

STORMWATER MANANGEMENT ORDINANCE

ORDINANCE NO. 401

MUNICIPALITY OF
LOYALSOCK TOWNSHIP

LYCOMING COUNTY, PENNSYLVANIA

Adopted at a Public Meeting Held on

September 24, 2024

Chapter 183

STORMWATER MANAGEMENT

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[HISTORY: Adopted by the Board of Supervisors of the Township of Loyalsock on September 24, 2024 by Ord. No. 401. Amendments noted where applicable.]

GENERAL REFERENCES

Construction and property maintenance standards — See Ch. 100.

Construction codes — See Ch. 103.

Sewers — See Ch. 175.

Subdivision and land development — See Ch. 190.

Water — See Ch. 210.

Zoning — See Ch. 215.

ARTICLE I

General Provisions

§ 183-1. Short Title.

This Ordinance shall be known, and may be cited, as the “Loyalsock Township Stormwater Management Ordinance.”

§ 183-2. Statement of Findings.

The governing body of the municipality finds that:

- A. Inadequate management of accelerated runoff of stormwater resulting from development throughout a watershed increases runoff volumes, flows and velocities, contributes to erosion and sedimentation, overtaxes the carrying capacity of streams and storm sewers, greatly increases the cost of public facilities to carry and control stormwater, undermines flood plain management and flood control efforts in downstream communities, reduces groundwater recharge, threatens public health and safety, and increases nonpoint source pollution of water resources.

- B. A comprehensive program of stormwater management (SWM), including reasonable regulation of development and activities causing accelerated runoff, is fundamental to the public health, safety, and welfare and the protection of people of the Commonwealth, their resources and the environment.
- C. Stormwater is an important water resource that provides groundwater recharge for water supplies and supports the base flow of streams.
- D. The use of green infrastructure and low impact development (LID) are intended to address the root cause of water quality impairment by using systems and practices which use or mimic natural processes to: 1) infiltrate and recharge, 2) evapotranspire, and/or 3) harvest and use precipitation near where it falls to earth. Green infrastructure practices and LID contribute to the restoration or maintenance of pre-development hydrology.
- E. Federal and state regulations require certain municipalities to implement a program of stormwater controls. These municipalities are required to obtain a permit for stormwater discharges from their separate storm sewer systems under the National Pollutant Discharge Elimination System (NPDES) program.

§ 183-3. Purpose.

The purpose of this Ordinance is to promote health, safety, and welfare within the municipality and its watershed by minimizing the harms and maximizing the benefits described in § 183-2 of this Ordinance, through provisions designed to

- A. Meet legal water quality requirements under state law, including regulations at 25 Pa. Code 93 to protect, maintain, reclaim, and restore the existing and designated uses of the waters of this Commonwealth.
- B. Preserve natural drainage systems.
- C. Manage stormwater runoff close to the source, reduce runoff volumes and mimic predevelopment hydrology.
- D. Provide procedures and performance standards for stormwater planning and management.
- E. Maintain groundwater recharge to prevent degradation of surface and groundwater quality and to otherwise protect water resources.
- F. Prevent scour and erosion of stream banks and streambeds.
- G. Provide proper operation and maintenance of all stormwater best management practices (BMPs) that are implemented within the municipality.
- H. Provide standards to meet NPDES requirements.

§ 183-4. Statutory Authority.

The municipality is empowered to regulate land use activities that affect runoff by the authority of the Act of July 31, 1968, P.L 805, No. 247, The Pennsylvania Municipalities Planning Code, as amended, and/or the Act of October 4, 1978, P.L 864 (Act 167), 32 P.S. Section 680.1, et. seq., as amended, The Stormwater Management Act.

§ 183-5. Applicability.

All regulated activities and all activities that may affect stormwater runoff, including land development and earth disturbance activity, are subject to regulation by this Ordinance.

§ 183-6. Repealer.

Any other ordinance provision(s) or regulation of the municipality inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

§ 183-7. Severability.

In the event that a court of competent jurisdiction declares any section or provision of this Ordinance invalid, such decision shall not affect the validity of any of the remaining provisions of this Ordinance.

§ 183-8. Compatibility with Other Requirements.

Approvals issued and actions taken under this Ordinance do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other code, law, regulation, or ordinance.

§ 183-9. Erroneous Permit.

Any permit or authorization issued or approved based on false, misleading or erroneous information provided by an applicant is void without the necessity of any proceedings for revocation. Any work undertaken or use established pursuant to such permit or other authorization is unlawful. No action may be taken by a board, agency or employee of the Municipality purporting to validate such a violation.

§ 183-10. Waivers.

- A. If the Municipality determines that any requirement under this Ordinance cannot be achieved for a particular regulated activity, the Municipality may, after an evaluation of alternatives, approve measures other than those in this Ordinance, subject to Section 183-10, paragraphs B and C.
- B. Waivers or modifications of the requirements of this Ordinance may be approved by the Municipality if enforcement will exact undue hardship because of peculiar conditions pertaining to the land in question, provided that the modifications will not be contrary to the public interest and that the purpose of the Ordinance is preserved. Cost or financial burden shall not be considered a hardship. Modification may be considered if an alternative standard or approach will provide equal or better achievement of the purpose of the Ordinance. A request for modifications shall be in writing and accompany the Stormwater Management Site Plan submission. The request shall provide the facts on which the request is based, the provision(s) of the Ordinance involved and the proposed modification.
- C. No waiver or modification of any regulated stormwater activity involving earth disturbance greater than or equal to one acre may be granted by the Municipality unless that action is approved in advance by the Department of Environmental Protection (DEP) or the delegated county conservation district.

ARTICLE II

Definitions

For the purposes of this Ordinance, certain terms and words used herein shall be interpreted as follows:

- A. Words used in the present tense include the future tense; the singular number includes the plural, and the plural number includes the singular; words of masculine gender include feminine gender; and words of feminine gender include masculine gender.
- B. The word “includes” or “including” shall not limit the term to the specific example but is intended to extend its meaning to all other instances of like kind and character.
- C. The words “shall” and “must” are mandatory; the words “may” and “should” are permissive.

These definitions do not necessarily reflect the definitions contained in pertinent regulations or statutes, and are intended for this Ordinance only.

ACCELERATED EROSION — The removal of the surface of the land through the combined action of man’s activity and natural processes at a rate greater than would occur because of the natural process alone.

AGRICULTURAL ACTIVITY — Activities associated with agriculture such as agricultural cultivation, agricultural operation, and animal heavy use areas. This includes the work of producing crops including tillage, land clearing, plowing, disking, harrowing, planting, harvesting crops or pasturing and raising of livestock and installation of conservation measures. Construction of new buildings or impervious area is not considered an agricultural activity.

ALLUVIAL SOILS — Those areas delineated pursuant to the Lycoming County, Pennsylvania, Soil Survey, November 1986, as may be amended from time to time.

ALTERATION — As applied to land, a change in topography as a result of the moving of soil and rock from one location or position to another; also the changing of surface conditions by causing the surface to be more or less impervious; land disturbance.

APPLICANT — A landowner, developer or other person who has filed an application to the municipality for approval to engage in any regulated activity at a project site in the municipality.

BMP (BEST MANAGEMENT PRACTICE) — Activities, facilities, designs, measures or procedures used to manage stormwater impacts from regulated activities, to meet state water quality requirements, to promote groundwater recharge, and to otherwise meet the purposes of this Ordinance. Stormwater BMPs are commonly grouped into one of two broad categories or measures: “structural” or “non-structural”. In this Ordinance, non-structural BMPs or measures refer to operational and/or behavior-related practices that attempt to minimize the contact of pollutants with stormwater runoff, whereas structural BMPs or measures are those that consist of a physical device or practice that is installed to capture and treat stormwater runoff. Structural BMPs include, but are not limited to, a wide variety of practices and devices, from large-scale retention ponds and constructed wetlands, to small-scale underground treatment systems, infiltration facilities, filter strips, low impact design, bioretention, wet ponds, permeable paving, grassed swales, riparian or forested buffers, sand filters, detention basins, and manufactured devices. Structural stormwater BMPs are permanent appurtenances to the project site. The term Stormwater Control Measure (SCM) is equivalent to BMP. [Amended 3-22-2005 by Ord No. 311].

BOARD OF REVIEW — The panel to hear, review and issue decisions on appeal from determinations of a municipal representative under this article.

CARBONATE — A sediment formed by the organic or inorganic precipitation of mineral compounds characterized by the fundamental chemical ion CO_3 , the principal element in limestone and dolomite strata.

CHANNEL — A perceptible natural or artificial waterway, which periodically or continuously contains moving water, having a definite bed and banks which confine the water.

CHANNEL EROSION — The widening, deepening, and headward cutting of small channels and waterways.

CISTERN — An underground reservoir or tank for storing rainwater.

CLOSED OR UNDRAINED DEPRESSION — In a Karst geologic area, a distinct bowl-shaped depression in the land surface; size and amplitude are variable; drainage is internal. It differs from a sinkhole in that the ground surface is unbroken and usually occurs in greater density per unit area.

CONSERVATION DISTRICT — A conservation district, as defined in Section 3(c) of the Conservation District Law (3 P.S. § 851(c)) that has the authority under a delegation agreement executed with DEP to administer and enforce all or a portion of the regulations promulgated under 25 Pa. Code 102.

CULVERT — A structure with appurtenant works which carries a stream under or through an embankment or fill.

DAM — An artificial barrier, together with its appurtenant works, constructed for the purpose of impounding or storing water or another fluid or semifluid, or a refuse bank, fill or structure for highway, railroad or other purposes which does or may impound water or another fluid or semifluid.

DESIGN STORM — The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a five-year storm) and duration (e.g., 24 hours), used in the design and evaluation of stormwater management systems. Also see Return Period.

DETENTION BASIN — A basin designed to retard stormwater runoff by temporarily storing the stormwater runoff and releasing it at a predetermined rate. A detention basin may be designed to drain completely after a storm event (dry pond), or it may be designed to contain a permanent pool of water (wet pond).

DETENTION VOLUME — The volume of runoff that is captured and released into the waters of the Commonwealth at a controlled rate.

