ERIE COUNTY

STORMWATER MANAGEMENT RULES, REGULATIONS

AND

EROSION CONTROL

SEPTEMBER, 2014
REVISED EDITION

JDF

RESOLUTION NO. 14-445

RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF ERIE COUNTY, OHIO, FOR THE PURPOSE OF ESTABLISHING A STORMWATER MANAGEMENT PLAN REVIEW FEE SCHEDULE

The Board of County Commissioners of Erie County, Ohio, met this 11th day of September, 2014, in regular session with the following members present:

William J. Monaghan and Patrick J. Shenigo.

Mr. Shenigo introduced the following resolution and moved its adoption.

BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF ERIE COUNTY, OHIO:

THAT, this Board hereby establishes a Stormwater Management Plan Review Fee Schedule for Stormwater Erosion Control Permits through the Erie County Engineer's Office and the Erie Soil and Water Conservation District, effective October 13, 2014, according to the provisions as outlined in the attached document; and

THAT, this Board of County Commissioners hereby finds and determines that all formal actions relative to the adoption of this resolution were taken in an open meeting of this Board; and that all deliberations of this Board and of its committees, if any, which resulted in formal action, were taken in meetings open to the public in full compliance with applicable legal requirements, including Section 121.22 of the Revised Code.

Mr. Monaghan seconded the motion for the adoption of said resolution; and the roll being called upon its adoption, the vote resulted as follows:

Roll Call: Mr. Shenigo, Aye; Mr. Monaghan, Aye; Mr. Ferrell, Absent

Adopted: September 11, 2014

CERTIFICATE

I, Carolyn L. Hauenstein, Clerk of the Board of County Commissioners of Erie County, Ohio, hereby do certify that the above is a true and correct copy of resolution adopted by said Board under said date, and as same appears in Commissioners' Journal Volume #200.

Carolyn L Hauenstein Clerk
Board of County Commissioners
of Erie County, Ohio

Approved by County Administrator
Peter S. Daniel

PLAN REVIEW FEE SCHEDULE

Erie County Engineer's Office Fee

1. PLAN REVIEW FEE: $100 or 0.50% of the cost estimate

   Upon submittal of a stormwater management plan that involves construction of stormwater management facilities, the applicant shall submit design calculations, quantities and itemized cost estimates for the project, prepared and stamped by a Professional Engineer to the ECEO for review and approval. A certified check in the amount of $100.00 or 0.50% of the cost estimate, whichever is greater, shall be made payable to the Erie County Engineer to offset the cost of plan review. Plans requiring resubmittal and additional review time may be charged on an hourly basis over and above the initial fee if the ECEO determines it is necessary due to the amount of additional review time needed.

2. STORMWATER EROSION CONTROL PERMIT FEE: $25.00

   Upon plan approval by the ECEO and ESWCD and payment of all review fees a Stormwater Erosion Control Permit can be issued by the ECEO at a cost of $25.00. Once the permit has been issued earthmoving activities may commence.

No permit fee will be required for activities, which are covered in an approved stormwater management plan (i.e. home construction on a lot in a subdivision with an approved stormwater management plan) providing the plan is complied with.

Erie Soil & Water Conservation District Fee

1. Upon submittal of the Stormwater Pollution Prevention Plan (SWP3) to the ESWCD a fee shall be required based on the area of disturbance of soil using the following criteria:

   A. Equal to 1,000 square feet but less than 1 acre……$300.00
   B. Greater than 1 acre but less than 5 acres……$600.00
   C. 5 acres and larger……$1,000.00

The fees are based on plan review, site visits for inspection to ensure compliance with the regulations and the required record keeping by the respective offices.

December, 2024
Revised Edition

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RESOLUTION NO. 14-446

RESOLUTION OF THE BOARD OF COUNTY COMMISSIONERS OF ERIE COUNTY, OHIO, FOR THE PURPOSE OF REVISING THE ERIE COUNTY STORMWATER MANAGEMENT RULES, REGULATIONS AND EROSION CONTROL MANUAL

The Board of County Commissioners of Erie County, Ohio, met this 11th day of September, 2014, in regular session with the following members present:

William J. Monaghan and Patrick J. Shenigo.

Mr. Shenigo introduced the following resolution and moved its adoption.

WHEREAS, the Board of Erie County Commissioners adopted the Stormwater Management Rules, Regulations and Erosion Control Manual on November 28, 1994, under Resolution No. 94-351, amended on October 23, 2008, under Resolution No. 08-476, and again on July 11, 2013 by Resolution No. 13-318; and

WHEREAS, it has been determined that these rules and regulations are in need of further revision;

WHEREAS, per Ohio Revised Code Section 307.79 (B), public hearings were held on September 4 and September 11, 2014; **NOW THEFORE**,

BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF ERIE COUNTY, OHIO:

THAT, this Board hereby adopts the revised Erie County Stormwater Management Rules, Regulations and Erosion Control Manual to include the Ohio Revised Code Sections related to stormwater management and language regarding the enforcement of regulations in order to meet Ohio EPA requirements; and removing the fee schedule from the manual, according to the provisions as outlined in the attached document; and

THAT, amendments to the Stormwater Management Rules, Regulation and Erosion Control Manual will become effective October 13, 2014; and

THAT, this Board of County Commissioners hereby finds and determines that all formal actions relative to the adoption of this resolution were taken in an open meeting of this Board; and that all deliberations of this Board and of its committees, if any, which resulted in formal action, were taken in meetings open to the public in full compliance with applicable legal requirements, including Section 121.22 of the Revised Code.

Mr. Monaghan seconded the motion for the adoption of said resolution; and the roll being called upon its adoption, the vote resulted as follows:

Roll Call: Mr. Shenigo, Aye; Mr. Monaghan, Aye; Mr. Ferrell, Absent

Adopted: September 11, 2014

CERTIFICATE

I, Carolyn L. Hauenstein, Clerk of the Board of County Commissioners of Erie County, Ohio, hereby do certify that the above is a true and correct copy of resolution adopted by said Board under said date, and as same appears in Commissioners' Journal Volume #200.

Carolyn L Hauenstein Clerk
Board of County Commissioners
of Erie County, Ohio

Approved by County Administrator
Peter S. Daniel

stormwater management rules-revision/clh

CHAPTER ONE

GENERAL PROVISIONS

Section 1.00 Authority and Title

These rules and regulations have been developed under authority of chapter 307.79 of the Ohio Revised Code.

The official title of these rules shall be known as the "Erie County Stormwater Management Rules and Regulations." However, simply "Stormwater Rules and Regulations" may be used as a short title.

Authority to administer and enforce these regulations is hereby delegated to the Erie County Engineer and the Erie Soil and Water Conservation District and their duly authorized representatives by the Board of Erie County Commissioners by Resolution No. 14-446 dated September 11, 2014.

Section 1. 10 Purpose

The Board of the Erie County Commissioners has adopted Stormwater Management Rules and Regulations to provide information to the general public on stormwater policy and design practices, assist developers, engineers, public officials, and county staff in the review and approval of development proposals. It is the purpose of this document to establish feasible and economically reasonable standards to achieve a level of management and conservation practices to prevent flooding, streambank erosion, and water quality degradation that may result from stormwater run-off in conjunction with non-farm earth-disturbing activities of development and redevelopment projects.

It is the specific intent of these rules and regulations to:

a. Permit development without increasing downstream flooding, erosion or sedimentation.

b. Reduce damage to receiving streams and impairment of their capacity, which may be caused by increases in the quantity and/or rate of water discharged.

c. Reduce negative impacts to receiving streams and impairment of their EPA designated uses of water quality goals as stated in an approved TMDL report, which may be caused from run-off resulting from development and redevelopment projects.

d. Establish a basis for the design of all storm drainage systems, which will preserve the rights and options of both the dominant and subservient property owners and help assure the long-term adequacy of storm drainage systems.

Section 1.20 Applicability

These rules and regulations shall apply to all non-farm, earth-disturbing activities within the unincorporated areas of Erie County and those municipalities and villages that have duly adopted these regulations, (excepting those activities outlined in Section 1.30 of this text).

Section 1.30 Scope

Stormwater Management Rules and Regulations shall apply to all non-farm earth-disturbing activities performed on the unincorporated lands of Erie County, Ohio except those activities as outlined in Chapter 307.79 of the Ohio Revised Code and as follows:

a. Strip mining operations regulated under Chapter 1513.01 of the Ohio Revised Code.

b. Surface mining operations regulated under Chapter 1514.01 of the Ohio Revised Code.

c. Public transportation, utilities and drainage improvements or maintenance thereof undertaken by a government agency or political subdivision in accordance with a statement of their standard policies that have been approved by the Board of Erie County Commissioners or the Chief of the Division of Soil and Water Conservation.

d. Earth disturbing activities involving less than 1,000 square feet.

Section 1.31 Requirements

<u>Residential</u>

a. Any entity performing an earth-disturbing activity on 1 residential or 1 acre lot is required to submit a Stormwater Management Erosion Control Permit Application (PA) and may be required to submit a drainage plan or a stormwater/erosion control plan. A determination as to what type of needed compliance practice will be made by the County Engineer's Office representative (ECEO) upon review of the PA.

b. Any entity performing an earth-disturbing activity, which will consist of 5 lots or more regardless of size, shall submit a PA and shall comply with the Erie County Subdivision Regulations (ECSR) currently in effect.

c. Any entity performing an earth-disturbing activity, which will create a minor subdivision, shall submit a stormwater/erosion control plan with a PA. The plan shall be configured in plat form so that it can be recorded and shall contain the following:

- Plan and profile of the storm sewer lines.
- Plan and profile of the detention basin if required.
- Design calculations and drawing details for water quality improvements.
- Design calculations of all of the storm water management facilities.
- A catch basin located such that each lot has access to it without trespassing on adjoining property.
- Planned water quality improvement practices highlighted to meet specific water quality goals of project and schedule for implementation and maintenance.
- Planned erosion control practices and schedule for implementation and maintenance.
- Easements that cover the improvements and wording to allow access to the entire storm water management system for maintenance by any and all owners within the development the cost of which is borne by the individual(s) performing and/or requiring the maintenance/repairs.
- A stamp and signature of the designing Professional Engineer (PE) licensed in the state of Ohio.

The improvements must be installed and the plat/plan recorded prior to any residential construction commencing unless all of the following conditions are met:

1. The plat/plan has been recorded.

2. Financial guarantees are in place and approved by the ECEO to cover all the costs of the stormwater/erosion control improvements.

3. A contractor has been hired to install the improvements as per plan and has given written documentation to that effect.

Commercial/Industrial

a. Any entity performing an earth-disturbing activity on a parcel of land with the intent of creating a commercial or industrial site is required to submit a PA and a detailed site plan with the following:

- Existing land grade elevations.
- Proposed finished grade elevations.
- Plan and profile of proposed storm sewers.
- Plan and profile of proposed detention basins.
- Design calculations and drawing details for water quality improvements.
- Design calculations for all of the storm water management facilities.
- A stamp and signature of the designing PE.
- Planned water quality improvement practices highlighted to meet specific water quality goals of project and schedule for implementation and maintenance.
- Planned erosion control practices and schedule for implementation and maintenance.

b. Any entity performing a change on an existing commercial/industrial site shall submit PA and a detailed site plan. If the site lacks the required stormwater management system it shall be brought up to compliance. The same requirements from Item (a) shall apply. If the ECEO representative, upon appeal from the site engineer, determines that due to the conditions and latent circumstances with the site full compliance cannot be met then the ECEO representative shall define what goals must be met.

Section 1.32 Waivers

In the event there is a proposed earth-disturbing activity that will not result in a net increase of volume or rate of runoff, the developer may submit a written waiver request to the County Engineer. This request must include sufficient data to determine that granting of the waiver will not violate the provisions of these regulations. However, water quality standards shall still be met should a waiver under this section be granted.

Section 1.40 Plan Review

The ECEO shall review the stormwater management plan or drainage plan within thirty (30) days of receipt and indicate approval or disapproval to the applicant.
The ESWCD shall review the Storm Water Pollution Prevention Plan (SWP3) for compliance to these regulations and for compliance to the Phase II Clean Water Act where applicable. Their comments shall be forwarded to the ECEO and the owner/developer. Deficiencies noted shall be included in the ECEO notice to the owner/developer.

The notice of disapproval shall specify the deficiencies identified in the plan and the procedure for filing a revised plan. Earth-disturbing activities shall not begin until the deficiencies have been addressed and final approval has been issued.

The ECEO may review and comment on recommendations to the proposed plan from the Erie Soil and Water Conservation District (ESWCD) and the Erie Regional Planning Commission (ERPC). The ECEO shall be responsible for review and approval of all hydrological data and runoff calculations, as well as, design and construction inspection for all stormwater management facilities.

Section 1.41 Permits

Permit Application (PA) forms will be made available in the Office of the Erie County Engineer. Preliminary information shall be sufficient for the ECEO to determine if a stormwater management or drainage plan is necessary and that the information demonstrates an effort to comply with these regulations. At a minimum the application shall include the following:

1. Name, address and phone number of property owner or other person responsible for the activity.

2. Location of the activity.

3. Description of the activity including.

    a. Type of activity

    b. Area to be disturbed

    c. Area to be rendered permanently impervious

    d. Size of parcel or lot on which activity will occur

    e. Name of stream or tributary where stormwater discharge will occur.

4. If it is determined that no plan is required, the County Engineer may require a signed statement that the responsible person will comply with these rules and regulations.

The ECEO will review the permit application and if no stormwater management plan or drainage plan is required, a permit will be issued within thirty (30) working days.

In the event that a plan is required, the permit will be issued upon approval of detail design, payment of required review and inspection fees and posting of required bonds.

Section 1.42 Fees

A fee schedule of all current fees, including Plan Review Fees, Permit Fees, and Field Inspection Fees is available at the ECEO. Applicants may call ECEO for the current fee schedule or view it at www.eriecounty.oh.gov/printable-forms/engineerhighway-forms/. Fees are payable by certified check to the entity indicated in the following sections.

Plan Review Fees

a. Upon submittal of a stormwater management plan that involves construction of stormwater management facilities, the applicant shall submit design plan, quantities and itemized cost estimates for the project, prepared and stamped by a Professional Engineer to the ECEO for review and approval. A certified check in the amount of the current fee, shall be made payable to the Erie County Engineer to offset the cost of plan review. Plans requiring resubmittal and additional review time may be charged on an hourly basis over and above the initial fee if the ECEO determines it is necessary due to the amount of additional review time needed.

b. Upon submittal of the SWP3 to the ESWCD the current fee shall accompany the plans made payable to the ESWCD. This fee also covers site inspection and documentation to insure that the owner/developer complies with the approved plans and that the Best Management Practices (BMPs) are constructed and maintained.

Permit Fees

The permit fee shall be paid to the Erie County Engineer when the permit is issued. The permit shall be issued upon final approval of the construction plans and payment of the review fee has been received.

No permit fee will be required for activities, which have been covered in an approved stormwater management plan (i.e. home construction on a lot in a subdivision with an approved stormwater management plan).

Field Inspection Fees

a. All field inspection to assure construction is in conformance with the approved plans, shall be charged to the developer on an hourly basis. These fees shall be paid to the County Engineer.

   If the stormwater management facilities to be constructed are part of a subdivision developed under the "Subdivision Regulations and Improvement Standards for Erie County, Ohio" and inspection fees for the stormwater management facilities are included under said regulations then those provisions shall be utilized with the plan review fees determined as above.

b. If the stormwater management facilities to be constructed are part of a subdivision being developed under municipal subdivision regulations, the Engineer of Jurisdiction is hereby authorized by the County Commissioners to review, inspect and enforce these regulations. The Engineer of Jurisdiction is further authorized to establish and to collect a fee to cover the costs of such services.

Section 1.43 Financial Assurance

a. The developer may be required to provide a 100% performance, or surety bond, a verified letter of credit, or a deposit of cash or equivalent, to guarantee the proper completion of the stormwater drainage facilities and control structures included in the approved plans. The sufficiency of the bond shall be approved by the ECEO and the County Prosecutor shall approve the form of the security given.

b. Storm drainage facilities and control structures constructed as part of a subdivision under the Subdivision Regulations of Erie County the subdivision regulations shall apply. They shall be subject to the bonding requirements therein and these requirements shall be waived.

c. If acceptable financial assurance can be demonstrated by use of another regulation, this section shall be waived.

d. When the development requires public water supply, water service meters shall not be installed, nor water turned on until all drainage improvements, as shown on the approved construction plans, are installed, inspected and approved by the ECEO.

