.

iii. Discharge of washout and cleanout of stucco, paint, form release oils, curing compounds, and other materials to the MS4 and waters of the state is prohibited

iv. Provide a designated fuel storage area.

v. Toxic or hazardous waste material shall be disposed of properly

vi. Contaminated soils from redevelopment sites shall be disposed of properly

h. Trench and Groundwater Control

i. Filter sediment laden trench or groundwater through a sediment settling pond or equally effective practice before it leaves the site.

ii. Clean ground water is not required to be treated.

6. Inspections

a. Contractor to assign qualified personnel to perform inspections.

b. All controls to be inspected once every seven calendar days and within 24 hours after a ½ inch storm event.

c. Inspections may be reduced to once/month if entire site is temporarily stabilized or runoff is unlikely due to weather conditions (i.e., site is frozen).

d. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of or the potential for pollutants entering the drainage system.

e. Inspection forms shall contain the following information:

i. Inspection date.

ii. Name, title and qualification of inspector.

iii. Weather information for the period since the last inspection, including the best estimate of the beginning of each storm event, duration of each storm event and approximate rainfall amounts in inches and whether any discharges occurred.

iv. Weather information and a description of discharges occurring at the time of the inspection.

v. Locations of discharges of sediment or other pollutants from the site.

vi. Locations of BMPs that need to be maintained.

vii. Locations of BMPs that failed to operate as designed or proved inadequate.

viii. Locations of any additional BMPs needed that did not exist at the time of the inspection.

ix. Locations where vehicles enter or exit the site shall be inspected for off-site tracking.

7. Maintenance of BMPs

a. Provide a description of the maintenance procedures for sediment controls to be employed.

b. Repair and Maintenance:

i. Practices other than sediment ponds – within 3 days of the inspection.

ii. Sediment Ponds – within 10 days of the inspection.

b. Failed or Inadequate BMPs

i. Amend SWP3 to show new more appropriate BMP and install new BMP within 10 days of inspection.

c. Uninstalled BMPs

i. Implement per the SWP3 within 10 days of the inspection or document why practice is not needed on SWP3.

8. Final Stabilization

a. All soil disturbing activity at the site is completed.

b. 70% coverage of perennial vegetation over site.

E. Abbreviated SWP3

1. Plan Requirements

a. Provide location of construction entrance.

b. Provide location of concrete truck washout.

c. Provide notes that street will be cleaned daily or more frequently if needed.

d. Provide locations of silt fence and inlet protection.

e. Provide details for site stabilization (see stabilization tables above).

f. Provide notes for required site inspections and maintenance of BMPs (see inspection and maintenance requirements above).