DEP — The Pennsylvania Department of Environmental Protection

DEVELOPER — A person or persons, partnership, association, corporation or other entity, or any responsible person therein or agent thereof, who undertakes the activities covered by this chapter.

DEVELOPMENT SITE (SITE) — See Project Site.

DISTURBED AREA — An unstabilized land area where an earth disturbance activity is occurring or has occurred.

DRAINAGE EASEMENT — A right granted by a landowner to a grantee allowing the use of private land for stormwater management purposes.

DRAINAGE PLAN — The documentation of the stormwater management system, if any, to be used for a given development site, the contents of which are established in Section 183-17.

EARTH DISTURBANCE ACTIVITY — A construction or other human activity which disturbs the surface of the land, including, but not limited to: clearing and grubbing; grading; excavations; embankments; road maintenance; building construction; and the moving, depositing, stockpiling, or storing of soil, rock, or earth materials. [Added 3-22-2005 by Ord. No 311]

EASEMENT — A recorded agreement of right-of-way granted, but not dedicated, for limited use of private land for a public or quasi-public purpose, identified on the final plan, and within which the owner of the property shall not erect any permanent structures but shall have the right to make any other use of the land which is not inconsistent with the rights of the grantee.

EROSION — The natural process by which the surface of the land is worn away by water, wind or chemical action.

EROSION AND SEDIMENT POLLUTION CONTROL PLAN — A plan designed to minimize accelerated erosion and sedimentation.

EXISTING CONDITION — The dominant land cover during the 5-year period immediately preceding a proposed regulated activity.

FEMA — Federal Emergency Management Agency.

FLOOD — A general but temporary condition of partial or complete inundation of normally dry land areas from the overflow of streams, rivers, and other waters of this Commonwealth.

FLOODPLAIN — Any land area susceptible to inundation by water from any natural source or delineated by applicable FEMA maps and studies as being a special flood hazard area. Also includes areas that comprise Group 13 Soils, as listed in Appendix A of the Pennsylvania Department of Environmental Protection (PA DEP) Technical Manual for Sewage Enforcement Officers (as amended or replaced from time to time by DEP).

FLOODWAY — The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA. In an area where no FEMA maps or studies have defined the boundary of the 100-year floodway, it is assumed—absent evidence to the contrary—that the floodway extends from the stream to 50 feet from the top of the bank of the stream.

FOREST MANAGEMENT/TIMBER OPERATIONS — Planning and activities necessary for the management of forestland. These include conducting a timber inventory, preparation of forest management plans, silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation and reforestation.

GABION — A large rectangular box of heavy-gauge wire mesh which holds large cobbles and boulders; used in streams and ponds to change flow patterns, stabilize banks, or prevent erosion.

GRADE — A slope, usually of a road, channel or natural ground, specified in percent and shown on plans as specified herein. (TO) **GRADE**: To finish the surface of a roadbed, top of embankment or bottom of excavation.

GRADING — The act of excavating and/or filling land for the purpose of changing natural slope.

GREEN INFRASTRUCTURE — Systems and practices that use or mimic natural processes to infiltrate, evapotranspire, or reuse stormwater on the site where it is generated.

GROUNDWATER RECHARGE — The replenishment of existing natural underground water supplies.

HYDROLOGIC SOIL GROUP (HSG) — Infiltration rates of soils vary widely and are affected by subsurface permeability as well as surface intake rates. Soils are classified into four HSGs (A, B, C, and D) according to their minimum infiltration rate, which is obtained for bare soil after prolonged wetting. The NRCS defines the four groups and provides a list of most of the soils in the United States and their group classification. The soils in the area of the development site may be identified from a soil survey report that can be obtained from local NRCS offices or conservation district offices. Soils become less pervious as the HSG varies from A to D (NRCS^{1,2}).

IMPERVIOUS SURFACE (IMPERVIOUS AREA) — A surface that prevents the infiltration of water into the ground. Impervious surfaces (or areas) shall include, but not be limited to: roofs; additional indoor living spaces, patios, garages, storage sheds and similar structures and any new streets or sidewalks. Decks, parking areas, and driveway areas are not counted as impervious areas if they do not prevent infiltration. Any surface areas designed to initially be gravel or crushed stone shall be assumed to be impervious surfaces. [Amended 3-22-2005 by Ord No. 311]

IMPOUNDMENT — A retention or detention basin designed to retain stormwater runoff and release it at a specified rate.

INFILTRATION STRUCTURE — A structure designed to direct stormwater runoff into the ground, such as french drains, seepage pits, or seepage trenches.

INLET — A surface connection to a closed drain. A structure at the diversion end of a conduit. The upstream end of any structure through which water may flow.

KARST — A type of topography or landscape characterized by surface depressions, sinkholes, rock pinnacles/uneven bedrock surface, underground drainage, and caves. Karst is formed on carbonate rocks, such as limestone or dolomite.

LAND DEVELOPMENT (DEVELOPMENT) — Inclusive of any or all of the following meanings: (i) the improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) a group of two or more Residential buildings or any non residential building (b) the division or allocation of land or space between or among two or more existing or prospective occupants by means of, or for the purpose of streets, common areas, leaseholds, condominiums, building groups, or other features; (ii) any subdivision of land; (iii) development in accordance with Section 503(1.1) of the PA Municipalities Planning Code.

LAND DISTURBANCE — Any activity involving grading, tilling, digging, or filling of ground or stripping of vegetation, or any other activity which causes land to be exposed to erosion.

LEVEL SPREADER — A device used to spread out stormwater runoff uniformly over the ground surface as sheet flow (i.e., not through channels). The purpose of level spreaders is to prevent concentrated, erosive flows from occurring, and to enhance infiltration.

LOW FLOW CHANNEL — An incised or paved channel from inlet to outlet in a dry basin which is designed to carry low stormwater runoff flows and/or base flow directly to the outlet without detention.

LOW IMPACT DEVELOPMENT (LID) — Site design approaches and small-scale stormwater management practices that promote the use of natural systems for infiltration, evapotranspiration, and reuse of rainwater. LID can be applied to new development, urban retrofits, and revitalization projects. LID utilizes design techniques that infiltrate, filter, evaporate and store runoff close to its source. Rather than rely on costly large-scale conveyance and treatment systems, LID addresses stormwater through a variety of small, cost effective landscape features located on-site.

MUNICIPAL ENGINEER — A registered professional engaged by the Loyalsock Township to provide municipal engineering services.

MUNICIPALITY — The Loyalsock Township, Lycoming County, Pennsylvania.

NPDES — National Pollutant Discharge Elimination System, the federal government's system for issuance of permits under the Clean Water Act, which is delegated to DEP in Pennsylvania. [Added 3-22-2005 by Ord. No. 311]

NRCS — USDA Natural Resources Conservation Service (previously SCS).

OPEN CHANNEL — A drainage element in which stormwater flows with an open surface. Open channels include, but shall not be limited to, natural and man-made drainageways, swales, streams, ditches, canals, and pipes flowing partly full.

OUTLET — Points of water disposal from a stream, river, lake, tidewater or artificial drain.

PEAK DISCHARGE — The maximum rate of stormwater runoff from a specific storm event.

PENNSYLVANIA MUNICIPALITIES PLANNING CODE (MPC) — Act of 1968, July 31, P.L. 805, as amended (53 P.S. 10101 et seq.).

PERVIOUS AREA — Any area not defined as impervious.

PIPE — A culvert, closed conduit, or similar structure (including appurtenances) that conveys stormwater.

POINT SOURCE — Any discernible, confined and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, or conduit from which stormwater is or may be discharged, as defined in state regulations at 25 Pa. Code § 92.1. [Added 3-22-2005 by Ord. No. 311]

PROJECT SITE — The specific area of land where any regulated activities in the municipality are planned, conducted, or maintained.

RATIONAL METHOD — A rainfall-runoff relation used to estimate peak flow.

RECORD DRAWING — A drawing prepared by a registered professional in accordance with the “As-Built Plans Requirements” policy memo of Lycoming County; February 4, 1994, and as may be amended from time to time.

QUALIFIED PROFESSIONAL — Any person licensed by the Pennsylvania Department of State or otherwise qualified by law to perform the work required by this Ordinance.

REGULATED ACTIVITIES — Any earth disturbance activities or any activities that involve the alteration or development of land in a manner that may affect stormwater runoff.

REGULATED EARTH DISTURBANCE ACTIVITY — Activity involving earth disturbance subject to regulation under 25 Pa. Code 92, 25 Pa. Code 102 or the Clean Streams Law. Earth disturbance activity of one acre or more with a point source discharge to surface waters or the municipality’s storm sewer system, or five acres or more regardless of the planned runoff. This includes earth disturbance on any portion of, part, or during any stage of, a larger common plan of development. This only includes road maintenance activities involving 25 acres or more of earth disturbance. [Added 3-22-2005 by Ord. No. 311]

RESPONSIBLE PARTY — A “person,” as defined in the Stormwater Management Act, Act of October 4, 1978, P.L. 864 Number 167, 32 P.S. § 680.1 et seq. (as amended).

RETENTION BASIN — A basin in which stormwater runoff from a given flood event is stored and is not discharged into the downstream drainage system during the flood event.

RETENTION VOLUME/REMOVED RUNOFF — The volume of runoff that is captured and not released directly into the surface waters of this Commonwealth during or after a storm event.

RETURN PERIOD — The average interval, in years, within which a storm event of a given magnitude can be expected to occur one time. For example, the twenty-five-year return period rainfall would be expected to occur on average once every 25 years; or stated in another way, the probability of a 25-year storm occurring in any one year is 0.04 (i.e. a 4% chance).

RIPARIAN BUFFER — A permanent area of trees and shrubs located adjacent to streams, lakes, ponds and wetlands.

RIPRAP — A combination of large stone, cobbles, and boulders used to line channels, stabilize banks, and reduce stormwater runoff velocities.

RISER — A vertical pipe extending from the bottom of a detention basin that is used to limit the discharge rate from the detention basin for a specified design storm.

RUNOFF — Any part of precipitation that flows over the land surface.

SEDIMENT — Soils or other materials transported by surface water as a product of erosion.

SEDIMENTATION — The process by which mineral or organic matter is accumulated or deposited by the movement of water.