Section 1.44 Notice of Commencement of Activity

Any entity required to submit a Permit Application pursuant to Section 1.31 of these Regulations shall notify the ECEO at least three days prior to the commencement of the

activity for which an application is required to be filed. Failure to provide this notice is a violation subject to the provisions of Section 1.52.

Section 1.50 Inspection and Compliance

The Erie County Engineer or its designated representative shall inspect land disturbance activities to determine compliance with these rules and regulations. If it is determined that a violation of these rules and regulations exists, the ECEO or its designated representative shall notify the responsible person of the deficiencies or noncompliance construction shall cease until the issues are corrected. Should the developer disagree with the decision of the ECEO or its designated representative, an appeal can be filed with the Erie County Commissioners. If the requests of the County Engineer are not recognized and the Commissioners determines a violation exists, they shall file a written request with the Erie County Prosecutor's Office to seek an injunction or other appropriate measure to assure compliance with these regulations. Relief granted through the court may require construction of additional control measures, as per Section 307.79 O.R.C.

Submittal of the Application expressly grants, for inspection purposes, permission for ingress and egress on the subject premises to the Erie County Commissioners and their appointed agency, the Erie County Engineer and its designated representatives for continuous inspection, as per Section 307.79 of the Ohio Revised Code.

Section 1.51 Stormwater, Sediment, and/or Water Quality Complaint

Upon receipt of a complaint, the County Engineer's Inspector shall inspect the site and follow the procedures as outlined in Section 1.50. Following the inspection, a report shall be filed with the County Commissioners and a copy shall be sent to complainant on findings.

During the complaint review, the County Engineer may request the assistance of the Erie Soil and Water Conservation District and the Erie Regional Planning Commission.

Section 1.52 Enforcement and Penalties

Section 307.79 of the ORC authorizes enforcement of these regulations. When violations and/or noncompliance have been determined and the owner/developer fails to take appropriate measures to come into compliance enforcement options shall be utilized as outlined in Section 307.79 of the ORC. This section provides for issuance of stop work orders and daily fines of up to five hundred dollars ($500.00) per violation.

a. The Board of County Commissioners of Erie County, Ohio, or its duly authorized representative or designee (collectively, "Board") may, upon identification to the

owner or person in charge, enter any land upon obtaining agreement with the owner, tenant or manager of the land in order to determine whether there is compliance with these Rules and Regulations. If the Board is unable to obtain such an agreement, it may apply for, and a judge of the Erie County Common Pleas Court may issue, an appropriate inspection warrant as necessary to achieve the purposes of these Rules and Regulations.

b. If the Board determines that a violation of the Rules and Regulations exists it may issue an immediate Stop Work Order if the violator failed to obtain any federal, state or local permit required for sediment and erosion control, earth movement, clearing or cut and fill activity.

c. In addition, if the Board determines a violation of the Rules and Regulations exists, regardless of whether or not the violator has obtained the proper permits, it may authorize the issuance of a Notice of Violation. If, after thirty days following the issuance of the Notice of Violation, the violation continues, a second Notice of Violation shall be issued.

d. If, after a period of fifteen days following the issuance of the second Notice of Violation, the violation continues, the Board may issue a Stop Work Order after first obtaining the written approval of the Erie County Prosecuting Attorney if, in the opinion of the prosecuting attorney, the violation is egregious.

e. Once a Stop Work Order is issued, the Board shall request, in writing, the Erie County Prosecuting Attorney to seek an injunction or other appropriate relief in the Court of Common Pleas to abate excessive erosion or sedimentation and secure compliance with these Rules and Regulations. If the prosecuting attorney seeks an injunction or other appropriate relief, then, in granting relief, the Erie County Court of Common Pleas may order the construction of sediment control improvements or implementation of other control measures and may assess a civil fine of not less than one hundred or more than five hundred dollars. Each day of violation of the Rules and Regulations or a Stop Work Order shall be considered a separate violation subject to a civil fine.

f. The person to whom a Stop Work Order is issued may appeal the order to the Erie County Court of Common Pleas, seeking any equitable or other appropriate relief from that order.

g. No Stop Work Order shall be issued under this section against any public highway, transportation, or drainage improvement or maintenance project undertaken by a government agency or political subdivision in accordance with a statement of its standard sediment control policies that is approved by the Board or the Chief of the Division of Soil and Water Conservation in the Department of Natural Resources.

h. No person shall violate any rule adopted or order issued under this section. Notwithstanding any provision of subsections b through g, of this section, if the Board determines that a violation of any rule adopted or administrative order issued under this section exists, the Board may request, in writing, the Prosecuting Attorney of Erie County to seek an injunction or other appropriate relief in the Court of Common Pleas to abate excessive erosion or sedimentation and secure compliance with the rules or order. In granting relief, the Court of Common Pleas may order the construction of sediment control improvements or implementation of other control measures and may assess a civil fine or not less than one hundred or more than five hundred dollars. Each day of violation of a rule adopted or administrative order issued under this section shall be considered a separate violation subject to a civil fine.

Section 1.60 Relationship to Subdivision Regulations

These rules and regulations are included in the Subdivision Regulations of Erie County. A subdivision plat prepared in conjunction with a stormwater management or drainage plan, shall include the necessary covenants and restrictions to assure compliance to these regulations and conformance to the approved stormwater management or drainage plan(s).

Section 1.61 Severability

If any clause, section or provision of these rules and regulations are declared invalid or unconstitutional by a court of competent jurisdiction, validity of the remainder shall not be affected thereby.

CHAPTER TWO

STORMWATER CONVEYANCE & RUNOFF CONTROL

Section 2.00 Purpose

This section provides criteria and guidance requirements for planning and designing stormwater conveyance and control systems. Properly designed stormwater facilities provide many necessary, beneficial services to developing areas. Services provided are reduction and prevention of flooding, streambank erosion, and water quality impairment in downstream areas. While separate design criteria are provided for stormwater quantity and quality control facilities, proper design can integrate these measures into a single facility.

Section 2.10 Preparing a Stormwater Management Plan

A Stormwater Management Plan is required on all developments. The planning process is one which should provoke thought and consideration of management alternatives relative to stormwater early in the overall site development process.

Section 2.10.1 Data Collection

Inventory the existing site conditions to gather relevant information to develop an effective stormwater management plan. The information obtained should be plotted on a map and included with the calculations portion of the plan.

a. Topography
A 200-scale topographic map of the site should be prepared to show the existing elevations at two-foot (2') intervals unless directed by the ECEO to provide additional information. When drainage areas are large and include areas off-site, USGS quadrangle maps may be used to show these off-site drainage areas. (Note: 2' contour interval maps are on file at the ECEO).

b. Drainage
All existing streams, drainage swales, and tile shall be located and clearly marked on the topographic map. It is also important to illustrate areas that exhibit potentially critical drainage hazards.

c. Soils
Major soil type(s) on the site should be determined and shown on the topographic map. Soil information can be obtained from the Soil Survey of Erie

County, issued January 2006. Soil information should be plotted directly onto the map or an overlay of the same scale for ease of interpretation.

d. Designated Floodplain
Designated 100-year floodplain boundaries established by the Federal Emergency Management Agency (FEMA) shall be plotted directly onto the map or an overlay of the same scale for ease of interpretation where applicable. If no portion of the site is located within a designated 100-year floodplain a notation of such shall be made on the map.

e. Existing Vegetation
The existing vegetation on the site should be shown on the topographic map. Such features as tree clusters, grassy areas and unique vegetation should be located on the map. In addition, existing denuded or exposed soil areas should be indicated on the map.

Section 2.10.2 Runoff Calculations Before Development

With the completion of the Data Collection activity the peak rate of runoff and runoff volume for the pre-development situation can be determined for a five (5) year 24-hour storm.

Section 2.10.3 Preliminary Site Design

Properly designed site layouts created with consideration of existing natural features can often reduce the need for additional structures. The primary goal of developing the site layout for stormwater management is to identify areas of critical importance (ie. Riparian zones, critical vegetation, existing drainage, etc.) and develop ways to avoid and preserve them as designated open space. It is the intention of this section to provide guidance for designing the layout of the proposed project through analysis of collected data.

a. Topography
The primary topography considerations are the steepness of the slopes and their length. Because of the adverse effect of these two types of slopes, or one that exhibits both characteristics on run-off, special design for erosion control, sedimentation and water quality is needed. BMPs for slope protection will be an important part of the plan as well as their scheduled implementation in the overall site construction sequence. Careful planning should be taken to limit soil disturbance in these areas as much as possible.

b. Natural Drainage
Natural drainage patterns including swales and ephemeral drainage without defined channels provide valuable stormwater benefits, as such they shall be

identified on the plan so they can be incorporated into the proposed drainage system. Where possible, natural drainage ways shall be used to convey the runoff to avoid the expense and problems of constructing artificial drainage systems.

c. Preservation and Protection of Riparian Areas

Riparian areas are natural "green infrastructure" that provide many benefits which include filtering runoff through the buffer zone, flood storage, groundwater recharge, and critical wildlife habitat. Site layout should limit encroachment into the riparian area. Encroachment may include the clearing of trees, filling of the floodplain, or hydromodification of the stream that may require additional permits through Sections 401/404 of the Clean Water Act.

d. Soils

The existing soils' rate of infiltration of rainwater must be considered in determining proper run-off control of a stormwater management plan. Soils of the County have been grouped into hydrologic soil classes, which should be utilized to determine the areas where critical runoff and increased infiltration will occur.

e. Existing Vegetation

The type of existing vegetation greatly affects the amount of runoff generated from the landscape. Rates of infiltration change with types of vegetative cover, particularly areas of native vegetation that increase percolation of rainwater into the soil. It is also important to make efforts to preserve large trees or clusters of large trees wherever possible. Maintaining woody vegetation preserves absorption of rainwater while reducing negative impacts on existing wildlife habitat.

Section 2.10.4 Drainage System Development

After analyzing the data, and determining the site limitations, the designer can then develop a proper drainage system. In proper planning, buildings, roads and parking lots should be located, to exploit the strengths of the site and overcome drainage limitations. The following are suggested considerations in design:

a. Terrain Considerations

The designer should attempt to tailor the drainage system to the existing site conditions. This will reduce unnecessary land disturbance and therefore reduce the increase in runoff and soil erosion potential.

b. Confine Construction to Areas Outside Drainage Ways

Land disturbance in drainage ways will necessitate the installation of more costly control measures.

c. Cluster Building Sites

Utilizing a Low Impact Development (LID) method such as clustering building sites minimizes the amount of disturbed land, reduces increases in runoff and in most cases, reduces the amount of conveyance system needed within the development. However local zoning regulations should be consulted first to insure cluster development is permitted.

d. Minimize Impervious Areas

Impervious surfaces such as building roof, parking lots, roads, and walkways greatly increase the amount of runoff leaving the site. To reduce runoff, buildings shall be clustered together where possible. To increase infiltration of stormwater runoff from the parking lot(s), the site design should include one or a combination of the following: use of impervious pavements in excess parking spaces or installation of infiltration best management practices (BMPs) such as filter strips, infiltration trenches or bioretention cells as described in the Ohio Rainwater and Land Development Manual (RLDM).

e. Native Landscaping

Infiltration of stormwater is greater where native vegetation is present compared to non-native vegetation such as domestic turf grass. The benefits of native vegetation also include reduced need for watering, resistance to pests and disease, and are more adaptive to local climate. Native vegetation should be considered to replace large open areas of disturbed soil, within and surrounding detention basins, open drainage swales, and other areas where applicable. In addition to native plantings in open areas, tree plantings should consist of at least 50% species native to Erie County. Erie Soil and Water Conservation District and the Ohio State University Extension Office may assist in providing lists of native species.

Section 2.10.5 Plan for Runoff Control

After preparation of a general site layout of the stormwater control plan must be prepared.

a. Sub-Drainage Areas

Determine how much and where the runoff will travel over the site. Consider how runoff can be controlled in each drainage area. Remember, in most cases it is easier to control runoff in smaller areas than to try to handle the entire site at some location downstream as it leaves the site.

b. Select Runoff Control Practices

Runoff control practices can be divided into three broad categories:

- Vegetative Controls
- Structural Controls
- Management Measures

Local or State handbooks should be used to select and design appropriate vegetative and structural practices. Management measures are common sense types of controls used to help minimize the need for physical practices.

c. Vegetative Controls

Keep in mind that the first line of defense is to prevent increase in volume or rate of runoff. This is accomplished by protecting the soil surface as much as possible and not decreasing the over-land flow time. Vegetative controls can include grass swales, bioretention areas, grass filter strips, etc.

d. Structural Controls

Where large increases in runoff occur, structural practices are generally the only way to control runoff. It is very important that structural practices be selected, designed and constructed according to standards and specifications of the engineer of jurisdiction. Improper installation can create problems which are greater than the structure was designed to solve.

e. Management Measures

Good site design and construction management is as important as any physical practices used for runoff control. The following are only some management considerations:

- Design site to help reduce runoff in open areas and not increase it.
- Use staged construction.
- Use as few pipe systems as possible.
- Allow runoff to meander through the site, increasing flow lengths.

Section 2.10.7 Develop Design Details

Once a development plan and drainage system that meets the runoff criteria has been decided upon, the detail plans for the drainage facilities and control structures should be developed. Detail design plans shall be developed according to generally accepted engineering principles and approved by the County Engineer or the Engineer of Jurisdiction. It is important at this point in time to work closely with the County Engineer or Engineer of Jurisdiction to make sure that all facilities and structures are being designed according to standards and criteria that exist for these types of facilities and structures within that jurisdiction.

Section 2.20 Onsite Stormwater Conveyance

Adequate stormwater management facilities shall be planned for runoff generated by the proposed development. Stormwater generated onsite and offsite shall be conveyed through the development site to adequate stormwater control facilities designed to prevent flooding within the development and negative impacts to upstream and downstream areas.

Section 2.20.1 Offsite Stormwater Conveyance

Runoff from an offsite watershed that discharges to the development site can either be routed around the on-site storage and treatment facilities or accommodated by these facilities. If the runoff is routed around the site it must be discharged into a proper offsite receiving outlet, see Section 2.30. If the offsite runoff is routed through the on-site facility that facility must first be designed such that the maximum discharge is kept to the site's pre-developed 5-year release. This would mean that additional storage would be required to accommodate the additional volume from offsite discharge so that the meter structure is not enlarged.

Section 2.20.2 Watershed Diversions

Diversion of stormwater runoff from one watershed or receiving stormwater system to another is generally prohibited because such diversions have the potential to cause or increase flooding, erosion, or negative water quality impacts in the receiving conveyance system. Diversion of runoff from one major watershed to another shall require documentation that the diversion is beneficial and will not have detrimental effects on the receiving stream or system. Approval of diversion of runoff shall be at the sole discretion of the County Engineer or his designee.

Section 2.30 Stormwater Outlet

Proposed stormwater systems shall be routed to an adequate offsite outlet. This can be one of the following:

a. A natural stream, creek, river or tributary thereof,

b. A man-made open channel or ditch system (generally excluding roadside ditches),

c. A storm sewer system adequately sized for the design flow.

The applicant shall use a hydrologic method, acceptable to the County Engineer, (see Section 2.40) to demonstrate that the offsite stormwater system is of adequate size to convey existing offsite and proposed onsite flows. The downstream analysis shall be done from the outlet of the onsite system to the following points:

a. The next increase in pipe diameter in a downstream storm sewer system,

b. The downstream face of the next bridge or culvert crossing an open conveyance system, or

c. A point designated by the County Engineer based upon historic drainage issues in the downstream system.

If it is determined that the downstream system is not adequate, the County Engineer may require more stringent release rates and/or require the applicant to provide the necessary downstream improvements to remedy the identified issues. Also see Section 2.20.

Section 2.30.1 Agricultural Drainage Tile

Agricultural tile systems have been installed on agricultural lands for agricultural purposes only and, in general, may not be used as an outlet for development. If field tile are intercepted during construction, they shall be reconnected or connected to the proposed stormwater system. Field tiles that exhibit evidence of conveying septic effluent shall be immediately reported to the Erie County Health Department and should not be used for stormwater conveyance or tied into the onsite stormwater system.