SEDIMENT POLLUTION — The placement, discharge or any other introduction of sediment into the waters of the Commonwealth occurring from the failure to design, construct, implement or maintain control measures and control facilities in accordance with the requirements of this chapter.

SEEPAGE PIT/SEEPAGE TRENCH — An area of excavated earth filled with loose stone or

similar coarse material, into which surface water is directed for infiltration into the ground.

SEPARATE STORM SEWER SYSTEM — A conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains) primarily used for collecting and conveying stormwater runoff. [Added 3-22-2005 by Ord. No. 311]

SHEET FLOW — Stormwater runoff which flows over the ground surface as a thin, even layer, not concentrated in a channel. Flow depth is generally 0.1 feet or less.

SINKHOLE — A localized, gradual or rapid sinking of the land surface to a variable depth, occurring in areas of carbonate bedrock; generally characterized by a roughly circular outline, a distant breaking of the ground surface and downward movement of soil into bedrock voids.

SOIL-COVER COMPLEX METHOD — A method of computing stormwater runoff developed by NRCS, and found in its publication National Engineering Handbook, Section 4, Hydrology (USDA, NRCS).

SPILLWAY — A depression in the embankment of a detention basin which is used to pass peak discharge greater than the maximum design storm that said detention basin was designed for.

STATE WATER QUALITY REQUIREMENTS — The regulatory requirements to protect, maintain, reclaim, and restore water quality under Title 25 of the Pennsylvania Code and the Clean Streams Law. [Added 3-22-2005 by Ord. No. 311]

- A. Each stream segment in Pennsylvania has a “designated use,” such as “cold water fishery” or “potable water supply,” which uses are listed in Chapter 93. These uses must be protected and maintained, under state regulations.
- B. "Existing uses" are those attained as of November 1975, regardless of whether they have been designated in Chapter 93. Regulated earth disturbance activities must be designed to protect and maintain existing uses and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in special protection streams.
- C. Water quality involves the chemical, biological and physical characteristics of surface water bodies. After regulated earth disturbance activities are complete, these characteristics can be impacted by addition of pollutants such as sediment, and changes in habitat through increased flow volumes and/or rates as a result of changes in land surface area from those activities. Therefore, permanent discharges to surface waters must be managed to protect the stream bank, streambed and structural integrity of the waterway, to prevent these impacts.

STORM SEWER — A system of pipes or other conduits which carries intercepted surface stormwater runoff, street water and other wash water or drainage, excluding domestic sewage and industrial wastes.

STORMWATER — Drainage runoff from the surface of the land resulting from precipitation or snow or ice melt.

STORMWATER MANAGEMENT FACILITY — Any structure, natural or man-made, that, due to its condition, design, or construction, conveys, stores, or otherwise affects stormwater runoff. Typical stormwater management facilities include, but are not limited to, detention and

retention basins; open channels; storm sewers; pipes; and infiltration facilities.

STORMWATER MANAGEMENT SITE PLAN — The plan prepared by the developer or his representative indicating how stormwater runoff will be managed at the development site in accordance with this Ordinance. **Stormwater Management Site Plan** will be designated as **SWM Site Plan** throughout this Ordinance.

STRATA — Tabular or sheet-like mass, distinct layers of homogenous or gradational sedimentary material (consolidated rock or unconsolidated earth) of any thickness, visually separable from other layers above and below by a discrete change in the character of the material deposited or by a sharp physical break, deposition or both.

SUBAREA — The smallest drainage unit of a watershed for which stormwater management criteria have been established in the stormwater management plan.

SUBDIVISION — As defined in The Pennsylvania Municipalities Planning Code, Act of July 31, 1968, P.L. 805, No. 247. The division or redivision of a lot, tract or parcel of land by any means into two or more lots, tracts, parcels or other divisions of land, including changes in existing lot lines for the purpose, whether immediate or future, of lease, partition by the court for distribution to heirs or devisees, transfer of ownership, or building or lot development; provided, however, that the subdivision by lease of land for agricultural purposes into parcels of more than 10 acres, not involving any new street or easement of access or any residential dwellings, shall be exempted.

USDA — United States Department of Agriculture.

SWALE — A low-lying stretch of land or wide shallow ditch, usually grassed or paved, which gathers or carries stormwater runoff.

TIMBER OPERATIONS — See “forest management.”

TIME OF CONCENTRATION — The time for surface runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. This time is the combined total of overland flow time and flow time in pipes or channels, if any.

TOPOGRAPHY — The general configuration of a land surface or any part of the earth’s surface, including its relief and position of its natural and man-made features. The natural or physical surface features of a region, considered collectively as to its form.

WATERCOURSE — A channel or conveyance of surface water, such as a stream or creek, having defined bed and banks, whether natural or artificial, with perennial or intermittent flow. [Amended 3-22-2005 by Ord. No. 311]

WATERS OF THIS COMMONWEALTH — Any and all rivers, streams, creeks, rivulets, impoundments, ditches, watercourses, storm sewers, lakes, dammed water, wetlands, ponds, springs, and all other bodies or channels of conveyance of surface and underground water, or parts thereof, whether natural or artificial, within or on the boundaries of this Commonwealth. [Added 3-22-2005 by Ord. No. 311]

WATERSHED — Region or area drained by a river, watercourse, or other surface water of this Commonwealth.

WETLAND — Areas that are inundated or saturated by surface or groundwater at a frequency

and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

ARTICLE III

Stormwater Management Standards

§ 183-11. General Requirements.

Supplemental standards and criteria contained in the technical reference materials listed in Appendix B of this chapter¹ are hereby incorporated into this chapter to govern the hydrologic and hydraulic design provisions contained herein.

- A. For all regulated activities, unless preparation of an SWM Site Plan is specifically exempted in Section 183-12:
- (1) Preparation and implementation of an approved SWM Site Plan is required.
 - (2) No regulated activities shall commence until the municipality issues written approval of an SWM Site Plan, which demonstrates compliance with the requirements of this Ordinance.
 - (3) Stormwater runoff shall be managed so that no downstream increases in flood damages or impairment of streets and other public facilities occur. The Municipal Engineer may require that downstream impacts be evaluated at critical locations such as dams, tributaries, existing developments, undersized culverts, and flood prone areas. The Municipality and its Engineer shall make the final determination with respect to the degree of management required for any site. The applicant shall evaluate the effects of the proposed plan on such critical locations by providing computed water surface elevations (WSEL) for the ten- and one-hundred-year storms. Methods of computation shall have prior approval of the Municipal Engineer. At such downstream critical locations, stormwater management may be exercised by:
 - (a) Providing off-site improvements to downstream conveyances in order to contain flow increases.
 - (b) Providing downstream drainage easements with sufficient widths to contain the flood limits.
 - (4) Groundwater recharge and water quality for regulated earth disturbance activities shall meet the following requirements:
 - (a) No regulated earth disturbance activities within the municipality shall commence until approval by the municipality of a plan which demonstrates compliance with state water quality requirements after construction is complete. Appendix D provides the procedure for

¹. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

determining groundwater recharge and water quality requirements.²

- (b) Maximizing the groundwater recharge capacity of the area being developed is required.
 - (c) The BMPs must be designed to protect and maintain existing uses (e.g., drinking water use; cold water fishery use) and maintain the level of water quality necessary to protect those uses in all streams, and to protect and maintain water quality in "Special Protection" streams, as required by statewide regulations at 25 Pa. Code Chapter 93 (collectively referred to herein as "state water quality requirements").
 - (d) To control post-construction stormwater impacts from regulated earth disturbance activities, state water quality requirements can be met by BMPs, including site design, which provide for replication of pre-construction stormwater infiltration and runoff conditions, so that post-construction stormwater discharges do not degrade the physical, chemical or biological characteristics of the receiving waters. As described in the DEP Comprehensive Stormwater Management Policy (#392-0300-002, September 28, 2002), this may be achieved by the following:
 - i. Infiltration: replication of pre-construction stormwater infiltration conditions;
 - ii. Treatment: use of water quality treatment BMPs to ensure filtering out of chemical and physical pollutants from the stormwater runoff; and
 - iii. Streambank and streambed protection: management of volume and rate of post-construction stormwater discharges to prevent physical degradation of receiving waters (e.g., from scouring and erosion).
 - (e) DEP has regulations that require municipalities to ensure design, implementation and maintenance of best management practices ("BMPs") that control runoff from new development and redevelopment (hereinafter "development") after regulated earth disturbance activities are complete. These requirements include the need to implement post-construction stormwater BMPs with assurance of long-term operations and maintenance of those BMPs.
 - (f) Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to the Municipality.
- (5) In establishing the watershed conditions for calculating stormwater runoff prior to development, the following assumptions shall apply:

². Editor's Note: Said appendix is on file and available for inspection in the Loysock Township office.

- (a) Woodland or meadow in good condition shall be used for all undeveloped areas.
 - (b) Average antecedent moisture conditions as defined by the Natural Resource Conservation Service.
 - (c) Drainage area reductions equal to the area of undrained depressions or pond factor adjustments in accordance with the Urban Hydrology for Small Watersheds, Technical Release No. 55 (TR-55, USDA, NRCS) procedure shall be applied in determining predevelopment peak discharges from Karst geologic areas.
- (6) Hydrologic methods. All plans and designs for stormwater management facilities shall be reviewed by the Municipal Engineer. Plans for facilities other than storm sewers should determine stormwater peak discharge and stormwater runoff by the use of the Soil Cover Complex Method as set forth in TR-55, and Technical Release No. 20 (TR-20) with specific attention given to antecedent moisture conditions, flood routing, and peak discharge specifications included therein and in the National Engineering Handbook, Section 4, both by U.S. Department of Agriculture, Natural Resource Conservation Service. The Municipal Engineer may permit the use of the Modified Rational Method or other methods for calculation of the storage capacity of a stormwater management facility from drainage areas of 20 acres or less.
- (a) Coefficients. Acceptable runoff coefficient values for use in the Rational Method equation, and permissible curve numbers for TR-55, maximum velocities, and suggested roughness coefficients and permissible velocities for channels are identified in Tables A-2 through A-5 of Appendix A, Section I of this chapter.³ When applying the Rational Method coefficients in Table A-3, open space coefficients shall be used for undeveloped, densely vegetated (nonforest) areas instead of meadow coefficients.
 - (b) The Rational Method may be used in lieu of the Soil Cover Complex Method to compute design flows for the sizing of storm sewers, inlets, and swales. Methods approved by the Pennsylvania Department of Transportation and/or Department of Environmental Protection may be used to design the waterway areas of bridges.
 - (c) Rainfall amounts for the return periods specified shall be determined using the Pennsylvania Department of Transportation Intensity Duration Frequency Curves presented in Figure A-1 of Appendix A, Section I of this chapter.⁴ Rainfall duration for hydrograph generation shall be

³. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

⁴. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

selected for the specified recurrence intervals on the basis of twice the computed time of concentration for the given watershed and subwatersheds. In no case shall the duration be less than one hour.

- (d) Time of concentration shall be determined in accordance with the method presented in TR-55.
- (e) In order to reduce stormwater runoff volumes from developed areas and encourage groundwater recharge, underground basin drains, infiltration trenches, and cisterns are permitted, to which roof leaders may be connected. These drains consist of stone-filled basins which temporarily store and release water below ground surface. Plans for such facilities shall be submitted to the municipality for approval, and the basins shall be used only in those areas where soils, geologic, and water table conditions permit. Performance criteria which govern the location, design, construction, and maintenance of these infiltration facilities are contained in Appendix A, Section IV of this chapter.⁵ Suggested guidelines are contained in Standards and Specifications for Infiltration Practices (MD DNR).

(7) Stormwater management facilities and related installations shall be provided:

- (a) To permit unimpeded flow of natural watercourses. Such flow may be redirected as required, subject to the approval of the Pennsylvania Department of Environmental Protection and the municipality.
- (b) To ensure adequate drainage of all low points along the curblines of streets.
- (c) To intercept stormwater runoff along streets at intervals reasonably related to the extent and grade of the area drained, and to prevent substantial flow of water across intersections or flooded intersections during storms, in accordance with the procedures contained in the Pennsylvania Department of Transportation Design Manual Part 2, DM-2, Chapter 10 (PennDOT).
- (d) To ensure adequate and unimpeded flow of stormwater under driveways in, near, or across natural watercourses or drainage swales. Suitable pipes or other waterways shall be provided as necessary.
- (e) To properly drain stormwater runoff from all land development projects. All lot and open areas shall be designed to drain to the nearest practical street or drainage system, existing or proposed, as defined by the Municipal Engineer, with no impact on adjoining properties, unless an area specifically designed for stormwater detention is provided.

(8) Storm sewers and related installations:

⁵. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

- (a) Storm sewers, where required by zoning and land use densities, shall be placed under or immediately adjacent to the roadway side of the curb, or as directed by the municipality, when parallel to the street within the right-of-way.
 - i. When located in undedicated land, they shall be placed within a drainage easement not less than twenty-feet wide as approved by the Municipal Engineer.
 - ii. The use of properly designed, graded, and turfed drainage swales is encouraged in lieu of storm sewers in commercial and industrial areas and, where approved by the Municipal Engineer, in residential areas. Such swales shall be designed not only to carry the required discharge without excessive erosion but also to increase the time of concentration, reduce the peak discharge and velocity, and permit the water to percolate into the soil, where appropriate. Criteria related to the use and design of drainage swales are contained in Appendix A, Section II of this chapter.⁶
- (b) The design capacity of storm sewers shall be in accordance with Urban Drainage Design Manual, Hydraulic Engineering Circular Number 22 (US DOT, FHA). Storm drainage systems shall be designed without surcharging inlets to provide conveyance of stormwater runoff into a detention basin or similar facility utilized to manage the rate of stormwater runoff. To avoid surcharging inlets, and to ensure that inlets will receive stormwater runoff, the hydraulic grade line at the inlet should be at least six inches below the elevation of the inlet grate. Where site grading will direct stormwater runoff from the one-hundred-year design storm to a detention basin or similar facility utilized to manage the rate of stormwater runoff, then the storm sewer may be designed for the ten-year-design storm. Where site grading will not direct stormwater runoff from the one-hundred-year design storm to a detention basin or similar facility utilized to manage the rate of stormwater runoff, then the storm sewer shall be designed for the one-hundred-year-design storm. Conveyance of storms to the detention basin, up to and including the one-hundred-year frequency, shall be provided so as not to endanger life or seriously damage property.
- (c) Storm inlet types and inlet assemblies shall conform to the Pennsylvania Department of Transportation Standards for Roadway Construction as approved by the Municipal Engineer.
 - i. Inlets shall, at a minimum, be located at the lowest point of street intersections, to intercept the stormwater before it reaches pedestrian crossings, or at sag points of vertical curves in the street

⁶. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

alignment which provide a natural point of ponding of surface stormwater.

- ii. Where the municipality deems it necessary because of special land requirements, special inlets may be approved.
 - iii. The interval between inlets collecting stormwater runoff shall be determined in accordance with the Pennsylvania Department of Transportation Design Manual Part 2, DM-2, Chapter 10, Section 5, Capacity of Waterway Areas, or Urban Drainage Design Manual (HEC-22, US DOT, FHA).
 - iv. In curbed sections, the maximum encroachment of water on the roadway pavement shall not exceed 1/2 of a through-traffic lane or one inch less than the depth of curb during the ten-year design storm of five-minute duration. Inlets shall be provided to limit the encroachment of water on the pavement. When inlets are used in a storm system within the right-of-way limits of a street in lieu of manholes, the spacing of such inlets shall not exceed the maximum distance of 450 feet.
 - v. The design of storm inlets shall be in accordance with Drainage of Highway Pavements, Hydraulic Engineering Circular Number 12, (US DOT, FHA).
- (d) Accessible drainage structures shall be located on a continuous storm sewer system at all vertical dislocations, at all locations where a transition in storm sewer pipe sizing is required, at all vertical and horizontal angle points exceeding 5°, and at all points of convergence of two or more influent storm sewer mains. The construction locations of accessible drainage structures shall be as indicated on the subdivision drainage plan or area drainage plan approved by the municipality.
- (e) When evidence available to the municipality indicates that existing storm sewers have sufficient capacity as determined by hydrograph summation and are accessible, proposed stormwater facilities may connect to the existing storm sewers so long as the peak rate of discharge does not exceed the amount permitted by § 183-14 of this article.
- (9) Bridges and culverts shall have ample waterway to carry expected flows, based on the following minimum storm frequencies: ten-year for driveways; twenty-five-year for local streets; fifty-year for collector streets; and one-hundred-year for arterials; or as required by the Municipal Engineer. Bridge and/or culvert construction shall be in accordance with the Pennsylvania Department of Transportation specifications.
- (a) The design criteria contained in this article are intended for use in conjunction with the Chapter 105 Regulations of the Pennsylvania Department of Environmental Protection entitled, "Water Obstructions and Encroachments." All information and regulations contained in

Chapter 105 shall be considered to be incorporated into this article as if reproduced in full.

- (b) A PA DEP permit in accordance with Chapter 105 shall be required for any obstruction or encroachment in the regulated waters of the Commonwealth, prior to the approval of the stormwater plan. All areas of the municipality shall be classified as rural, suburban, or urban, as determined by the Municipal Engineer (See PA DEP § 105.161) for bridge and culvert designs. In the event any question or conflict arises between this article and the PA DEP Chapter 105 Regulations, the design criteria contained in the PA DEP regulations shall govern.
 - (c) Refer to Appendix A, Section II, of this chapter⁷ for additional design criteria.
- (10) Detention or retention basins for the management of stormwater peak discharges shall meet the following requirements:
- (a) Basins shall be installed prior to or concurrent with any earthmoving or land disturbances which they will serve. The phasing of their construction shall be noted in the narrative and on the plan.
 - (b) The design of all facilities over limestone formations shall include measures to prevent groundwater contamination and, where required, sinkhole formation. Soils used for the construction of basins shall have moderate-to-low erodibility factors (i.e., "K" factors of 0.32 or less).
 - (c) Energy dissipators and/or level spreaders shall be installed at points where pipes or drainageways discharge to or from basins. Generally, outlet pipes designed to carry the predevelopment, one-year storm flow will be permitted to discharge to a stream with only an energy dissipator; discharges to drainage swales shall be spread with a level spreader or piped to an acceptable point of discharge downstream.
 - (d) Outlet structures within detention/retention basins shall incorporate childproof, nonclogging trash racks or grates over all horizontally oriented openings. All vertically oriented openings over 12 inches, or larger in any dimension, where entry by a child could cause injury or death, shall be covered with childproof, nonclogging trash racks, except where such openings carry perennial stream flows. Design openings less than six inches in any dimension shall be covered with a pipe screen (e.g., Neenah R-7512 or equivalent). Measures to completely drain detention/retention basins in the event of clogging of the primary design opening(s) shall be incorporated into the design of basin outlet structures. Basin outlet pipes shall have a minimum inside diameter of 15 inches or a cross-sectional area of 176 square inches, except that

⁷. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

pipes under a twenty-five foot or greater fill shall not be less than 24 inches or a cross-sectional area of 453 square inches, and shall consist of reinforced concrete.