Designers preparing plans on agricultural lands should contact the Erie County Engineer's Office or the Erie Soil and Water Conservation District for tile system information that may be on file. All visible field tile outlets and locations shall be field located and shown on stormwater management plans with any plan information obtained from county agencies.

An agricultural drain tile main may not be used as an outlet for a major subdivision or commercial development.

If an existing agricultural tile main is proposed as an outlet for a single lot or a minor subdivision all of the following conditions must be met:

a. The Owner/Developer shall provide a disc (DVD) with the existing tile filmed so that a determination can be made by the ECEO as to its condition and whether or not it will be permitted to be used. This determination shall be made prior to plans being developed.

b. Runoff from the proposed development site shall be restricted to not more than the remaining capacity of full flow of the existing system in the predevelopment condition based on the tributary area within the development area.

c. An easement over the downstream owner(s) shall be required for discharges to a private tile main and is limited to a tile that crosses one landowner to an approved outlet per Section 2.30. If the private tile crosses two or more properties to an outlet it is not acceptable.

Section 2.40 Runoff Calculation Requirements

The amount of stormwater runoff depends on many factors. Some of these factors are reasonably fixed and can be determined accurately, such as watershed size, ground slope and natural ponding. Others vary by season, such as frozen soil, soil moisture, evaporation, or transpiration. Other factors vary by land use, such as type of ground cover, impervious areas or method of cultivation. Finally, precipitation is extremely variable by time of year and other natural factors.

Despite the indeterminate nature of these factors, methods for calculating accurate stormwater runoff have been developed

The following methods are acceptable for calculation of runoff within these regulations:

a. One of the methods described in Urban Hydrology for Small Watersheds, Technical Release Number 55, US Department of Agriculture, Soil Conservation Service and its Ohio Supplement.

b. The Rational Method (see Appendix D) shall be the minimum acceptable design method.

c. Procedures outlined in the current edition of the Ohio Rainwater and Land Development Manual (RLDM).

Section 2.40.1 Runoff Control Methods

The criteria established in this section, necessitates the use of stormwater runoff control facilities and/or Best Management Practices (BMPs). In many development situations both manufactured and structural BMPs can be utilized. Facilities designed and constructed under these regulations need to provide the required stormwater services and functionality while providing the desired aesthetics with proper public health and safety considerations. Properly designed and landscaped stormwater facilities can provide an amenity to the urban environment. This positive impact can be achieved by adherence to four basic steps in the implementation of stormwater control facilities. These are:

a. Proper selection of runoff control mechanisms and BMPs.

b. Proper facility design; site location, landscaping, flow controls.

c. Construction of facility in strict adherence to approved design plans.

d. Regular maintenance program performed by a designated responsible party.

Section 2.40.2 Stormwater Runoff Control Design Criteria

Stormwater runoff control shall address peak rate, total volume and water quality. The development must have an acceptable outlet as outlined in Section 2.30. If the outlet is acceptable but does not have the capacity to accommodate the allowable release, as per Item #3 below, then a reduced discharge rate not to exceed the existing outlet capacity and additional onsite storage will be required.

a. The storm drainage system shall be designed to carry a minimum 5-year frequency 24-hour duration post developed storm. The design and materials shall conform to Appendix D.

b. The detention facility shall have a minimum storage capacity for a 10-year frequency 24-hour duration storm based on the post-developed site conditions.

c. The peak rate of discharge from the detention area shall be held to a 5-year frequency 24-hour duration storm based on the pre-developed site conditions.

d. The detention basin may also provide for the water quality (WQ) requirements. If it is designed for that additional purpose then the required water quality volume (WQV) is in addition to the 10-year storage volume as per Item #2.

e. Any off-site land draining to the site must be addressed, see Section 2.20.1

Section 2.50 Stormwater Quality Control Design

Stormwater quality control facilities shall be designed to control runoff from small storm events before being discharged offsite. The design of these facilities is intended to reduce pollutants contained in stormwater runoff and to reduce streambank erosion during frequent, small storm events. The stormwater management plan for the development site shall include appropriate stormwater quality controls, the selection rationale, location and sizing calculations.

Unless exempted, stormwater quality controls should be used for runoff from development sites designed as outlined in Appendix F.

All stormwater quality control facilities shall be sized to fully capture and treat the WQv determined for the contributing drainage area. Stormwater quality facilities may be combined with stormwater quantity facilities.

Section 2.50.1 Illicit Discharge and Illegal Dumping

Any discharge into a storm sewer system that is not composed entirely of stormwater is an illicit discharge. No person shall:

a. Construct, maintain, operate or utilize any illicit connection,

b. Knowingly cause or allow any prohibited discharge, and

c. Act, cause or permit any agent, employee, or independent contractor to construct, maintain, operate or utilize any illicit connection or cause, allow or facilitate any prohibited discharge.

Development within Erie County shall be constructed in a manner that does not result in illicit discharge into the storm system. Discharges allowable under the terms of an NPDES permit are not considered illicit discharges.

Section 2.50.2 Stormwater Quality Control Methods

The BMPs described in the RLDM are acceptable. Four categories of stormwater quality control facilities have been identified for use:

a. Stormwater Basins
   - Extended Dry Detention
   - Extended Wet Detention
   - Constructed Stormwater Wetland

b. Media Filters
   - Bioretention Facility
   - Sand Filter

c. Vegetated Swales and Filter Strips

d. Commercial Proprietary Systems
   - Hydrodynamic Systems
   - Filtration Systems
   - Catch Basin Inserts
   - Chemical Treatment Systems
   - Package Treatment Plants
   - Prefabricated Detention Structures

Criteria to be used in determination of the proper facility include drainage area, hydrologic considerations, sediment management, health and safety, aesthetics, maintenance, accessibility, durability, cold weather issues, mosquito and vector control.

Section 2.60 Maintenance of the Stormwater Drainage and Water Quality Facilities and Control Structures

The maintenance of the storm water and drainage facilities and the flow control structures are maintained by methods in keeping with their individual characteristics. The following criteria will be used to determine how a facility and/or structure is maintained post development:

a. Major residential subdivisions constructed under current county subdivision regulations are required to construct their system under Section 6131.63 of the Ohio Revised Code (ORC) and maintained under Section 6137 (ORC) by the Erie County Commissioners.

b. Minor residential subdivision of 2 lots or more shall be maintained by the individual residents that rely on the drainage facility as outlined in Section 1.31 Residential Paragraph c. The developer may apply for maintenance under Section 6131.63 (ORC).

c. Commercial/Industrial sites that contain 2 divided lots or more may apply for maintenance of their drainage facilities using Section 6131.63 of the ORC. If public roads are a part of the development then using Section 6131.63 is mandatory for the future maintenance of the drainage facilities. If the owner(s) of a site desires and no public road is involved then he can apply for public maintenance as per Paragraph b above. If Section 6131.63 ORC is not invoked by the owner/developer then Paragraph d, below, shall apply.

d. Commercial/Industrial sites of a single lot are responsible for the future maintenance of their individual drainage facilities. Upon approval of their plan the project/design engineer shall notify the owner of his responsibility for the maintenance with the necessary documentation of the type of system and how it must be maintained to be functional.

e. Permanent wet detention and/or water quality basins cannot be placed on public maintenance and must be maintain by the owner, however the inlet and outlet connected system can be publicly maintained using Section 6131.63 ORC.

Section 2.70 Drainage Plan Preparation for Small Commercial/industrial Sites

Small site developments can result in major increases in runoff, but alternatives for handling these increase flows may be limited. Wherever possible, requirements of Section 2.10 thru 2.10.7 should be utilized. In those instances where very limited options are available, the designer is required to submit plans with sufficient information to demonstrate compliance with runoff criteria and that the drainage facilities and control structures have been designed to required standards.

Section 2.70.1 Data Collection

Analysis of predevelopment conditions for drainage plan preparation requires the same data required for a management plan. Requirements outlined in Section 2.50.1 should be followed

Section 2.70.2 Pre-Development Runoff Calculations

Upon completion of data collection, the pre-development peak rate of runoff and runoff volume can be determined for the five (5) year storm.

Section 2.70.3 Runoff Calculation and Control Criteria

In most cases for small sites, the developer will know how the surface of the site is to be developed. He can then go directly to calculation of increase of runoff and determination of runoff criteria following the steps in Section 2.10.5.

Section 2.70.4 Plan for Runoff Control

From the results of Section 2.70.3, the designer can determine the type and magnitude of control practices needed, in most cases being some type of structural control. These controls should be shown on the site plan and runoff calculations checked prepared.

Section 2.70.5 Develop Design Details

Once a development plan and drainage system and drainage system that meets the runoff criteria has been decided upon, then detail design plans for the drainage facilities and structures should be developed. It is important at this point in time to work closely with the ECEO to make sure that all facilities and structures are being designed according to these standards.

Section 2.80 Submission of a Storm Water Control Plan

The plan submission shall consist of three parts:

a. Site Plan
The site plan is an overall detail of the site improvements and is a series of maps pictorially explaining the information in the narrative.

b. Engineering Details
The engineering details are detailed drawings, calculations and specifications on the drainage facilities and control structures to be constructed as part of the development.

c. Erosion Control Details
The site plan shall show placement and types of approved erosion control structures and practices as per examples and/or acceptable manuals as noted in these regulations. A typical drawing of each typed used shall show on the plan for easy reference by the ECEO reviewer and contractor.

CHECKLIST
FOR STORMWATER CONTROL PLANS

SITE PLAN

_____ Vicinity Map – A small map locating the site in relation to the surrounding area.

_____ Existing Contours – The existing contours of the site should be shown on a map.

_____ Existing Vegetation – The existing tree lines, grassy areas or unique vegetation should be shown on a map.

_____ Soils – The boundaries of the different soil types should be shown on a map.

_____ Indicate North – The direction of north in relation to the site should be shown.

_____ Existing Drainage Patterns – The dividing lines and the direction of flow for the different drainage areas should be shown on a map.

_____ Development Plan – Location and size of all areas to be rendered impervious.

_____ Limits of Clearing and Grading – Areas, which are to be cleared and graded, should be outlined on a map.

_____ Location of Drainage and Water Quality Facilities and Control Structures – The location of the drainage facilities and control structures to be used on the site should be shown on a map. Facilities or structures subject to section 2.60 shall be delineated.

ENGINEERING DETAILS

The following shall be submitted for drainage and water quality facilities or control structures to be constructed.

_____ Design calculations _____ Design drawings

_____ Specifications _____ Quantities

CHAPTER THREE

EROSION AND SEDIMENT CONTROL MEASURES

Section 3.00 Plan Development Criteria

Effective erosion control planning requires a working knowledge of both the application of control measures in terms of their selection and location and the design of the control measure in terms of its configuration, size and construction. Under this section the requirements of the Ohio EPA General Permit shall be followed. The website for the Ohio EPA that contains the full permit is provided in Appendix G. The developer is required to provide the ECEO with a copy of the Storm Water Pollution Prevention Plan (SWPPP) that was submitted to the Ohio EPA.

a. Stabilization of Denuded Areas and Soil Stockpiles

Permanent or temporary soil stabilization should be applied to denuded areas after final grade is reached on any portion of the site see Appendix G. Soil stabilization should also be applied to denuded areas, which may not be at final grade, but will remain undisturbed during the construction period.

Soil stabilization refers to measures, which protect soil from the erosive forces of raindrop impact and flowing water. Applicable practices include vegetative establishment, mulching and the early application of gravel base on areas to be paved. Soil stabilization measures should be selected to be appropriate for the time of year, site conditions and estimated duration of use.

Soil stockpiles should be stabilized or protected with sediment trapping measures to prevent soil loss.

b. Establishment of Permanent Vegetation

A permanent vegetative cover should be established on denuded areas not otherwise permanently stabilized. Permanent vegetation should not be considered established until a ground cover is achieved which is mature enough to control soil erosion satisfactorily and to survive severe weather conditions.

c. Protection of Adjacent Properties

Properties adjacent to the site of a land disturbance should be protected from sediment deposition. This may be accomplished by preserving a well vegetated buffer strip around the lower perimeter of the land disturbance, by installing perimeter controls such as sediment barriers, filters or dikes, or sediment basins, or by a combination of such measures.

Vegetated filter strips may be used alone only where runoff in sheet flow is expected. In general, filter strips should be at least fifteen feet (15') in width. If at any time it is found that a vegetated filter strip along is ineffective in stopping

sediment movement into adjacent property, additional perimeter controls should be provided.

d. Timing and Stabilization of Sediment Trapping Measures

Sediment basins, diversions, sediment barriers and other measures intended to trap sediment on-site should be constructed as a first step in grading and be made functional before upslope land disturbance takes place. Earthen structures such as dams, dikes and diversions MUST be seeded and mulched immediately upon completion.

e. Sediment Basins

Stormwater runoff containing damaging amounts of sediment should pass through a sediment basin or other suitable sediment trapping facility.

f. Cut and Fill Slopes

Cut and fill slopes should be designed and constructed in a manner which will minimize erosion. Consideration should be given to the length and steepness of the slope, the soil type, upslope drainage area, groundwater conditions and other applicable factors. Slopes, which are found to be eroding excessively within one year of construction, should be provided with additional slope stabilizing measures until the problem is corrected.

g. Stabilization of Waterways and Outlets

All on-site stormwater surface channels should be designed and constructed to withstand the expected velocity of flow from a ten-year frequency storm without erosion. Design for a larger frequency storm may be necessary for protection from the stormwater flow. Stabilization adequate to prevent erosion should also be provided at the outlets of all pipes and paved channels.

h. Storm Sewer Inlet Protection

All storm sewer inlets, which are made operable during construction should be protected so that sediment-laden water will not enter the conveyance system without first being filtered or otherwise treated to remove sediment.

i. Working In or Crossing Watercourses

Construction vehicles should be kept out of watercourses. Where in-channel work is necessary, consultation with the Army Corps of Engineers and Ohio Environmental Protection Agency must be demonstrated for compliance with Clean Water Act provisions. If no permit is needed to proceed with proposed development project, precautions should be taken to stabilize the work area during construction to minimize erosion. The channel (including bed and banks) should always be re-established immediately after in-channel work is completed. Follow stream construction details located in the RLDM where a watercourse must be crossed by construction vehicles regularly during construction, a temporary stream crossing is required (see Chapter 5 RLDM).

j. Construction Access Routes

Wherever construction vehicle access routes intersect paved public roads, provisions should be made to minimize the transport of sediment (mud) by runoff or vehicle tracking onto the paved surface by providing and using a gravel wash area prior to vehicles leaving the site.

k. Disposition of Temporary Measures

All temporary erosion and sediment control measures should be disposed of after final site stabilization is achieved or after the temporary measures are no longer needed. Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures should be permanently stabilized to prevent further erosion and sedimentation.

l. Construction Materials

All construction materials shall be disposed of in an approved manner. Dumpsters needed to keep site free of debris shall be placed such that waste materials can be disposed of daily or more often should weather conditions (i.e. windy conditions) necessitate it. Site permitee is responsible to keep the dumpster emptied.

m. Concrete Truck Washout

The owner shall provide a concrete waste dumpsite on-site. This area shall be maintained such that overflow does not enter any adjacent waterway and shall have all concrete waste removed at completion of construction.

n. Maintenance

All temporary and permanent erosion and sediment control measures shall be maintained and repaired as needed to assure continued performance of their intended function. Inspection by the Project Engineer or his appointed inspector should determine if and when maintenance/repair is needed to comply with permit.

Documentation outlining the required maintenance for all permanent erosion and sediment control measures shall be provided by the design engineer to the owner with a copy to the Erie County Engineer's office.

o. Plans and Specifications

All erosion control practices contained on the plan shall be built to the standards and specifications of the RLDM.

APPENDIX A

DEFINITIONS

DEFINITIONS

For the purpose of this resolution, certain rules or word usage apply to the test as follows:

1. Words used in the present tense include the future tense; and the singular includes the plural, unless the context clearly indicates the contrary.

2. The terms “shall and should” are always mandatory and not discretionary; the word “may” is permissive.

3. The word or term not interpreted or defined by this article shall be used with a meaning of common or standard utilization, so as to give these rules and regulations their most reasonable application.

BEST MANAGEMENT PRACTICE (BMP)

Techniques used to lessen the environmental impacts of land use. These techniques may involve structures, vegetation, or alternating construction operations.

Development Area

Any contiguous (abutting) area owned by one person or operated as one development unit and used or being developed for non-farm commercial, industrial, residential or other non-farm purposes upon which earth-disturbing activities are planned or underway.

Drainage Area

1. The contributing area to a single drainage basin, expressed in acres, square miles, or other unit or area. Also called catchment area, watershed and river basin.

2. The area served by a drainage system receiving storm and surface water or by a watercourse.

Drainageway

A route or course along which water moves or may move to drain an area.

Earth-Disturbing Activity

Any grading, excavating, filling or other alteration of the earth's surface where natural or man-made ground cover is destroyed and which may result in increased rate and/or volume or runoff and/or contribute to erosion and sediment pollution.

Flood

A general and temporary condition of partial or complete inundation or normally dry land areas.

Floodplain

The relatively level land to either side of a channel which is inundated during high flows. It is often used to reference the 100-year floodplain.

Infiltration

The process of percolating stormwater into the subsoil

Person

Any individual, corporation, partnership, joint venture, agency, unincorporated association, municipal corporation, county or state agency, the federal government, or any combination thereof.

Native Vegetation

Vegetation that is referenced as present prior to European settlement in the region or area. Not to be confused with ornamental plants that are usually obtained from a nursery or greenhouse and used as landscaping décor.

Non-Point Surface Pollution

Pollution from any source other than from any discernible, confined, and discrete conveyances, and shall include, but not be limited to, pollutants from agricultural, silvicultural, mining, construction, subsurface disposal and urban runoff sources.

Porous Pavement

Pavements designed to allow infiltration of stormwater run-off.

Primary Drainage System

That part of the storm drainage system, which is used regularly for collecting, transporting and disposing of storm runoff, snow melt, and miscellaneous minor flows. The capacity of the primary drainage design storm which may have a frequency of occurrence of once in two, five or ten years.

The primary system is also termed the “convenience system,” “minor system,” or the “storm sewer system” and may include many features ranging from curbs and gutters to storm sewer pipes and open drainageways.

Post-Development

The state or condition of the earth’s surface after development occurs. Other terms are developed, future and after development.

Pre-Development

That state or condition of the earth’s surface the year prior to development.

Riparian Area

The transition region between flowing water and terrestrial ecosystems, which provides a continuous exchange of nutrients and natural debris between land and water. It generally includes not only the stream channel, but also the floodplain and associated wetlands.

Stormwater

Rainwater, snowmelt or other natural precipitation that collects on the ground in liquid form. Stormwater may also include manmade discharges of clean water.

Stormwater Runoff

Flow on the surface of the ground, resulting from precipitation.

Storm Drainage System

The surface and sub-surface system for the removal of stormwater from the land, including both the natural elements of streams, gullies, ravines, marshes, swales and ponds whether or not an intermittent or continuous natural and man-made elements which include conduits and appurtenant features, culverts, ditches, channels, storage facilities, streets and the storm sewer system.

Stormwater Management Facilities

The drainage system, water quality and discharge and control facilities necessary to meet the runoff criteria of these regulations.

Watercourse

A permanent or intermittent stream or other body of water, either natural or man-made, which gathers and carries surface water.

Water Quality Structure

A conventional (i.e. grass swale), structural (i.e. detention pond), manufactured (i.e. factory made unit), or LID (i.e. bio retention area) practice designed to remove silt and harmful chemicals from stormwater prior to its release into a receiving stream.

APPENDIX B

APPLICATION AND PERMIT FORMS

Form 170B

ERIE COUNTY
DEPARTMENT OF ENGINEERING
2700 COLUMBUS AVENUE
SANDUSKY, OHIO 44870

Phone (419) 627-7710
Fax (419) 625-9622

STORMWATER MANAGEMENT EROSION CONTROL
PERMIT APPLICATION

APPLICATION NUMBER: _____ DATE: _____

1. OWNER:

_____
Name

_____
Address

_____
City, State, Zip

DEVELOPER:

_____
Name

_____
Address

_____
City, State, Zip

CONTRACTOR:

_____
Name

_____
Address

_____
City, State, Zip

2. PROPERTY LOCATION:

_____
Township

_____
City/Village

_____
Adjoining Road

_____
Section /Lot

_____
Nearest Intersection

☐ North ☐ South
☐ East ☐ West

3. TYPE OF DEVELOPMENT:

☐ Single Family ☐ Subdivision ☐ Multi-Family Units (Condos)
☐ Commercial ☐ Industrial ☐ Multi-Family Units
☐ Other _____

4. Total Area of Parcel: _____ Acres

5. Total Area of disturbance: _____ Acres/Sq. Ft
(Including grubbing, grading, stock piles etc.)

6. Total Area to be Permanently Impervious: _____ Acres/Sq. Ft.
(i.e. Roads, Roofs, Drives, etc.)

STORMWATER MANAGEMENT EROSION CONTROL
PERMIT APPLICATION (CONT…)

7. Attach a site plan and any other additional information (i.e. lot survey, photo), that you have available that might help depict your intended activity and how the end project will appear.

8. I, _____ the undersigned, being responsible for the above described activity understand that the activity is subject to and must comply with the Stormwater Management Rules and Regulations of Erie County.

9. Permission for Ingress/Egress on the subject premises for inspection is expressly granted as per Section 1.50 and 1.52 of the Storm Water Management Rules and Regulations manual.

Signature: _____ Date: _____

Title: ☐ Owner ☐ Developer ☐ Contractor
☐ Other _____

----------*For Official Use Only* ----------

The above application had been reviewed and the applicant has been:

☐ Issued a permit

☐ No permit required

☐ Advised that a Stormwater Management and Erosion Control Plan must be submitted, reviewed and approved prior to the issuance of a permit.

☐ Advised that a Drainage Plan must be submitted, reviewed and approved prior to the issuance of a permit.

☐ Advised that there is an existing approved Stormwater Management Plan of this site that must be complied with. Approved site:_____

☐ Advised that no plan is required, but applicant is not exempt from compliance to the regulations.

_____
Erie County Engineer or Representative

Comments:

_____
_____
_____
_____

ERIE COUNTY
DEPARTMENT OF ENGINEERING
2700 COLUMBUS AVENUE
SANDUSKY, OHIO 44870

STORMWATER AND EROSION CONTROL PERMIT

Permit Number _____

Date Issue _____

Fee $_____

Project Name _____

Address: _____

This permit is being issued in accordance with the Stormwater Management Rules, Regulations and Erosion Control (SWREC) currently in effect. The below signed parties have agreed in the application (#_____), that the SWREC will be adhered to. That any violation found upon inspection will be grounds for suspending the earthmoving / disturbing activity until such time as compliance is met (see SWREC Section 1.50, 1.51 and 1.52). Permission for Ingress/egress on the subject premises for inspection is expressly granted.

_____ _____
(Owner) (Date)

_____ _____
(Developer) (Date)

_____ _____
(Contractor) (Date)

_____
(Erie County Engineer or Representative)

_____
(Notary)

APPENDIX C

DETENTION AND METER LINE DESIGN CALCULATIONS EXAMPLES

7/13/01

QUICK DETENTION

1	Gross Area =		sf		
2	Pavement Area =		sf		
3	Building Area =		sf		
4	Total Impervious	0	sf	s.f. x 0.90	0
5	Net Pervious Area	0	sf	s.f. x 0.15	0
6	Wt. C – Cw = CAI/At				

7. Allowable Q into existing system

Quallow = CiA = 0.15 x 3.5 x AT/43560 0.00 CFS

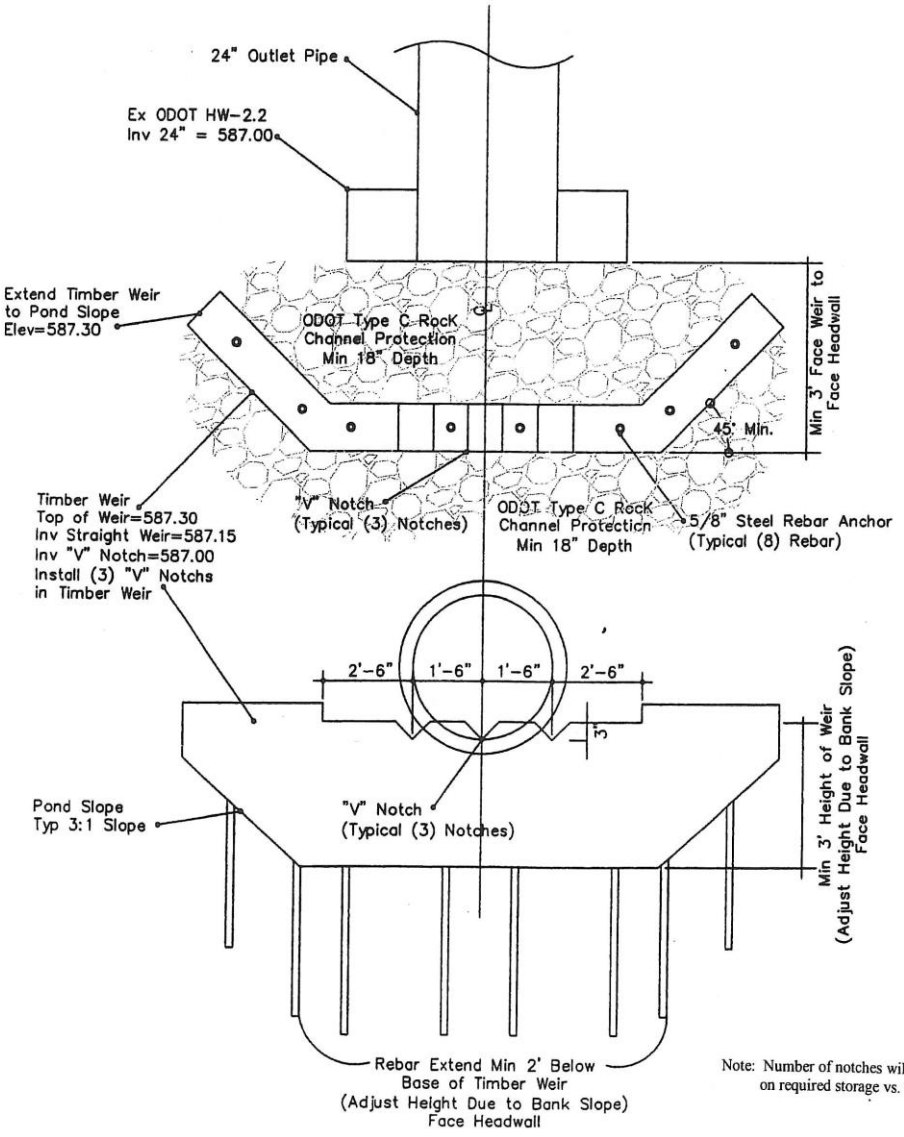
(Note:i5 = 3.5”/hr. 5 year 20 min.)

8. Detention Volume Required

Tc (min.)	i10 in/hr	Cwa (A=acres)	Qin Q10	Qout=Qallow	(Qin–Qout x tc x 60)
10	**5.41**	0.00	0.00	0.00	0
20	**4.10**	0.00	0.00	0.00	0
30	**3.50**	0.00	0.00	0.00	0
40	**2.90**	0.00	0.00	0.00	0
50	**2.50**	0.00	0.00	0.00	0
60	**2.21**	0.00	0.00	0.00	0
70	**1.95**	0.00	0.00	0.00	0
80	**1.76**	0.00	0.00	0.00	0
90	**1.61**	0.00	0.00	0.00	0
100	**1.50**	0.00	0.00	0.00	0
110	**1.40**	0.00	0.00	0.00	0
120	**1.30**	0.00	0.00	0.00	0
130	**1.25**	0.00	0.00	0.00	0
140	**1.15**	0.00	0.00	0.00	0
150	**1.10**	0.00	0.00	0.00	0
160	**1.05**	0.00	0.00	0.00	0

REQUIRED DETENTION VOLUME = 0 CUBIC FEET

Detail – Timber Weir
Storm Sewer Outlet



Note: Number of notches will vary depending on required storage vs. volume of pool.

See Notch Design Next Page

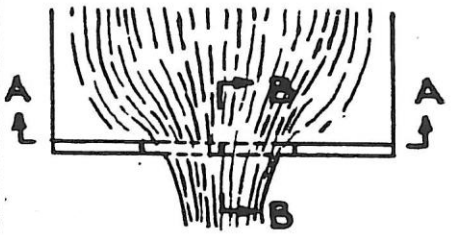
DISCHARGE OVER 90° TRIANGULAR V NOTCH SHARP-CRESTED WEIR*

(COMMONLY USED WHERE FLOWS ARE SMALL.)

Thompson Formula

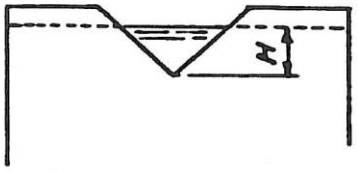
$Q = 2.54 H^{5/2}$

For general notes see drawing of rectangular weir.

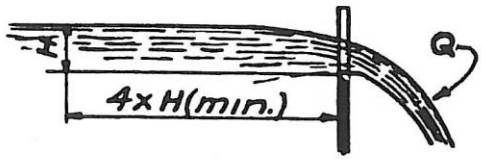


PLAN

Q = Discharge in cu. ft. per sec.
H = Head in feet.



SECTION A-A



SECTION B-B

H IN FEET	H IN INCHES	Q IN CU. FT. PER SEC.
0.05	5/8	0.0015
0.10	1 3/16	0.0085
0.15	2 3/8	0.022
0.20	2 3/8	0.047
0.30	3 5/8	0.129
0.40	4 13/16	0.262
0.50	6	0.455
0.60	7 3/16	0.714
0.70	8 3/8	1.044
0.80	9 5/8	1.452
0.90	10 13/16	1.943
1.00	12	2.520
1.10	13 3/16	3.189
1.20	14 3/8	3.954
1.30	15 5/8	4.818
1.40	16 13/16	5.785
1.50	18	6.860

Detention Design Meter Line Check (Culvert Analysis)

$$H = \frac{V^2}{2g}\left(1 + Ke + \frac{29n^2L}{R\ 4/3}\right)$$

$$2gH = V^2\left(1 + Ke + \frac{29n^2L}{R\ 4/3}\right)$$

$$V^2 = \frac{2gH}{\left(1 + Ke + \frac{29n^2L}{R\ 4/3}\right)}$$

DATA:

1. Length of meter line = ft.
2. Slope of meter line = %
3. Size of meter line = in.
4. Pipe type & "N"
   (CMP-n = 0.024 =
   all others n= .013)
5. Entrance Coeff (Ke) = 0.5
6. Assumed Max. Head = ft.
7. Hydr. Radius (R) = ft.
   (R 4/3) =

Assumed Head (H)	H x 2g	$1+Ke+\frac{29n^2L}{R\ 4/3}$	V^2	V	Area of Pipe (A)	Flow Q	Q av ΣQ
0.5'							
1.0'							
1.5'							
2.0'							
2.5'							
3.0'							

APPENDIX D

STORM SEWER DESIGN AND TYPE OF MATERIALS

1. STORM SEWERS

a. General

The subdivider or developer shall provide the necessary means to assure complete drainage in and adjacent to the development. Storm sewer systems shall be constructed of an adequate size to carry away the runoff produced by the development. The drainage area shall include all of the pavement surface, front, side and back of all lots and future plat extensions utilizing the same system.

b. Design Formula for "Rational Method"

The quantity of stormwater runoff to be used in the design of the system shall be determined when using the "Rational Method" and the "Manning Formula" for areas less than 200 acres. The equation is Q=CxIxA.

Where: Q= Ratio of runoff in cubic feet per second.

C= Ration of runoff to rainfall.

I= Rainfall intensity in inches per hour.

A= Area of the watershed in acres.