- (e) Outlet aprons shall be designed and shall extend at a minimum to the toe of the basin slope. Where spillways will be used to manage peak discharges in excess of the ten-year storm, such spillways shall be constructed to withstand the pressures of impounded waters and convey flows at computed outlet velocities without erosion.
- (f) Stormwater detention facilities shall be designed to release their total volumes detained within the following maximum time periods:
 - i. Roofs and parking lots: 24 hours.
 - ii. Detention basin: 48 hours.
 - iii. Infiltration facilities: 72 hours.
- (g) When the Pennsylvania Department of Environmental Protection requires facilities to be permitted, the designer shall submit all information to the PA DEP regional office, and obtain all necessary approvals and permits pursuant to Pennsylvania Code, Title 25, Chapter 105, Dam Safety and Encroachment Act.
- (h) Downstream analysis:
 - i. Where deemed necessary by the Municipal Engineer, the applicant shall submit an analysis of the impacts of detained stormwater flows on downstream areas within the watershed, established with the concurrence of the Municipal Engineer. The analysis shall include hydrologic and hydraulic calculations necessary to determine the impact of peak discharge modifications of the proposed development on critical locations such as dams, tributaries, existing developments, undersized culverts, and flood prone areas.
 - ii. Review and comment on the analysis by the Engineer of a downstream municipality shall be obtained as deemed necessary.
- (i) Detention basins may be waived by the municipality, upon recommendation of the Municipal Engineer, at sites in close proximity to larger receiving streams, depending on the hydrology of the watershed. This is to facilitate drainage prior to main stream flooding. It shall be incumbent upon the applicant to demonstrate that no downstream increase in stream flooding or channel erosion will result in accordance with § 183-11 (10)(h) of this article, and that no increases in peak discharge within the receiving stream will occur as outlined under § 183-14 of this article.
- (j) Multiple-use basins. The design and construction of multiple-use stormwater detention facilities are strongly encouraged. In addition to

stormwater management, where appropriate, facilities should allow for recreational uses, including ballfields, play areas, picnic grounds, etc. Provision for parking facilities within basins and permanent wet ponds with stormwater management capabilities may also be appropriate. Prior approval and consultation with the municipality are required before design. Multiple-use basins should be constructed so that potentially dangerous conditions are not created.

- (k) Multiple-development basins. Stormwater management facilities designed to serve more than one property or development in the same watershed are encouraged. Staged construction of existing or proposed multiple-use detention facilities by several developers in conjunction with watershed development is encouraged. Each developer shall be responsible for the incremental increase in stormwater runoff generated by the respective development and incremental construction improvements necessary for the overall detention facility. Prior approval and consultation with the municipality is required before design of such facilities.
 - (l) Alternative detention facilities. Alternative stormwater detention facilities including rooftop, subsurface basins or tanks and in-pipe detention storage, or other approved alternative designs are permitted as determined by the Municipal Engineer.
 - (m) Specific criteria related to the design of detention basins is contained in Appendix A, Section III of this chapter.⁸
- (11) All calculations shall be submitted to the Municipal Engineer on computation sheets for approval. If the Municipal Engineer determines through review and independent computation that the size(s) of storm pipes or detention basins is insufficient, the municipality may require the developer to increase the size(s) of said storm pipes or detention basins. If the storm drainage system design is completed on a computer installation, sufficient supporting data shall be provided to allow comprehensive review by municipal officials.
- (12) When the elevation of any existing or proposed entrance to a structure, including windows, is lower than the elevation of the public cartway serving that site, a grading plan shall be submitted, reviewed and approved as part of the zoning permit process for the proposed structure.
- (13) Natural drainageways shall be utilized to the maximum extent possible in carrying stormwater runoff, provided such use remains consistent with the purpose of this chapter specified in Article I, § 183-3 of this chapter.
- (14) Stormwater management facilities located outside of existing or proposed rights-of-way shall be located within and accessible by easements as follows:

⁸. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

- (a) Drainage easements.
 - i. Where a tract is traversed by a watercourse, drainageway, channel or stream, there shall be provided a drainage easement paralleling the line of such watercourse, drainageway, channel or stream. The width of the drainage easement will be adequate to preserve the unimpeded flow of natural drainage in the one-hundred-year floodplain, in accordance with computed top widths for water surface elevations determined under Subsection A of this article.
 - ii. Drainage easements shall provide for maintenance, and for the purpose of widening, deepening, improving or protecting such drainage facilities.
- (b) Access easements. Where proposed stormwater management facilities are not adjacent to proposed or existing public rights-of-way or are not accessible due to physical constraints, as determined by the Municipal Engineer, a twenty-foot-wide passable access easement specifying rights of entry shall be provided. Access easements shall provide for vehicle ingress and egress on grades of less than 10% for carrying out inspection or maintenance activities.
- (c) Maintenance easements. A maintenance easement shall be provided which encompasses the stormwater facility and appurtenances and provides for access for maintenance purposes. The maintenance easement must be located at least 20 feet outside of the one-hundred-year surface elevation and the stormwater facility and appurtenances.
- (d) Easements shall stipulate that no trees, shrubs, structures, excavation, or fill be placed, and no regrading be performed within the area of the easement without written approval from the municipality upon review by the Municipal Engineer. Upon approval of the Municipal Engineer, such landscaping may be placed in maintenance easements, provided it does not impede access.
- (e) Whenever practicable, easements shall be parallel with and linked to property lines of the subdivision.
- (f) All easement agreements shall be recorded with a reference to the recorded easement indicated on the site plan. The format and content of the easement agreement shall be reviewed and approved by the Municipal Engineer and Solicitor.

B. SWM Site Plans approved by the municipality, in accordance with Section 183-23, shall be on site throughout the duration of the regulated activity.

C. The municipality may, after consultation with DEP, approve measures for meeting the state water quality requirements other than those in this Ordinance, provided that they meet the minimum requirements of, and do not conflict with, state law including, but not limited

to, the Clean Streams Law.

D. For all regulated earth disturbance activities:

- (1) Erosion and sediment control BMPs shall be designed, implemented, operated, and maintained during the regulated earth disturbance activities (e.g. during construction) to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code and the Clean Streams Law. Various BMPs and their design standards are listed in the Erosion and Sediment Pollution Control Program Manual (E&S Manual3), No. 363-2134-008, as amended and updated.
- (2) No regulated earth disturbance activities within the municipality shall commence until approval by the municipality of an erosion and sediment control plan for construction activities.
- (3) An erosion and sediment control plan for construction activities shall be submitted to the municipality for any land developments, nonregulated earth disturbance of 5,000 square feet or more, and regulated earth disturbance activities. DEP has regulations that require an erosion and sediment control plan for any earth disturbance activity of 5,000 square feet or more, under 25 Pa. Code § 102.4(b).
- (4) In addition, under 25 Pa. Code Chapter 92, a DEP "NPDES Construction Activities" permit is required for regulated earth disturbance activities.
- (5) Evidence of any necessary permit(s) for regulated earth disturbance activities from the appropriate DEP regional office or County Conservation District must be provided to the municipality. The issuance of an NPDES Construction Permit [or permit coverage under the statewide General Permit (PAG-2)] satisfies the requirements of Subsection (2) above.
- (6) A copy of the erosion and sediment control plan and any required permit, as required by DEP regulations, shall be available at the project site at all times.

E. Impervious areas:

- (1) The measurement of impervious areas shall include all of the impervious areas in the total proposed development even if development is to take place in stages.
- (2) For development taking place in stages, the entire development plan must be used in determining conformance with this Ordinance.
- (3) For projects that add impervious area to a parcel, the total impervious area on the parcel is subject to the requirements of this Ordinance; except that the volume controls in Section 183-13 and the peak rate controls of Section 183-14 do not need to be retrofitted to existing impervious areas that are not being altered by the proposed regulated activity.

F. Stormwater flows onto adjacent property shall not be created, increased, decreased, relocated, or otherwise altered without written notification to the adjacent property owner(s). Such stormwater flows shall be subject to the requirements of this Ordinance.

- G. All regulated activities shall include such measures as necessary to:
- (1) Protect health, safety and property.
 - (2) Meet the water quality goals of this Ordinance by implementing measures to:
 - (a) Minimize disturbance to floodplains, wetlands, and wooded areas.
 - (b) Maintain or extend riparian buffers.
 - (c) Avoid erosive flow conditions in natural flow pathways.
 - (d) Minimize thermal impacts to waters of this Commonwealth.
 - (e) Disconnect impervious surfaces by directing runoff to pervious areas, wherever possible.
 - (3) Incorporate methods described in the *Pennsylvania Stormwater Best Management Practices Manual* (BMP Manual⁴). If methods other than green infrastructure and LID methods are proposed to achieve the volume and rate controls required under this Ordinance, the SWM Site Plan must include a detailed justification demonstrating that the use of LID and green infrastructure is not practicable.
- H. Stormwater from roadways, parking lots, storm sewers, roof drains, or other concentrated stormwater runoff paths shall not be discharged directly into sinkholes.
- I. To protect sensitive Karst areas, the Municipal Engineer may require basins to contain an impervious liner. The liner may be of the impervious-membrane type, placed in accordance with the manufacturer's recommendations, or an approved alternative as approved by the Municipal Engineer.
- J. Infiltration BMPs should be spread out, made as shallow as practicable, and located to maximize use of natural on-site infiltration features while still meeting the other requirements of this Ordinance.
- K. Normally dry, open top, storage facilities should completely drain both the volume control and rate control capacities over a period of time not less than 24 and not more than 72 hours from the end of the design storm.
- L. The design storm volumes to be used in the analysis of peak rates of discharge should be obtained from the latest version of the Precipitation-Frequency Atlas of the United States, National Oceanic and Atmospheric Administration (NOAA), National Weather Service, Hydrometeorological Design Studies Center, Silver Spring, Maryland.
NOAA's Atlas 14⁵ can be accessed at: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.
- M. For all regulated activities, SWM BMPs shall be designed, implemented, operated, and maintained to meet the purposes and requirements of this Ordinance and to meet all requirements under Title 25 of the Pennsylvania Code, the Clean Streams Law, and the Storm Water Management Act.
- N. Various BMPs and their design standards are listed in the BMP Manual⁴.
- O. All regulated activities that do not fall under the exemption criteria referenced herein shall submit a drainage plan to the municipality for review. These criteria shall apply to the

total proposed development even if development is to take place in stages. Impervious cover shall include, but not be limited to, any roof, parking or driveway areas and any new streets and sidewalks. Any areas designed to initially be gravel or crushed stone shall be assumed to be impervious for the purposes of comparison to the waiver criteria.

- P. Stormwater drainage systems shall be provided in order to permit unimpeded flow along natural watercourses, except as modified by stormwater management facilities or open channels consistent with this chapter.
- Q. The existing points of concentrated drainage that discharge onto adjacent property shall not be altered without permission of the affected property owner(s) and shall be subject to any applicable discharge criteria specified in this chapter.
- R. Areas of existing diffused drainage discharge shall be subject to any applicable discharge criteria in the general direction of existing discharge, whether proposed to be concentrated or maintained as diffused drainage areas, except as otherwise provided by this chapter. If diffused flow is proposed to be concentrated and discharged onto adjacent property, the developer must document that adequate downstream conveyance facilities exist to safely transport the concentrated discharge, or otherwise prove that no erosion, sedimentation, flooding or other harm will result from the concentrated discharge.
- S. Where a development site is traversed by watercourses, drainage easements shall be provided conforming to the line of such watercourses. The terms of the easement shall prohibit excavation, the placing of fill or structures, and any alterations that may adversely affect the flow of stormwater within any portion of the easement. Also, maintenance, including mowing of vegetation within the easement shall be required, except as approved by the appropriate governing authority.
- T. When it can be shown that, due to topographic conditions, natural drainageways on the site cannot adequately provide for drainage, open channels may be constructed conforming substantially to the line and grade of such natural drainageways. Work within natural drainageways shall be subject to approval by PA DEP through the joint permit application process, or, where deemed appropriate by PA DEP, through the general permit process.
- U. Any stormwater management facilities regulated by this chapter that would be located in or adjacent to waters of the commonwealth or wetlands shall be subject to approval by PA DEP through the joint permit application process, or, where deemed appropriate by PA DEP, the general permit process. When there is a question whether wetlands may be involved, it is the responsibility of the developer or his agent to show that the land in question cannot be classified as wetlands; otherwise, approval to work in the area must be obtained from PA DEP.
- V. Any stormwater management facilities regulated by this chapter that would be located on state highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PennDOT).
- W. Minimization of impervious surfaces and infiltration of stormwater runoff through seepage beds, infiltration trenches, etc. are encouraged, where soil conditions permit, to reduce the size or eliminate the need for detention facilities.
- X. In order to promote overland flow and infiltration, roof drains should not discharge

directly to streets or storm sewers. Roof drains may discharge directly to streets or storm sewers when deemed necessary by the municipality. Under no circumstances shall roof drains discharge directly to sanitary sewer systems.

§ 183-12. Exemptions.

- A. Regulated Activities are exempt from the requirements in Section 183-13, Section 183-14 and Article IV of this ordinance if the cumulative earth disturbance meets the following criteria:

Total Tract Size (acres)	Exempt Impervious Area¹ (square feet)
Less than 1	5,000
1 to 2	10,000
2 to 5	15,000
More than 5	20,000

- B. Agricultural activity is exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.
- C. Forest management and timber operations are exempt from the SWM Site Plan preparation requirements of this Ordinance provided the activities are performed according to the requirements of 25 Pa. Code Chapter 102.
- D. Use of land for gardening for home consumption is exempt.
- E. In addition to the criteria in this article subsection, the municipality or the Municipal Engineer may require that regulated activities maintain a minimum distance between proposed impervious areas/stormwater management facility outlets and downslope property line(s).
- F. Exemptions from any provisions of this Ordinance shall not relieve the applicant from the requirements in Sections 183-11 D. through K.
- G. The Municipality may deny or revoke any exemption pursuant to this Section at any time for any project that the Municipality believes may pose a threat to public health and safety or the environment.

§ 183-13. Volume Controls.

The green infrastructure and low impact development practices provided in the BMP Manual⁴ shall be utilized for all regulated activities wherever possible. Water volume controls shall be implemented using the *Design Storm Method* in Subsection A or the *Simplified Method* in Subsection B below. For regulated activity areas equal to or less than one acre that do not require hydrologic routing to design the stormwater facilities, this Ordinance establishes no preference for either methodology; therefore, the applicant may select either methodology on the

basis of economic considerations, the intrinsic limitations on applicability of the analytical procedures associated with each methodology and other factors.

A. The Design Storm Method (CG-1 in the BMP Manual⁴) is applicable to any size of regulated activity. This method requires detailed modeling based on site conditions.

(1) Do not increase the post-development total runoff volume for all storms equal to or less than the 2-year 24-hour duration precipitation.

(2) For modeling purposes:

(a) Existing (predevelopment) non-forested pervious areas must be considered meadow in good condition.

(b) 20% of existing impervious area, when present, shall be considered meadow in good condition in the model for existing conditions.

B. The Simplified Method (CG-2 in the BMP Manual⁴) provided below is independent of site conditions and should be used if the Design Storm Method is not followed. This method is not applicable to regulated activities greater than one acre or for projects that require design of stormwater storage facilities. For new impervious surfaces:

(1) Stormwater facilities shall capture at least the first two (2) inches of runoff from all new impervious surfaces.

(2) At least the first one inch of runoff from new impervious surfaces shall be permanently removed from the runoff flow, i.e., it shall not be released into the surface waters of this Commonwealth. Removal options include reuse, evaporation, transpiration, and infiltration.

(3) Wherever possible, infiltration facilities should be designed to accommodate infiltration of the entire permanently removed runoff; however, in all cases at least the first 0.5 inch of the permanently removed runoff should be infiltrated.

(4) This method is exempt from the requirements of Section 183-14, Rate Controls.

§ 183-14. Rate Controls.

A. For areas not covered by a release rate map from an approved Act 167 Stormwater Management Plan:

Post-development discharge rates shall not exceed the pre-development discharge rates for the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events. If it is shown that the peak rates of discharge indicated by the post-development analysis are less than or equal to the peak rates of discharge indicated by the pre-development analysis for 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storms, then the requirements of this section have been met. Otherwise, the applicant shall provide additional controls as necessary to satisfy the peak rate of discharge requirement.

B. For areas covered by a release rate map from an approved Act 167 Stormwater Management Plan:

For the 1-, 2-, 5-, 10-, 25-, 50-, and 100-year, 24-hour storm events, the post-development peak discharge rates will follow the applicable approved release rate maps. For any areas

not shown on the release rate maps, the post-development discharge rates shall not exceed the pre-development discharge rates.

- C. After installation of impervious cover, peak discharges for the 1-, 2-, 5-, 10-, 25-, 50- and 100-year frequency storms from the site shall not exceed the respective peak discharge performance standards in Appendix A, Section VI.

§ 183-15. Riparian Buffers.

- A. In order to protect and improve water quality, a Riparian Buffer Easement shall be created and recorded as part of any subdivision or land development that encompasses a Riparian Buffer.
- B. Except as required by Chapter 102, the Riparian Buffer Easement shall be measured to be the greater of the limit of the 100-year floodplain or a minimum of 35 feet from the top of the streambank (on each side).
- C. Minimum Management Requirements for Riparian Buffers.
 - (1) Existing native vegetation shall be protected and maintained within the Riparian Buffer Easement.
 - (2) Whenever practicable, invasive vegetation shall be actively removed and the Riparian Buffer Easement shall be planted with native trees, shrubs and other vegetation to create a diverse native plant community appropriate to the intended ecological context of the site.
- D. The Riparian Buffer Easement shall be enforceable by the municipality and shall be recorded in the appropriate County Recorder of Deeds Office, so that it shall run with the land and shall limit the use of property located therein. The easement shall allow for the continued private ownership and shall count toward the minimum lot area required by Zoning, unless otherwise specified in the municipal Zoning Ordinance.
- E. Any permitted use within the Riparian Buffer Easement shall be conducted in a manner that will maintain the extent of the existing 100-year floodplain, improve or maintain the stream stability, and preserve and protect the ecological function of the floodplain.
- F. The following conditions shall apply when public and/or private recreation trails are permitted within Riparian Buffers:
 - (1) Trails shall be for non-motorized use only.
 - (2) Trails shall be designed to have the least impact on native plant species and other sensitive environmental features.
- G. Septic drainfields and sewage disposal systems shall not be permitted within the Riparian Buffer Easement and shall comply with setback requirements established under 25 Pa. Code Chapter 73.

ARTICLE IV

Stormwater Management Site Plan Requirements

§ 183-16. Plan Requirements.

The following items shall be included in the SWM Site Plan:

- A. Appropriate sections from the municipality's Subdivision and Land Development Ordinance, and other applicable local ordinances, shall be followed in preparing the SWM Site Plans. In instances where the Municipality lacks Subdivision and Land Development regulations, the content of SWM Site Plans shall follow the county's Subdivision and Land Development Ordinance.
- B. The Municipality shall not approve any SWM Site Plan that is deficient in meeting the requirements of this Ordinance. At its sole discretion and in accordance with this Article, when an SWM Site Plan is found to be deficient, the municipality may either disapprove the submission and require a resubmission, or in the case of minor deficiencies, the Municipality may accept submission of modifications.
- C. All materials, workmanship, and methods of work shall comply with the Pennsylvania Department of Transportation Publication 408 specifications, as accepted and commonly used by the municipality, and shall be considered to be incorporated into this article as if copied in full. In the event a conflict arises between the requirements of this article and the PennDOT Publication 408 specifications, the Municipal Engineer shall resolve the difference, and said opinion shall be binding.
- D. Provisions for permanent access or maintenance easements for all physical SWM BMPs, such as ponds and infiltration structures, as necessary to implement the Operation and Maintenance (O&M) Plan are discussed in paragraph F.9 below.
- E. The following signature block for the municipality:
“(Municipal official or designee), on this date (Signature date), has reviewed and hereby certifies that the SWM Site Plan meets all design standards and criteria of the Municipal Ordinance No. (number assigned to ordinance).”
- F. The SWM Site Plan shall provide the following information:
- (1) The overall stormwater management concept for the project.
 - (2) A determination of site conditions in accordance with the BMP Manual⁴. A detailed site evaluation shall be completed for projects proposed in areas of carbonate geology or karst topography, and other environmentally sensitive areas, such as brownfields.
 - (3) Stormwater runoff design computations and documentation as specified in this Ordinance, or as otherwise necessary to demonstrate that the maximum practicable measures have been taken to meet the requirements of this Ordinance, including the recommendations and general requirements in Section 183-11.
 - (4) Expected project time schedule.
 - (5) A soil erosion and sediment control plan, where applicable, as prepared for and submitted to the approval authority.
 - (6) The effect of the project (in terms of runoff volumes, water quality, and peak flows) on surrounding properties and aquatic features and on any existing stormwater conveyance system that may be affected by the project.
 - (7) Plan and profile drawings of all SWM BMPs, including drainage structures, pipes,

open channels, and swales.