When using the Soil Conservation Service Methods that programs values will be used.

c. Runoff Coefficient

The following runoff coefficients shall be used in single family residential subdivisions including right-of-way:

Average Lot Size in Subdivision	Runoff Coefficient "C"
5,000 sq. ft. or less	0.50
5,000 sq. ft. to 6999 sq. ft.	0.40
7,000 sq. ft. to 10,000 sq. ft.	0.35
Over 10,000 sq. ft.	0.30

These coefficients shall be used in residential subdivisions unless actual coefficients are determined by engineering analysis.

Coefficients for surfaces and occupancies other than one family residential subdivisions shall be based on the following values:

Character of Surface	Runoff Coefficient "C"
Pavement	0.95
Roofs	0.95
Lawns	.15
Description of Area	
Business:	
Downtown	0.95
Neighborhood	0.75
Residential:	
Multi-units, detached	0.75
Multi-units, attached	0.85
Apartments	0.85
Industrial:	
Light	0.80
Heavy	0.95

The coefficients in these tabulations are applicable for storms of 5 to 10 year frequencies and shall be called minimum coefficients.

d. Rainfall Intensity

The rainfall intensity, "I" can be taken from the appropriate curves for Erie County, Ohio as published by the U.S. Weather Bureau, the Ohio Department of Transportation Location and Design Manual, or the Urban Hydrology for Small Watersheds TR-55.

A maximum of twenty (20) minutes shall be used as time of concentration to the first collection point in the system for residential areas. Preferred runoff pattern design of streets and lot grading shall be such that runoff from roofs, driveways and other impervious surfaces shall be toward the street or rear lot swales/tile systems. The subsurface system shall be designed such that each lot will have an outlet for footer tile, perimeter drains, sump pumps, etc. The runoff/discharge shall be collected in either system and both systems shall be directed to a detention/retention facility.

e. Design Storm Frequency

Minimum frequencies for various types of occupancies or land use shall be as follows:

Residential Area	5 year frequency
Industrial Area	5 year frequency
Commercial Area	5 year frequency

Storm sewers shall be designed to flow just full for the five-year frequency storm. The detention/retention facility shall be designed for a ten-year frequency storm plus the volume needed for Water Quality Compliance if the detention basin serves both functions.

Catch basin type and spacing shall be designed using the five-year intensity duration frequency curve.

f. Drainage Calculations Presentation

An overall drainage layout plan showing the limits of the contributing runoff area broken down into areas contributing to each drainage pick-up point, shall be submitted with the paving and drainage plans. Drainage design within the development shall be adequate to handle the entire contributing watershed area and its existing, proposed and probably future development and not the area under submission only. When the design makes use of an existing storm sewer or open ditch, cross sections and profiles shall be submitted which show the existing conditions at least 500 feet downstream from the plat being considered.

If future plat extensions will utilize the same drainage system, the overall drainage plan shall be submitted with the first plat plans. Complete drainage calculations shall be submitted for pipe size determinations, five year hydraulic gradient checks and catch basin type and spacing designs.

g. Pipe, Catch Basin and Manhole Materials

- All catch basin and manhole structures shall conform to the January 1, 2010 Ohio Department of Transportation (ODOT) “Construction and Materials Specifications” (CMS) manual Item 604.

- All storm sewer pipe proposed in the plan must conform to the ODOT CMS manual Item 603. This includes mandrill testing of any flexible pipe used.

- Storm sewers within the road right-of-way shall be either reinforced concrete pipe (RCP), polyvinyl chloride (PVC) SDR-35, PVC corrugated pipe or polypropylene pipe (PP) both with smooth walled interior and meeting the minimum pipe stiffness of 46 psi (pounds per square inch). The ECEO reserves the right to require RCP within the road right-of-way due to ground conditions.

- Rear lot storm sewer collectors can be designed using either of the afore named types of pipe in addition to corrugated polyethylene smooth walled interior pipe approved in ODOT “CMS” manual Item 603. The polyethylene type of pipe can only extend to the road right-of-way, where it will be connected to either RCP, PP or PVC extending to a catch basin or manhole.

- Driveway culverts, for crossing a roadside ditch within the public right-of-way to access a property, must be constructed of RCP of not less than 12 inches in diameter and having a minimum length of 32 feet.

- PVC or PP pipe crossing under the roadway must have at least 18 inches of cover from the outside top of the pipe to the pavement sub-grade and have a maximum diameter of 36 inches. Pipe larger than 36 inches shall be RCP.

- RCP will be required if it is determined by the Erie County Engineer that insufficient cover will exist during construction prior to the pavement installation such that construction equipment can damage the pipe.

- Road culverts that have exposed ends and whose function is to convey a watercourse under a roadway shall be RCP.

Drainage systems outside the public right-of-way for private developments that public improvements are not dependant upon may be constructed using the developer's choice of pipe materials with the exception of metal pipe and single walled polyethylene pipe. Installation and design will still have to meet ODOT design and installation standards found in the CMS manual.

h. Conduit Design Factors

Velocity when flowing full or half full shall not be more than twelve feet (12') per second.

Drop manholes shall be used to keep the velocity below twelve feet (12') per second.

Storm sewers shall be designed so that the projected accumulated 5-year discharge from the watershed is within the full flow capacity of proposed pipe. Top to top design is preferred at the structures when there is a pipe size change however in some areas there is not sufficient grade to allow for this. In those cases center to center or invert to invert design is acceptable with center to center being the second preferred and invert to invert the last.

i. Manholes and Catch Basins

Manholes and catch basins are required as follows:

1. At all changes in grade.

2. At all changes in alignment.

3. At all points of intersection of sewers.

4. At the point of all changes in pipe size.

5. At all locations where inlets from catch basins connect to the main sewer.

j. Transitions in Size and Flow

Where the sewer size or shape changes, a manhole or structure shall be constructed. Special attention must be given where smaller sewers enter larger sewers to prevent blocking of the flow in either sewer. In some instances, special transition junction structures may be required. Smooth flow at all manholes and junction structures is vital which requires all manholes and catch basins to have poured inverts.

k. Outfall Ends

The outfall ends of storm sewers shall be properly protected by concrete headwalls, rock channel protection of the banks and bottom of open channels, paved inverts of open channels or similar means as required by standard engineering practices and approved by the County Engineer.

2. SPECIAL DRAINAGE STRUCTURES

a. General

Special drainage structures are considered to be such items as open drainage channels, culverts, bridges and detention ponds. The design of these items must be discussed with all concerned departments or agencies prior to commencement; they are:

1. County Highway Engineer

2. Soil and Water Conservation District

3. Township Trustees

4. Regional Planning Commission

b. Open Drainage Channels

As a general rule, stormwater runoff in subdivisions shall be collected in a system of closed conduits (storm sewers) of adequate design and properly constructed to conduct the runoff to a proper and adequate outlet. Open drainage channels may be used to collect and convey stormwater runoff in subdivisions where approved by the various agencies, The approved open drainage channel shall be so located on an individual lot so that there is a minimum distance of not less than fifteen feet (15') from the top of the bank of the drainage channel and the property line, or to any physical encroachment, obstacle or structure. It is intended by this requirement, to provide a permanent easement along the top of each bank of the drainage channel at least fifteen feet (15') in width in which to move equipment for maintenance of the open drainage channel.

The above does not preclude an open drainage channel, where permitted, to be so located so that its centerline follows a property line dividing individual lots of a subdivision, or along a boundary line or tract of property, provided the minimum width of fifteen feet (15') along the top of each bank is provided.

Permanent easements shall be dedicated for all open drainage channels and right of ingress provided so the County may have its maintenance forces enter upon the easement to maintain the open drainage channel or have this work done by a Contractor. The width of the easements shall be determined after the open drainage channels have been designed.

Open drainage channels shall be designed to adequately carry the stormwater runoff, which shall be determined as if closed conduits or storm sewers were to be constructed as provided in this manual. The slopes shall be protected from erosion and the grade of the invert of the channel shall be such that will not cause erosion of the bottom of the channel. Cross-sections shall show the type of channel at each fifty-foot (50') along the channel centerline. Check dams or grade stabilization structures shall be constructed as required to preserve the channel from, excessive velocities.

Existing drainage channels shall be enlarged, repaired, realigned, graded and sloped as required for new channels and shall be adequately sized.

All construction work on open drainage channels shall be completed and approved by the County before any building construction is started in the subdivision.

Open drainage channels shall be protected from scouring on curves, storm sewer outfalls and similar damage by proper placement of rock channel protection. Open drainage channel banks shall be properly sloped, in accordance with standard engineering practice and properly seeded, sodded or paved as may be required.

c. Pipe Culverts

Pipe culverts or other culvert structures conveying an open ditch under public streets or public ways shall be constructed of reinforced concrete.

The pipe culverts shall be designed to carry a twenty-five 25-year post development flow.

d. Driveway Culverts

In estate type subdivisions of lots with areas of two acres or more and frontages of 150 feet or more, the Planning Commission may approve open roadside ditches where rights-of-way widths for streets and public ways are not less than 66 feet wide.

Where culverts are provided under driveways from individual lots onto public streets without curbs and utilizing roadside ditches for street drainage, each driveway shall be provided with a reinforced concrete pipe not less than twelve inches (12") diameter and a minimum length of thirty-two feet (32'). Final sizing will be determined by a ditch flow design to show required capacity.

3. STORM PIPE AND PIPE SPECIFICATIONS

a. General

Pipe and pipe specifications shall be furnished in accordance with the provisions of the following specifications or shall be in accordance with such other specifications as may be shown on the plans or ordered by the Engineer.

b. Pipe and Fittings – Type and Kind

Pipe ten inches (10") or smaller shall be one of the following:

1. PVC corrugated pipe with smooth walled interior with a pipe stiffness rating of 46 PSI or higher.

2. PVC SDR-35

3. Corrugated Polyethylene smooth bore pipe (for off road usage only). This type of pipe is intended for lot drainage only and is not acceptable for any collector main that will convey drainage from or along a public road.

c. Pipe twelve inches (12") to thirty-six inches (36") shall be:

1. Reinforced concrete pipe conforming to the requirements of A.S.T.M. Specification C-76 and of a class as required by the County Engineer.

2. Reinforced elliptical concrete pipe conforming to the requirements of A.S.T.M. Specification C-507 and of a class as required by the County Engineer.

3. PVC SDR-35

4. PVC corrugated pipe with smooth walled interior with a pipe stiffness rating of 46 PSI or higher.

5. PP with smooth walled interior that meets the minimum 46 psi stiffness requirement.

6. Corrugated Polyethylene smooth bore pipe (for off road usage only) as in Paragraph 3b above.

d. Pipe larger than thirty-six inches (36”) shall be reinforced concrete. No connections shall be permitted to the storm sewer pipe without the use of either a catch basin or manhole unless in special situations connections made where the placement of a structure would be impractical then a manufactured core type insert may be used, i.e. “Inserta-Tee”.

e. Joints

All sewer pipe joints shall be watertight to prevent any trench settlement from leaking joints. Joints for various of pipe shall conform to:

1. Polyvinyl chloride (PVC) SDR 35, PVC corrugated smooth walled and PP, shall be gasketed.

2. Concrete sewer pipe of a resilient flexible joint as required in A.S.T.M. Specification C-443.

3. Concrete sewer pipe of a cold application mastic joint filled as required by Ohio Department of Transportation “Construction and Material Specifications Item 706.10 and 603.06.

4. Corrugated Polyethylene Pipe with smooth walled interior shall be a gasketed manufactured joint fitting.

f. Pipe Fittings – Inspection and Rejection

1. All pipes shall bear a means to identify the manufacturer and class of the pipe. The markings shall be indented or stenciled on the barrel and shall be plainly legible for purposes of identification.

2. All pipes shall be subject to inspection at the factory and the job site.

3. The manufacturer shall furnish a Certificate of Conformance in the form of an affidavit of conformance, test results or copies of test results for the pipe supplied for the project.

4. Inspection by the County will not relieve the manufacturer of the responsibility of furnishing material performing in all respects to the specifications.

5. Pipe shall be subject to rejection based on any of the following:

.01 Variations in any dimensions exceeding permissible variations as shown in the appropriate A.S.T.M. Specifications.

.02 Fractures, splits or cracks passing through the barrel, bell or socket of a pipe or fitting.

.03 Blisters or defects, which indicate imperfect proportioning, mixing or molding.

.04 Cracks, which impair the strength, durability or serviceability of the pipe.

.05 Variation of more than 1/8 inch per foot in alignment of the pipe intended to be straight.

g. Testing

Infiltration and ex-filtration tests will not usually be required of storm sewers. However, if it is the opinion of the County Engineer that the tests are necessary due to poor workmanship or materials, the Contractor shall perform all tests required to determine the leakage (i.e. run video camera down pipe). Testing for flexible storm sewer lines may include mandrill usage.

APPENDIX E

SITE PLAN CHECKLIST

CHECKLIST

SITE PLAN

_____ Vicinity Map - A small map locating the site in relation to the surrounding area.

_____ Existing Contours – The existing contours of the site should be shown on a map at 2' intervals.

_____ Existing Vegetation – The existing tree lines, grassy areas, or unique vegetation should be shown on a map.

_____ Soils – The boundaries of the different soil types should be shown on a map.

_____ Indicate North – The direction of north in relation to the site should be shown.

_____ Critical Erosion Areas – Areas with potentially serious erosion problems should be shown on a map.

_____ Existing Drainage Patterns – The dividing lines and the direction of flow for the different drainage areas and drainageways should be shown on a map.

_____ Final Elevations – Changes to the existing contours should be shown on a map. As final finish grades to building sites and directions of flow to channels, storm sewer, etc.

_____ Limits of Clearing and Grading – Areas, which are to be cleared and graded, should be outlined on a map.

_____ Location of Practices – The locations of the erosion and sediment control and storm water management practices used on the site should be shown on a map.

_____ Detailed Drawings – The detailed drawings for the structural practices that will be installed.

_____ Utilities and Easements – Show the existing location of buried and overhead utilities and all recorded easements.

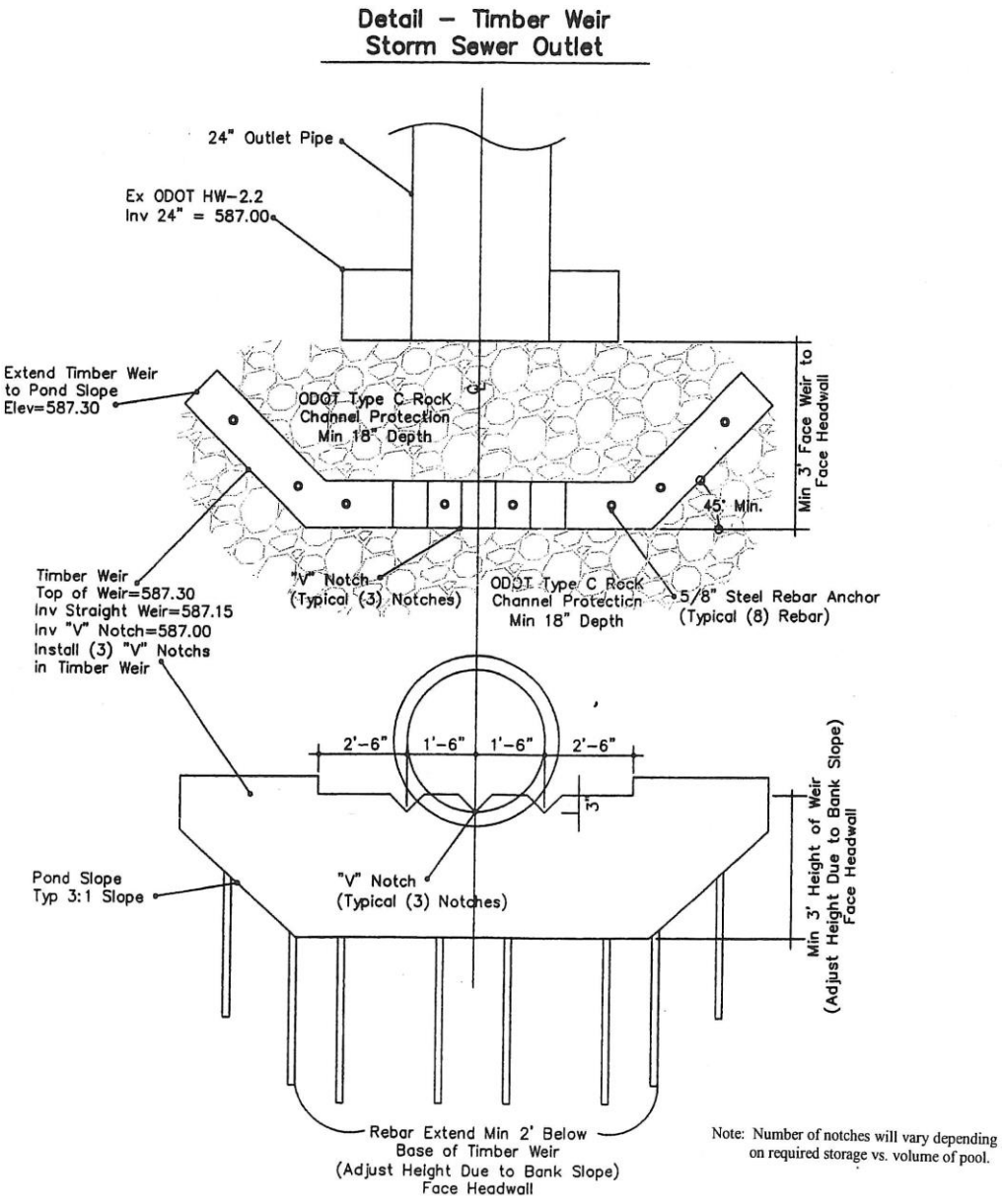
_____ Legend – Explain all symbols used.