- (8) SWM Site Plan shall show the locations of existing and proposed on-lot wastewater facilities and water supply wells.
- (9) The SWM Site Plan shall include an O&M Plan for all existing and proposed physical stormwater management facilities. This plan shall address long-term ownership and responsibilities for O&M as well as schedules and costs for O&M activities.
- (10) A justification must be included in the SWM Site Plan if BMPs other than green infrastructure methods and LID practices are proposed to achieve the volume, rate and water quality controls under this Ordinance.

§ 183-17. Plan content.

- A. The content of the plan shall consist of maps, drawings, engineering plans, and construction details. Said plan shall be prepared by a registered professional land surveyor, qualified geologist, landscape architect, architect, or engineer licensed in the State of Pennsylvania, with said preparer's seal and registration number affixed to the plan. Plans for tracts of less than 20 acres shall be drawn at a scale of one inch equals no more than 50 feet; for tracts of 20 acres or more, plans shall be drawn at a scale of one inch equals no more than 100 feet. Plans shall be submitted on the following sheet sizes: 18 inches by 24 inches; 24 inches by 36 inches, or 36 inches by 42 inches. All lettering shall be drawn to a size to be legible if the plans are reduced to 1/2 size. All sheets comprising a submission shall be of one size.
- B. The following information, unless specifically exempted in writing, must be shown on the plans, prepared in a form which meets the requirements for recording in the Office of the Registrar and Recorder of Lycoming County, Pennsylvania:
 - (1) The name of the proposed development and the name and address of the owner of the property and the individual or firm preparing the plan.
 - (2) Date of submission and revision.
 - (3) Graphic scale.
 - (4) North point.
 - (5) Total tract boundary with distances marked to the nearest foot and bearings to the nearest degree and total acreage of the tract.
 - (6) Key map showing all existing natural and man-made features beyond the property boundary affected by the project, and the extent of the watershed or subbasin which drains through the project site.
 - (7) Topographic contours at intervals not greater than five feet for existing and proposed conditions. Topographic contours at intervals less than five feet may be required for flat sites and to depict certain existing and future stormwater management features. The reference datum used to develop topographic contours shall be stated on the plans.
 - (8) Drainage areas and subareas affecting the site, including areas necessary to

determine downstream impacts analysis, where required, for proposed stormwater management facilities.

- (9) Existing and proposed use, including the total area of impervious surfaces after construction.
- (10) Existing soil types, Karst formations, floodplain boundaries, sinkholes, undrained depressions, rock outcrops, streams, drainage courses, wetlands, based on existing sources and references, and vegetation.
- (11) Complete drainage systems for the site, including details for construction. All existing drainage features which are to be incorporated in the design shall be so identified. If the site is to be developed in stages, a general drainage plan for the entire site shall be presented with the first stage and appropriate development stages for the drainage system shall be indicated.
- (12) Location and selected plant material used for vegetative filter paths to sinkholes, and the location of all notices to be posted, as specified in Article III, of this chapter.
- (13) If stormwater management facilities are off site, a note on the plan referring to location and agreements indicating responsibility for conveyance to and maintenance of the facilities; all such off-site facilities shall meet the design standards and criteria specified in Article III of this chapter, and details of the facilities shall be included with the plan.
- (14) Proposed easement locations, including drainage, maintenance, and access easements in conformance with Article III of this chapter.
- (15) The following statement by the landowner:

<p>“I/we hereby acknowledge that I/we and/or my/our assignees/grantees shall be responsible for maintenance of the stormwater management system shown hereon, in accordance with approved stormwater management ownership and maintenance plan for this project, and that such stormwater system shall remain as a permanent fixture that cannot be altered, replaced, or removed without prior written approval from the Loyalsock Township.</p>

- (16) The location of the permanent watercourse to which stormwater from the site will drain.
- (17) Complete erosion and sediment pollution control facilities, including details for construction, in accordance with this chapter.
- (18) Horizontal location and vertical profiles of all open channels including hydraulic capacity.
- (19) A note indicating that record (as-built) drawings will be submitted by the developer’s registered engineer or surveyor for all stormwater facilities prior to

occupancy or the release of the surety bond. The Loyalsock Township reserves the right to authorize the Municipal Engineer to review said record drawing.

- (20) The following stormwater management design certification signature block for the registered professional preparing the stormwater management Plan:

“I, _____, hereby certify that the stormwater management plan meets all design standards and criteria of the Loyalsock Township Stormwater Management Ordinance.”

- (21) The following municipal stormwater management review signature block for the Municipal Engineer reviewing the stormwater management plan:

“I, _____, have reviewed this Stormwater Management Plan in accordance with the design standards and criteria of the Loyalsock Township Stormwater Management Ordinance.”

§ 183-18. Supplemental information.

In addition to the plan information enumerated in § 183-17 of this article, the following information shall be submitted.

A. A written description of:

- (1) The overall project concept.
- (2) Stormwater runoff computations as specified in Article III of this chapter, and in accordance with criteria contained in Appendix A of this chapter.⁹
- (3) Horizontal and vertical profiles of any existing and proposed watercourses, drainageways, channels or streams, including hydraulic capacity.
- (4) Hydrologic and hydraulic computations for all existing and proposed stormwater management facilities and measures.
- (5) Stormwater management both during and after development.
- (6) Expected project time schedule.

B. The effect of the project on stormwater runoff volume, time to peak flow, and rate of flow on adjacent property and upon an existing municipal stormwater drainage system, when such will be utilized.

⁹. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

- C. Description of all watercourses, impoundments, and wetlands on or adjacent to the site or into which stormwater flows.
- D. Soils investigation report, including boring logs, compaction requirements, and recommendations for construction of detention basins, when requested by the municipality or the Municipal Engineer.
- E. Karst features identification and analysis reports and a hydrogeologic assessment of the effects of stormwater runoff on sinkholes as specified in Article III, § 183-11 A(10)(b), and § 183-11 H.
- F. A soil erosion and sediment pollution control plan, including all reviews and approvals as required by the Pennsylvania Department of Environmental Protection (PA DEP) and/or Lycoming County Conservation District.
- G. All easements, deed restrictions, covenants, and maintenance measures of the system shall be outlined in an ownership and maintenance program in accordance with Article V of this chapter. For stormwater management systems to be dedicated to the municipality, a maintenance guarantee, as specified by the PA Municipalities Planning Code, may be required by the Loysock Township. The Municipality has the explicit right to reject any offer of dedication.
- H. All permits required by the Pennsylvania Department of Environmental Protection, Pennsylvania Department of Transportation (PennDOT), and U.S. Army Corps of Engineers (USACOE) and other regulatory agencies.

§ 183-19. Plan Submission.

Typically five copies of the SWM Site Plan shall be submitted as follows:

- 1. Typically two copies to the municipality.
 - 2. Typically one copy to the municipal engineer (when applicable).
 - 3. Typically one copy to the County Conservation District.
 - 4. Typically one copy to the County Planning Commission/Office.
- A. General requirements. From and after the date of enactment of this chapter, a stormwater management plan and other information specified herein shall be submitted to the municipality for all lands subdivided or for which land development plans are prepared after the enactment of this chapter. A stormwater management plan and other information specified herein shall be submitted at the same time and together with submission of a preliminary subdivision or land development plan, along with a completed checklist supplied by the municipality indicating the items contained within the submission.
 - B. Concurrent reviews. Such plans and information shall be considered part of said zoning and subdivision documents and shall be reviewed in accordance with procedures established thereunder. Preliminary approval or final approval of a subdivision or land development plan, or the issuance of a zoning permit, shall be contingent upon the submission of a stormwater management plan and other materials specified herein, and approval of the stormwater management plan in accordance with provisions of this chapter.

§ 183-20. Plan Review.

- A. SWM Site Plans shall be reviewed by the Municipality for consistency with the provisions of this Ordinance.
- B. The Municipality shall notify the applicant in writing within 45 days whether the SWM Site Plan is approved or disapproved. If the SWM Site Plan involves a Subdivision and Land Development Plan, the notification shall occur within the time period allowed by the Municipalities Planning Code (90 days). If a longer notification period is provided by other statute, regulation, or ordinance, the applicant will be so notified by the municipality.
- C. For any SWM Site Plan that proposes to use any BMPs other than green infrastructure and LID practices to achieve the volume and rate controls required under this Ordinance, the Municipality will not approve the SWM Site Plan unless it determines that green infrastructure and LID practices are not practicable.
- D. If the Municipality disapproves the SWM Site Plan, the Municipality will state the reasons for the disapproval in writing. The Municipality also may approve the SWM Site Plan with conditions and, if so, shall provide the acceptable conditions for approval in writing.

§ 183-21. Modification of Plans.

Once a stormwater management plan has been approved together with a subdivision or land development plan approval, or together with the issuance of a zoning permit, said stormwater management plan shall be valid only for the subdivision, land development, or zoning permit approved. Any further development on the lot or lots requires a revision of the approved plan or other construction or activities as defined by Municipal Zoning Regulations*. A modification to a submitted SWM Site Plan that involves a change in SWM BMPs or techniques, or that involves the relocation or redesign of SWM BMPs, or that is necessary because soil or other conditions are not as stated on the SWM Site Plan as determined by the Municipality shall require a resubmission of the modified SWM Site Plan in accordance with this Article.

§ 183-22. Resubmission of Disapproved SWM Site Plans.

A disapproved SWM Site Plan may be resubmitted, with the revisions addressing the Municipality's concerns, to the Municipality in accordance with this Article. The applicable review fee must accompany a resubmission of a disapproved SWM Site Plan.

§ 183-23. Authorization to Construct and Term of Validity.

The Municipality's approval of an SWM Site Plan authorizes the regulated activities contained

* . Editor's Note: See Ch. 215, Zoning.

in the SWM Site Plan for a maximum term of validity of 5 years following the date of approval. The Municipality may specify a term of validity shorter than 5 years in the approval for any specific SWM Site Plan. Terms of validity shall commence on the date the Municipality signs the approval for an SWM Site Plan. If an approved SWM Site Plan is not completed according to Section 183-23 within the term of validity, then the Municipality may consider the SWM Site Plan disapproved and may revoke any and all permits. SWM Site Plans that are considered disapproved by the Municipality shall be resubmitted in accordance with Section 183-19 of this Ordinance.

§ 183-24. As-Built Plans, Completion Certificate, and Final Inspection.