_____ Scale – Show the scale use on the site plan. 1"=100' shall be minimum scale.

_____ Existing Features – Show location of natural and man-made features, utilities and easements.

APPENDIX F

WATER QUALITY STRUCTURES DESIGNS & EXAMPLES



NOTE: See Page 38 for notch design

Large Construction Activities. For all large construction activities (involving the disturbance of five or more acres of land or will disturb less than five acres, but is a part of a larger common plan of development or sale which will disturb five or more acres of land), the post construction BMP(s) chosen must be able to detain storm water runoff for protection of the stream channels, stream erosion control, and improved water quality. Structural (designed) post-construction storm water treatment practices shall be incorporated into the permanent drainage system for the site. The BMP(s) chosen must be sized to treat the water quality volume (WQ_v) and ensure compliance with Ohio's Water Quality Standards in OAC Chapter 3745-1. The WQ_v shall be equivalent to the volume of runoff from a 0.90-inch rainfall and shall be determined according to one of the two following methods:

i. Through a site hydrologic study approved by the local municipal permitting authority that uses continuous hydrologic simulation and local long-term hourly precipitation records or

ii. Using the following equation:

$WQ_v = C * P * A / 12$
where:
WQ_v = water quality volume in acre-feet
C = runoff coefficient appropriate for storms less than 1 inch (see Table 1)
P = 0.90 inch precipitation depth
A = area draining into the BMP in acres

Table 1
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 the 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) + (0.5) + (0.1)(0.2) = 0.35.

An additional volume equal to 20 percent of the WQ_v shall be incorporated into the BMP for sediment storage and/or reduced infiltration capacity. It is recommended that BMPs be designed according to the methodology included in the Rainwater and Land Development manual or in another design manual acceptable for use by Ohio EPA.

BMPs shall be designed such that the drain time is long enough to provide treatment, but short enough to provide storage available for successive rainfall events as described in Table 2 below.

Table 2
Target Draw Down (Drain) Times for Structural
Post-Construction Treatment Control Practices

Best Management Practice	Drain Time of WQ_v
Infiltration	24 – 48 hours
Vegetated Swale and Filter Strip	24 hours
Extended Detention Basin (Dry Basins)	48 hours
Retention Basins (Wet Basins)*	24 hours
Constructed Wetlands (above permanent pool)	24 hours
Media Filtration, Bioretention	40 hours

* Provide both a permanent pool and an extended detention volume above the permanent pool, each sized at 0.90 *WQ_v

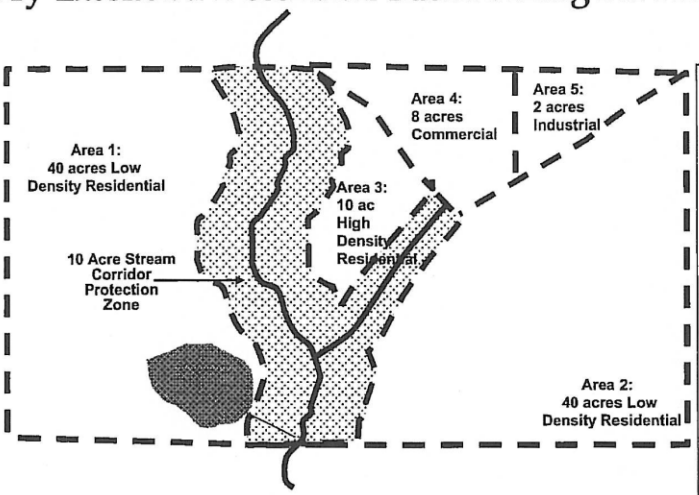
The permittee may request approval to use alternative structural post-construction BMPs if the permittee can demonstrate that the alternative BMPs are equivalent in effectiveness to those listed in Table 2 above. Construction activities shall be exempt from this condition if it can be demonstrated that the WQ_v is provided within an existing structural post-construction BMP that is part of a larger common plan of development or if structural post-construction BMPs are addressed in a regional or local storm water management plan.

Small Construction Activities. For all small land disturbance activities (which disturb one or more, but less than five acres of land and is not a part of a larger common plan of development which will disturb five or more acres of land), a description of measures that will be installed during the construction process to control pollutants in storm water discharges that will occur after construction operations have been completed must be included. Structural measures should be placed on upland soils to the degree attainable.

i. Such practices may include, but are not limited to: storm water detention structures (including wet basins); storm water retention structures; flow attenuation by use of open vegetated swales and natural depressions; infiltration of runoff onsite; and sequential systems (which combine several practices). The plan shall include an explanation of the technical basis used to select the practices to control pollution where flows exceed pre-development levels.

ii. Velocity dissipation devices shall be placed at discharge locations and along the length of any outfall channel to provide non-erosive flow velocity from the structure to a water course so that the natural physical and biological characteristics and functions are maintained and protected (e.g., no significant changes in the hydrological regime of the receiving water).

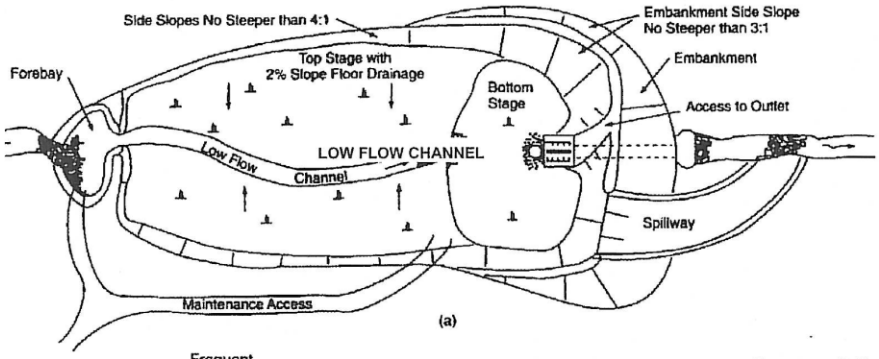
Example 110 Acre Development Site:
Dry Extended Detention Basin Sizing for Area 1



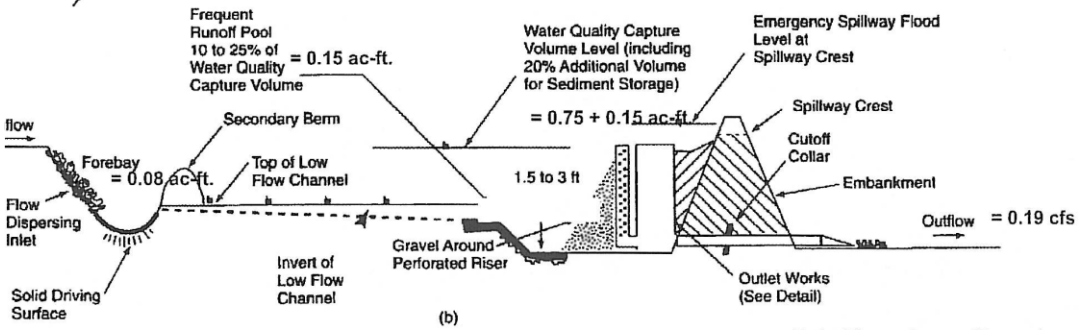
Area 1:
Extended Dry Detention Pond

WQV = P * C * A / 12 (Sec. 3.3.2)
WQV = (0.75" * 0.3 * 40 ac) / 12
= .75 ac-ft
Extended Detention = WQV (Sec. 3.3.4)
= .75 ac-ft
Sediment Storage = 0.2 * WQV (Sec. 3.3.4)
= .15 ac-ft
Forebay = 0.1 * WQV (Sec. 3.3.4.1)
= 0.08 ac-ft
Micropool = 0.2 * WQV (Sec. 3.3.4.1)
= 0.15 ac-ft
Discharge = Extended Detention Volume / Drawdown time (Sec. 3.3.4)
= (.75 ac-ft / 48 hrs) * (43560sf/ac)(1h/3600s)
= .19 cfs
Assume max depth = 5 ft
4 inch diameter perforated riser with 1/4 inch perforations
Area of perforation = 0.049 in^2
Flow through perforation (Sec. 3.3.4.1)
= $AC(64.4\ H)^{1/2}$
= $(0.049/144)*0.8(64.4*5)^{1/2}$
= 0.005 cfs
Number of perforations (Sec. 3.3.4.1)
= 0.19 cfs / 0.005 cfs
= 38 (Use 5 rows with 8 perforations per row with each row 4 inches apart)

Extended Dry Detention Basin Site



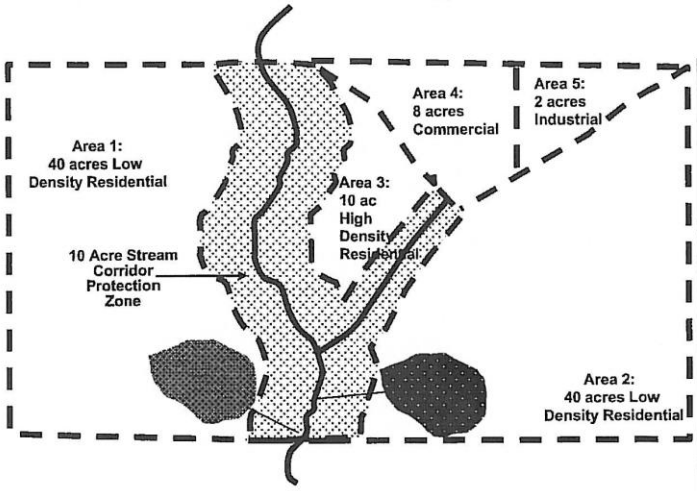
(a)



(b)

Note: The water quality capture volume plus sediment storage volume includes the forebay volume and micropool volume.

Example 110 Acre Development Site: Wet Detention Basin Sizing for Area 2

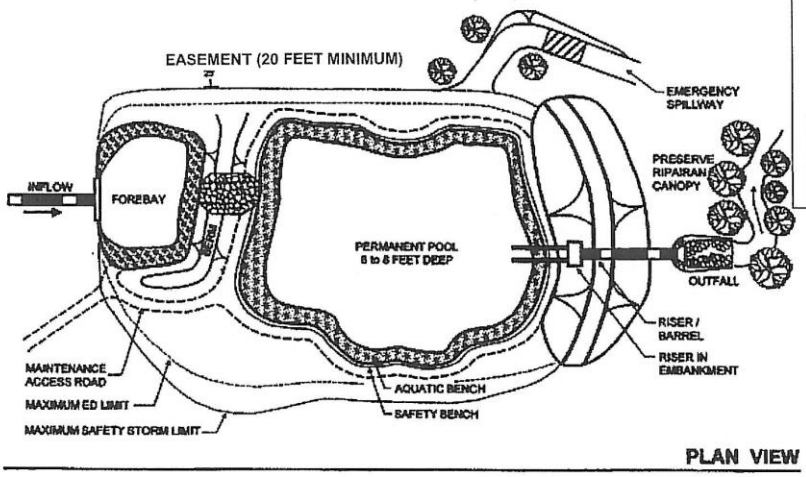


Area 2:
Wet Detention Pond

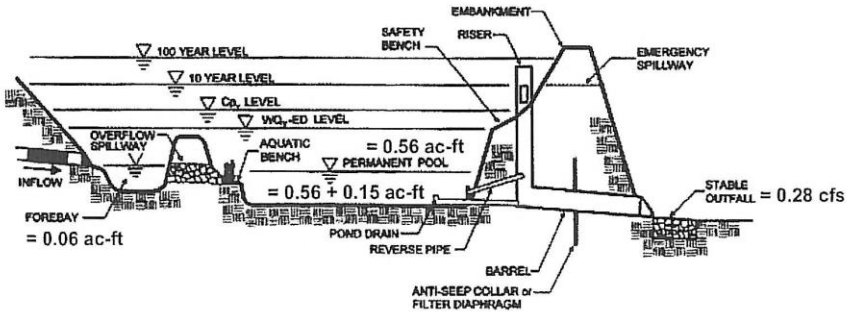
WQV = P * C * A / 12 (Sec. 3.3.2)
WQV = (0.75" * 0.3 * 40 ac) / 12
= .75 ac-ft
Extended Detention = 0.75 * WQV (Sec. 3.3.4)
= .56 ac-ft
Permanent Pool = 0.75 * WQV (Sec. 3.3.4)
= .56 ac-ft
Sediment Storage = 0.2 * WQV (Sec. 3.3.4)
= .15 ac-ft
Forebay = 0.1 * WQV (Sec. 3.3.4.1)
= 0.08 ac-ft
Discharge = Extended Detention Volume / Drawdown time (Sec. 3.3.4)
= (.56 ac-ft / 24 hrs)*(43560sf/ac)(1h/3600s)
= .28 cfs
Assume Max depth = 5 ft
Outlet orifice size: (Sec. 3.3.4.1)
$Q = AC(64.4\ H)^{1/2}$
$0.28 = A*0.66(64.4*5)^{1/2}$
$A = 0.024\ ft^2$
$=\pi*D^2/4$
$D = (4*0.024\ ft^2/\pi)^{1/2} * 12$
= 2 inches

Extended Dry Detention Basin Site

Wet Detention Basin Site

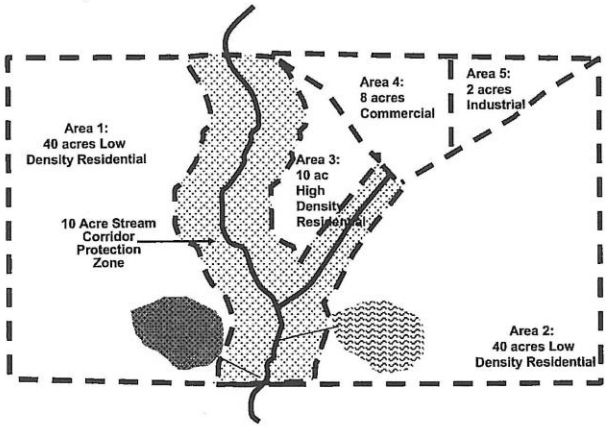


PLAN VIEW



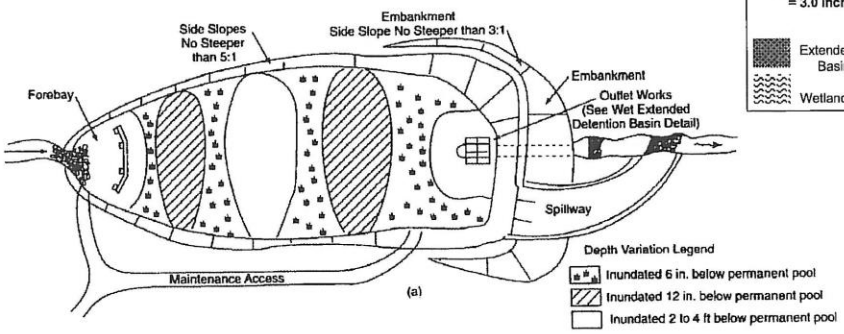
PROFILE

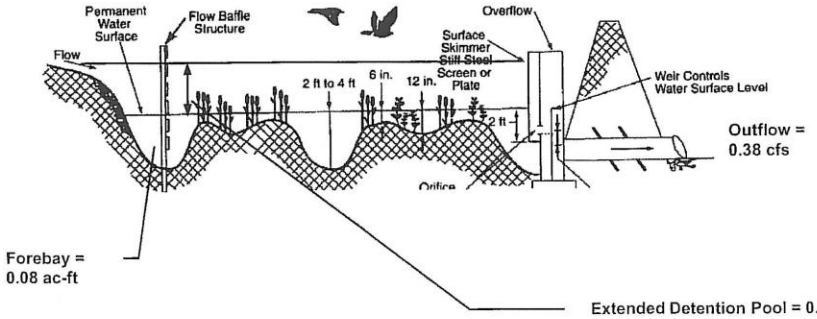
Example 110 Acre Development Site: Wetlands Sizing for Area 2 (Alternative to Wet Detention Basin)



Area 2 (Alternative):
Wetland
WQV = P * C * A / 12 (Sec. 3.3.2)
WQV = (0.75" * 0.3 * 40 ac) / 12
= .75 ac-ft
Extended Detention = WQV (Sec. 3.3.4)
= .75 ac-ft
Sediment Storage = 0.2 * WQV (Sec. 3.3.4)
= .15 ac-ft
Forebay = 0.1*WQV (Sec. 3.3.4.1)
= 0.08 ac-ft
Max depth = 2 ft
Surface Area = .75 ac-ft / 2 ft
= .38 ac
Discharge = Extended Detention Volume / Drawdown time (Sec. 3.3.4)
= (.75 ac-ft / 24 hrs)*(43560sf/ac)(1h/3600s)
= .38 cfs
Outlet orifice size (Sec. 3.3.4.1):
$Q = AC(64.4\ H)^{1/2}$
$0.38 = A*0.66(64.4*2)^{1/2}$
$A = 0.05\ ft^2$
$=\pi*D^2/4$
$D = (4*0.05ft^2/\pi)^{1/2}*12$
= 3.0 inches

Extended Dry Detention Basin Site
Wetland Site





Example 110 Acre Development Site: Wetland Water Balance for Area 2

The following ***water balance calculation*** shall be performed to demonstrate that any proposed stormwater wetland is sufficient to maintain normal pool elevation(s) during a thirty day drought at summer evaporation rates. The City requires that the permanent pool of any proposed stormwater wetland shall be at least two times the volume of evapotranspiration during a thirty day drought at summer evaporation rates or 0.75WQv, whichever is greater.

The change in water storage is given by:

ΔV = Inflows – Outflows

Potential inflow sources include rainfall-runoff and baseflow, and potential outflows include basin discharges, evaporation and evapotranspiration. During a drought, assume that there is no rainfall-runoff, baseflow, or basin discharges.

Therefore:

$$\Delta V = - (E_t) * A * T$$

where:

ΔV = change in volume of the permanent pool (ac-ft/month)
E_t = Evapotranspiration rate (inches/day)
= 75 percent of the summertime pan evaporation rate[1]
A = surface area of permanent pool (acres)
T = Duration of drought = 30 days

The pan evaporation rate reported by NOAA for the region including the City of Columbus is 0.2 inches/day for all of the summer months of June, July and August.

Therefore:

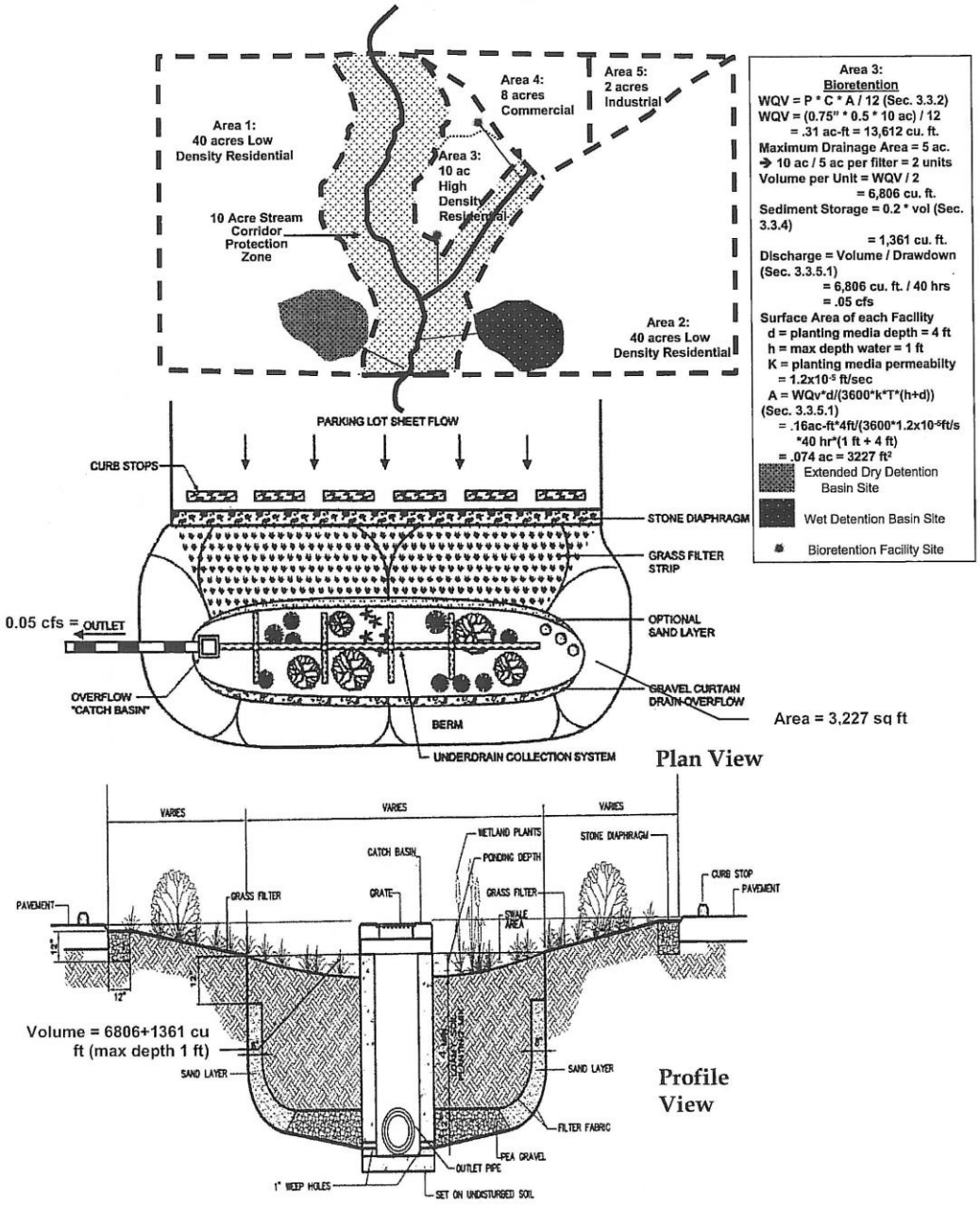
$$\Delta V = - (0.75*0.2 \text{ inches / day}) * A * 30 \text{ days} * 1 \text{ foot}/12 \text{ inches}$$

$$= -0.375 * A \text{ ac-ft}$$

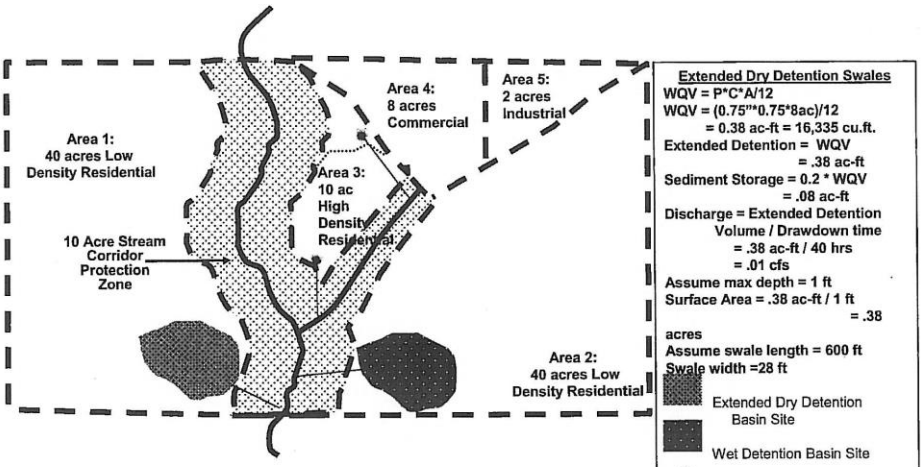
In other words, the volume of water lost to evapotranspiration in the wetlands will be 0.375 times the area of the wetland, and the permanent pool depth will decrease approximately 0.375 ft (4 inches) during a one-month drought where no rainfall occurs. The permanent pool volume must be twice the evapotranpiration volume, i.e., 0.75 times the area of the wetland, or 0.75 times the WQ_v, whichever is greater. Vegetation selected for constructed wetlands must be able to tolerate a drawdown of this depth.

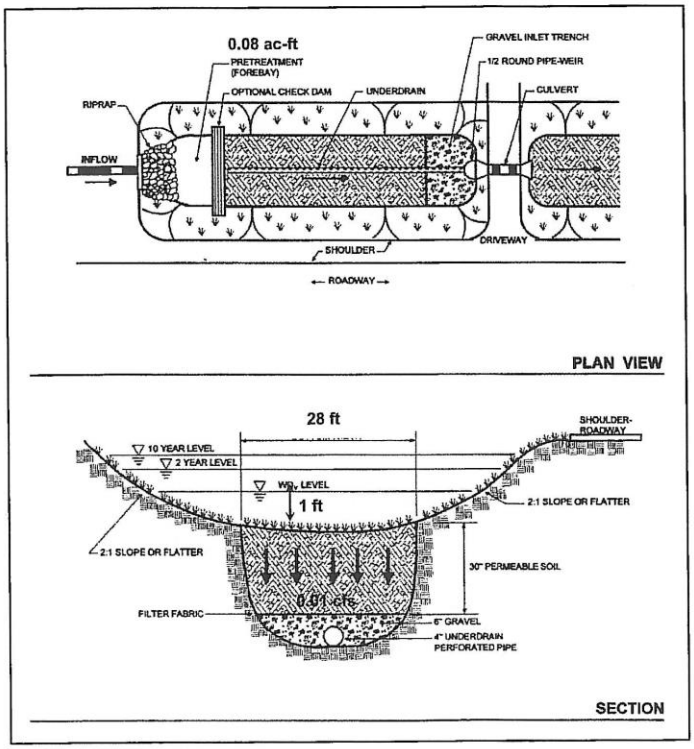
[1] *Treatment Wetlands*, pg. 192.

Example 110 Acre Development Site: Bioretention Facility Sizing for Area 3

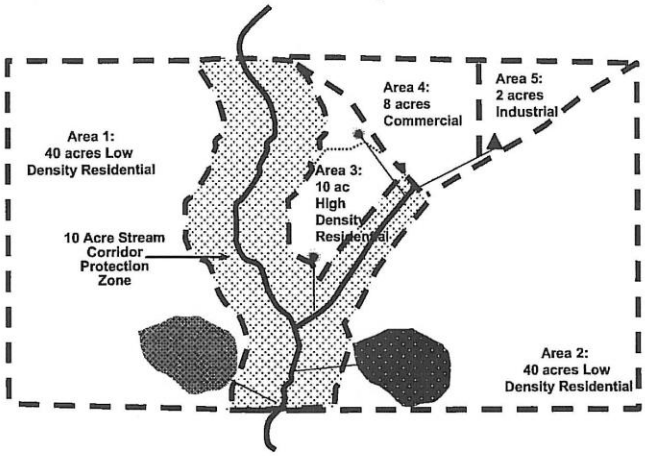


Example 110 Acre Development Site: Extended Dry Detention Swale for Area 4





Example 110 Acre Development Site:
Sand Filter Water Quality Treatment for Area 5



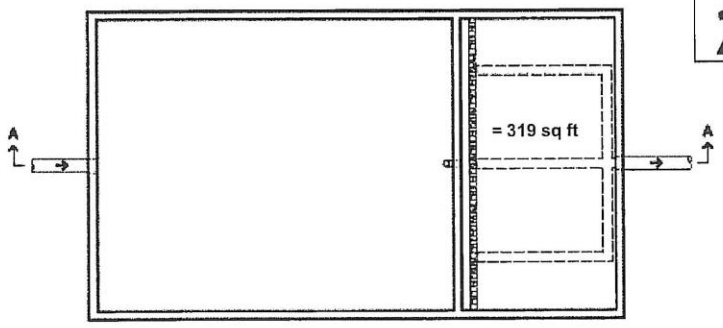
Area 5:
Sand Filter

WQV = P * C * A / 12 (Sec. 3.3.2)
WQV = (0.75" * 0.8 * 2 ac) / 12
= .1 ac-ft (43560sf/ac)
= 4,356 cu ft
Sedimentation Basin = WQV (Sec. 3.3.5.2)
= 4,356 cu ft
Sediment Storage = 0.2 * WQV (Sec. 3.3.4)
= 871 cu ft
Discharge = Extended Detention Volume / Drawdown time (Sec. 3.3.5.2)
= 4,356 cu ft / 40 hrs
= .03 cfs
Assume depth on filter = 4 ft (Sec. 3.3.5.2, L&G#2)
Surface area, sand filter
Af = WQv*d/(k*t*(h+d)) (Sec. 3.3.5.2)

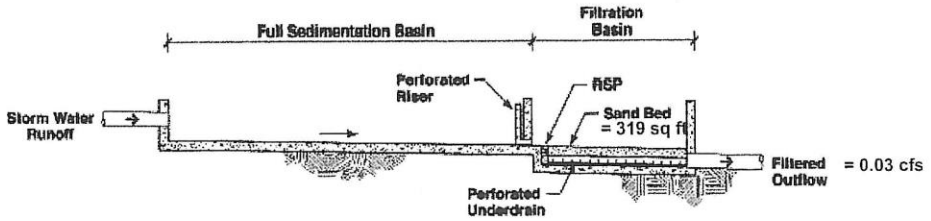
$$= \frac{4,356 \text{ cu ft} * 1.5 \text{ ft}}{(3.5 \text{ ft/day} * 1.67 \text{ day} * (2 \text{ ft} + 1.5 \text{ ft}))}$$

= 319 sq ft

Extended Dry Detention Basin Site
Wet Detention Basin Site
Bioretention Facility Site
Sand Filter Site



PLAN

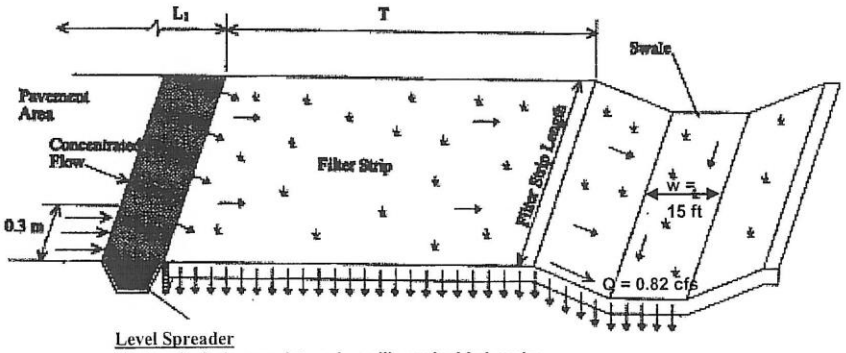


SECTION A-A

Example < 5 Acre Development Site:
Vegetated Swale for 4 acre Development Site

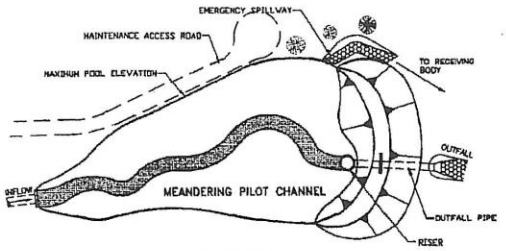
Vegetated Swales

WQV = P*C*A/12
WQV = (0.75"*0.75*4ac)/12
= 0.19 ac-ft = 8,168 cu.ft.
$t_o = 1.8(1.1-C)L^{1/2} / s^{1/3}$
$t_o = 1.8(1.1-0.75)100^{1/2} / 0.03^{1/3}$
t_o = 20 minutes
Using Figure 2-1, intensity = 1.1 in/hr
Qp = C*I*A = 0.75*1.1"/hr*4 ac
= 3.3 cfs (Peak flow)
Since Qp >1 cfs, 4 swales should serve the 4 ac site, with Qp=0.82 cfs
$Q = (1.49/n) A R^{2/3} S^{1/2}$
$0.82 cfs = (1.49/0.25) A R^{2/3} 0.03^{1/2}$
$0.79 = A R^{2/3}$
Max depth, d, is 2 in (0.17ft)
With wide channel assumption:
A = wd
R = d
$0.79 = w*(0.17)^{5/3}$
w = 15 ft

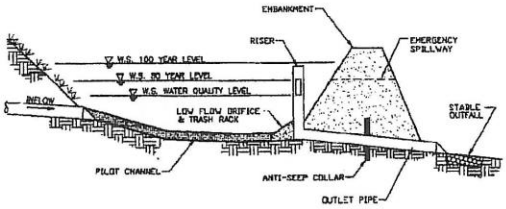


Level Spreader
Designs include gravel trenches, sills, embedded curbs, modular porous pavement, stabilized turf strip)

Note: Not to Scale

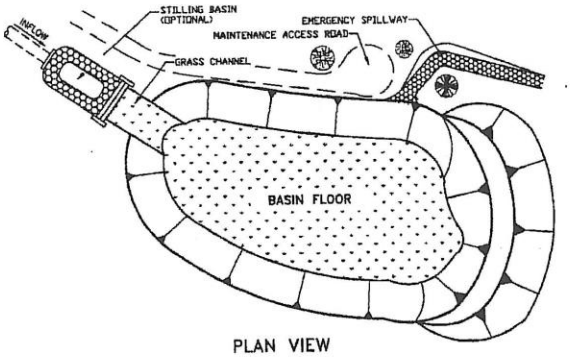


PLAN VIEW

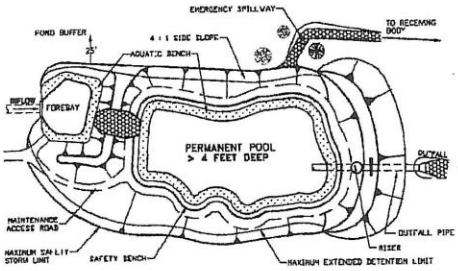


SECTION

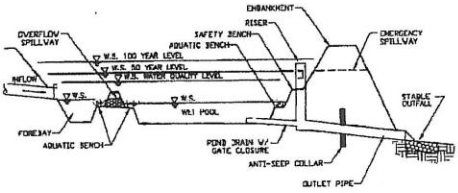
Detention Pond



PLAN VIEW

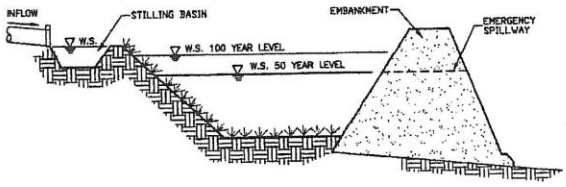


PLAN VIEW



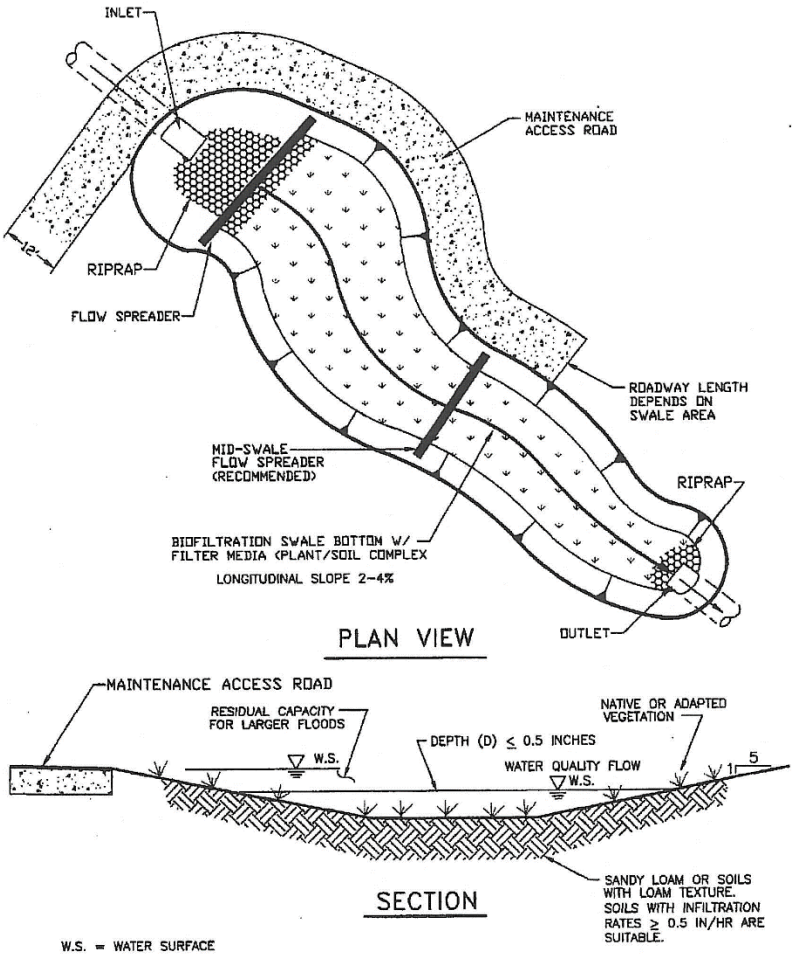
SECTION

Extended Detention Pond

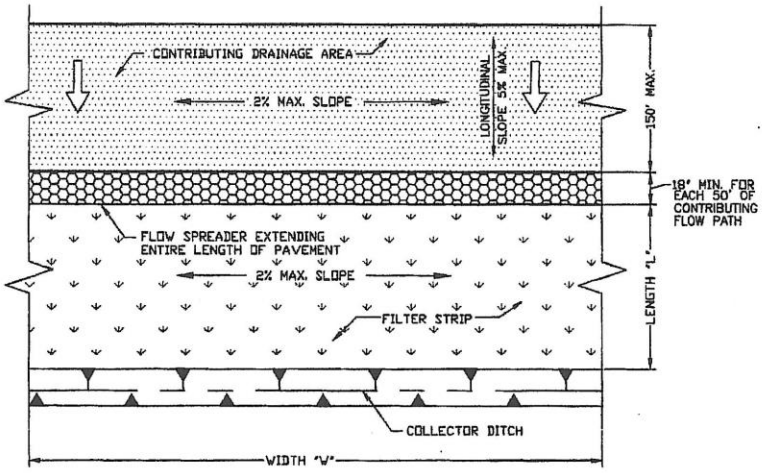


SECTION

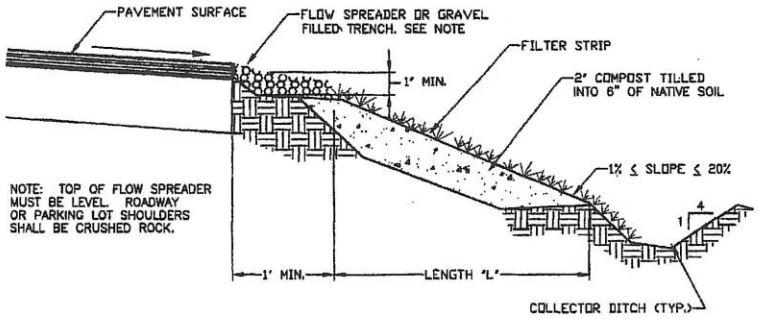
Evaporation Pond



Vegetated Swale

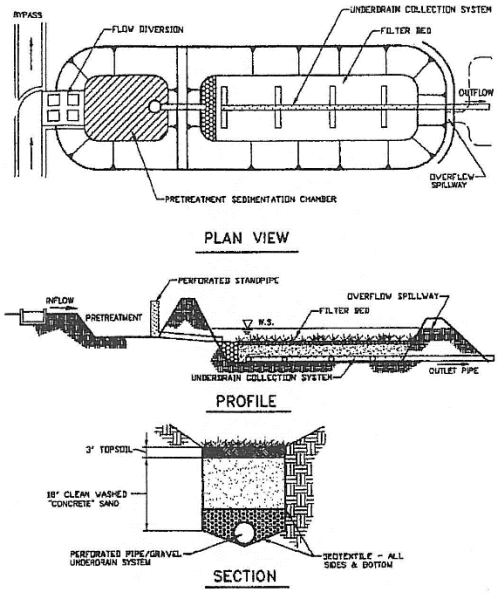


PLAN VIEW

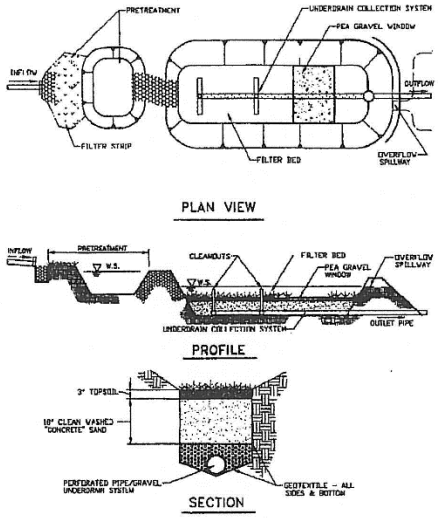


SECTION

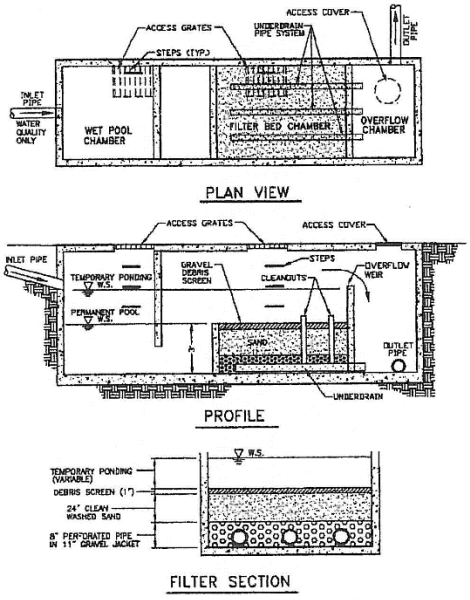
Irrigated Grass Buffer Strips



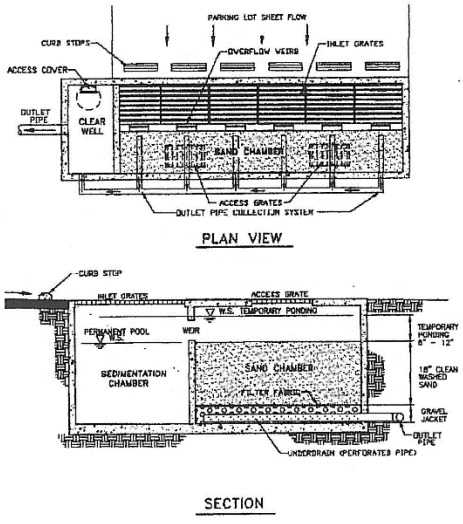
Austin Sand Filter



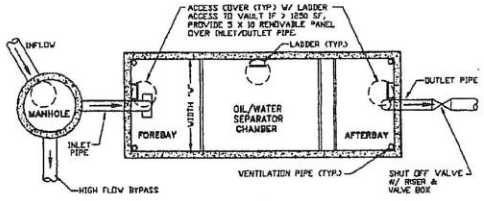
Pocket Sand Filter



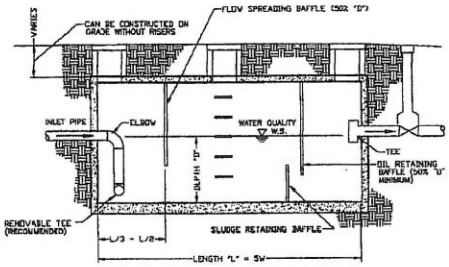
Underground Sand Filter



Delaware Sand Filter

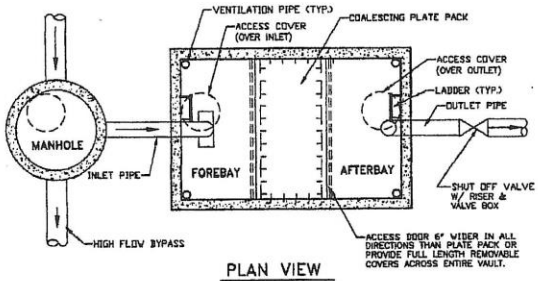


PLAN VIEW

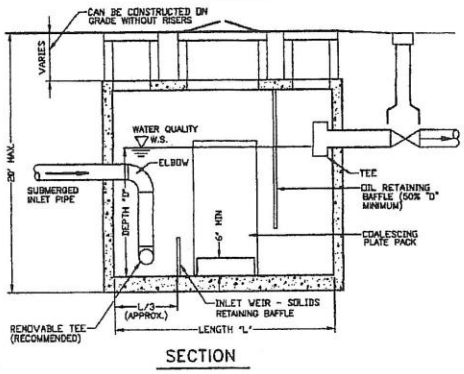


SECTION

Oil/Water Separator



PLAN VIEW



SECTION

Coalescing Oil/Water Separator

APPENDIX G

EROSION CONTROL
AND
REFERENCE DOCUMENT WEBSITES

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 seven days of the most recent disturbance
Any areas within 50 feet of a surface water of the State and at final grade	Within two days of reaching final grade
Any other areas at final grade	Within seven days of reaching final grade within that area

Table 2: Temporary Stabilization

Area requiring temporary stabilization	Time frame to apply erosion controls
Any disturbed areas within 50 feet of a surface water of the State and not at final grade	Within two days of the most recent disturbance if the area will remain idle for more than 21 days
For all construction activities, any disturbed areas that will be dormant for more than 21 days but less than one year, and not within 50 feet of a surface water of the State	Within seven 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

Where vegetative stabilization techniques may cause structural instability or are otherwise unobtainable, alternative stabilization techniques must be employed.

Additional information can be found on the EPA website at:
http://www.epa.state.oh.us/dsw/permits/GP_ConstructionSiteStormWater.html

Ohio Department of Natural Resources RLMD Manual at:
http://www.dnr.state.oh.us/tabid/9186/default.aspx

APPENDIX H

NOTICE OF VIOLATION
AND
STOP WORK ORDER FORMS

ERIE COUNTY, OHIO
NOTICE OF VIOLATION

ADDRESS/PREMISES _____

_____

Notice Date: _____

TO: _____
_____
_____

You are hereby notified that there exists a VIOLATION of the ERIE COUNTY STORMWATER MANAGEMENT RULES AND REGULATIONS regarding the above referenced premises.

The VIOLATION is: _____

_____

_____

in violation of Chapter _____ Section _____of the Rules and Regulations.

In order to resolve this Violation, you must do the following: _____

_____

_____

If this Violation is not resolved within thirty days after the date of this Notice, further legal action may be taken against you pursuant to Ohio Revised Code §307.79(E)(1).

Violations of the Rules and Regulations can result in additional legal action being taken against the violator, and can result in civil fines of not less than one hundred or more than five hundred dollars for each day of Violation.

_____ _____

Date Official Signature

Authorized by Ohio Revised Code §307.79.

ERIE COUNTY, OHIO

STOP WORK ORDER

ADDRESS/PREMISES _____

_____

TAKE NOTICE that there exists a VIOLATION of the ERIE COUNTY STORMWATER MANAGEMENT RULES AND REGULATIONS regarding the above referenced premises.

The VIOLATION is: _____

_____

_____

_____

in violation of Chapter _____ Section _____of the Rules and Regulations.

YOU ARE HEREBY DIRECTED AND ORDERED TO STOP WORK.

Violations of the Rules and Regulations or this Order can result in further legal action being taken against the violator, and can result in civil fines of not less than one hundred or more than five hundred dollars for each day of violation of the Rules or Stop Work Order.

_____ _____

Date Official Signature

Authorized by Ohio Revised Code §307.79.