- A. The developer shall be responsible for providing as-built plans of all SWM BMPs included in the approved SWM Site Plan. The as-built plans and an explanation of any discrepancies with the construction plans shall be submitted to the Municipality.
- B. The as-built submission shall include a certification of completion signed by a qualified professional verifying that all permanent SWM BMPs have been constructed according to the approved plans and specifications. The latitude and longitude coordinates for all permanent SWM BMPs must also be submitted at the central location of the BMPs. If any licensed qualified professionals contributed to the construction plans, then a licensed qualified professional must sign the completion certificate.
- C. After receipt of the completion certification by the Municipality, the Municipality may conduct a final inspection.
- D. At the completion of the project, and as a prerequisite for the release of the guarantee or issuance of an occupancy permit, the owner(s) or his representative shall provide a set of approved As-Built stormwater management plan drawings showing all approved revisions and elevations and inverts to all manholes, inlets, pipes, and stormwater management facilities.

ARTICLE V

Operation and Maintenance

§ 183-25. Responsibilities of Developers and Landowners.

- A. The Municipality shall make the final determination on the continuing maintenance responsibilities prior to final approval of the SWM Site Plan. The municipality may require a dedication of such facilities as part of the requirements for approval of the SWM Site Plan. Such a requirement is not an indication that the municipality will accept the facilities. The municipality reserves the right to accept or reject the ownership and operating responsibility for any portion of the stormwater management controls.
- B. Facilities, areas, or structures used as SWM BMPs shall be enumerated as permanent real estate appurtenances and recorded as deed restrictions or conservation easements that run with the land.

- (1) Description of maintenance requirements.

- (2) Establishment of suitable easements for access to all facilities by public officials, in accordance with Article III Section 183-11 (14)(a).
 - (3) Identification of the responsible party or entity for ownership and maintenance of both temporary and permanent stormwater management and erosion and sediment pollution control facilities. In meeting this requirement, the following options are hereby provided for upon approval by the Loyalsock Township:
- C. The O&M Plan shall be recorded as a restrictive deed covenant that runs with the land. A description of the facility or system and the terms of the required maintenance shall be incorporated as part of the deed to the property.
- (1) Ownership and maintenance may be the responsibility of a property owners' association. The stated responsibilities of the property owners' association in terms of owning and maintaining the stormwater management facilities shall be submitted with final plans for determination of their approved subdivision plan among the deed records of Lycoming County, Pennsylvania. In addition, the approved subdivision plan and any deed written from said plan for a lot or lots shown herein shall contain a condition that it shall be mandatory for the owner or owners of said lot to be members of said property owners' association.
 - (2) For stormwater management facilities that are proposed as part of the site development plan, the developer will be required to execute a developer agreement and a maintenance agreement with the municipality for the construction and continued maintenance of the facilities prior to the signature approval on the final plan. Access for inspection by the municipality of all such facilities deemed critical to the public welfare at any reasonable time shall be provided.
 - (3) In the event the above priorities cannot be achieved, or where it is required, the facilities may be dedicated to the municipality in accordance with this chapter. As a condition of municipality acceptance of said facilities, the applicant shall provide 10% of the cost of improvements, in the form of a maintenance bond, as estimated by the applicant's registered professional, and approved by the Municipal Engineer, to cover contingency maintenance costs for 18 months from the date of stormwater management facilities acceptance of dedication. The ten-percent bond shall be based on the construction costs of the detention basin and outlet structure within the area dedicated to the municipality.
- D. Operations and maintenance agreement for privately owned stormwater BMPs.
[Added 3-22-2005 by Ord. No. 311]
- (1) The property owner shall sign an operations and maintenance agreement with the municipality covering all stormwater BMPs that are to be privately owned. The agreement shall be substantially the same as the agreement in Appendix E of this chapter.¹⁰

¹⁰. Editor's Note: Said appendix is on file and available for inspection in the Loyalsock Township office.

- (2) Other items may be included in the agreement where determined necessary to guarantee the satisfactory operation and maintenance of all permanent stormwater BMPs. The agreement shall be subject to the review and approval of the municipality.
- (3) All agreements shall be filed at the Lycoming County Courthouse as a separate document. After the agreement is filed, all deeds to the property covered by the agreement must contain a reference to the agreement by record book number, page number, date and where it is filed.

§ 183-26. Operation and Maintenance Agreements

- A. Prior to final approval of the SWM Site Plan, the property owner shall sign and record an Operation and Maintenance (O&M) Agreement (see Appendix E) covering all stormwater control facilities which are to be privately owned.
 - (1) The owner, successor and assigns shall maintain all facilities in accordance with the approved maintenance schedule in the O&M Agreement.
 - (2) The owner shall convey to the Municipality conservation easements to assure access for periodic inspections by the Municipality and maintenance, as necessary.
 - (3) The owner shall keep on file with the Municipality the name, address, and telephone number of the person or company responsible for maintenance activities; in the event of a change, new information shall be submitted by the owner to the Municipality within ten (10) working days of the change.
- B. The owner is responsible for operation and maintenance (O&M) of the SWM BMPs. If the owner fails to adhere to the O&M Agreement, the Municipality may perform the services required and charge the owner appropriate fees. Nonpayment of fees may result in a lien against the property.

§ 183-27. Performance Guarantee

For SWM Site Plans that involve subdivision and land development, the applicant shall provide a financial guarantee to the Municipality for the timely installation and proper construction of all stormwater management controls as required by the approved SWM Site Plan and this Ordinance in accordance with the provisions of Sections 509, 510, and 511 of the Pennsylvania Municipalities Planning Code.

ARTICLE VI

Fees and Expenses

§ 183-28. General

The Municipality may include all costs incurred in the review fee charged to an applicant.

The review fee may include, but not be limited to, costs for the following:

- A. Administrative/clerical processing.

- B. Review of the SWM Site Plan.
- C. Attendance at meetings.
- D. Inspections.

ARTICLE VII

Prohibitions

§ 183-29. Prohibited discharges and Connections. [Added 3-22-2005 by Ord. No. 311]

- A. Any drain or conveyance, whether on the surface or subsurface, that allows any non-stormwater discharge including sewage, process wastewater, and wash water to enter a regulated small MS4 or to enter the surface waters of this Commonwealth, including any connections to the storm drain system from indoor drains and sinks, is prohibited.
- B. Any drain or conveyance connected from a commercial or industrial land use to the separate storm sewer system which has not been documented in plans, maps, or equivalent records, and approved by the municipality is prohibited.
- C. No person shall allow, or cause to allow, discharges into a regulated small MS4, or discharges into waters of this Commonwealth, which are not composed entirely of stormwater, except:
 - (1) As provided in paragraph D below; and
 - (2) Discharges authorized under a state or federal permit.
- D. The following discharges are authorized unless they are determined to be significant contributors to pollution of a regulated small MS4 or to the waters of this Commonwealth:
 - (1) Discharges or flows from fire-fighting activities.
 - (2) Discharges from potable water sources, including water line flushing and fire hydrant flushing, if such discharges do not contain detectable concentrations of Total Residual Chlorine (TRC).
 - (3) Non-contaminated irrigation water, water from lawn maintenance, landscape drainage and flows from riparian habitats and wetlands.
 - (4) Diverted stream flows and springs.
 - (5) Non-contaminated pumped ground water and water from foundation and footing drains and crawl space pumps.
 - (6) Non-contaminated HVAC condensation and water from geothermal systems.
 - (7) Residential (i.e., not commercial) vehicle wash water where cleaning agents are not utilized.
 - (8) Non-contaminated hydrostatic test water discharges, if such discharges do not contain detectable concentrations of TRC.
- E. In the event that the municipality or DEP determines that any of the discharges identified in Subsection D significantly contribute pollutants to a regulated small MS4 or to the waters of the Commonwealth, the municipality or DEP will notify the responsible

person(s) to cease the discharge.

F. Upon notice provided by the municipality under Subsection E, the discharger will have a reasonable time, as determined by the municipality, to cease the discharge consistent with the degree of pollution caused by the discharge.

G. Nothing in this section shall affect a discharger's responsibilities under state law.

§ 183-30. Roof Drains and Sump Pumps

Roof drains and sump pumps shall discharge to infiltration or vegetative BMPs wherever feasible.

§ 183-31. Alteration of SWM BMPs

No person shall modify, remove, fill, landscape or alter any SWM BMPs, facilities, areas, or structures that were installed as a requirement of this Ordinance without the written approval of the Municipality.

ARTICLE VIII

Enforcement and Penalties

§ 183-32. Right of entry.

Upon presentation of proper credentials, the municipality or its designated agent may enter at reasonable times upon any property within the municipality to inspect the condition of the stormwater structures and facilities in regard to any aspect regulated by this Ordinance.

§ 183-33. Inspection

The landowner or the owner's designee (including the Municipality for dedicated and owned facilities) shall inspect SWM BMPs, facilities and/or structures installed under this Ordinance according to the following frequencies, at a minimum, to ensure the BMPs, facilities and/or structures continue to function as intended:

- A. Annually for the first 5 years.
- B. Once every 3 years thereafter.
- C. During or immediately after the cessation of a 10-year or greater storm.

Inspections should be conducted during or immediately following precipitation events. A written inspection report shall be created to document each inspection. The inspection report shall contain the date and time of the inspection, the individual(s) who completed the inspection, the location of the BMP, facility or structure inspected, observations on performance, and recommendations for improving performance, if applicable. Inspection reports shall be submitted to the Municipality within 30 days following completion of the inspection.

§ 183-34. Enforcement.

The municipal governing body is hereby authorized and directed to enforce all of the provisions of this chapter. All inspections regarding compliance with the approved stormwater management plan shall be the responsibility of the Municipal Engineer, or other qualified persons designated by the municipality.

- A. It shall be unlawful for a person to undertake any regulated activity except as provided in an approved SWM Site Plan, unless specifically exempted in Section 183-12. A set of design plans approved by the municipality shall be on file at the site throughout the duration of construction activity. Periodic inspections may be made by the municipality or its designee during construction.
- B. It shall be unlawful to violate Section 183-29 of this Ordinance. It shall be unlawful for any person, firm or corporation to undertake any activity regulated by this chapter on any property except as provided for in the approved stormwater management plan and pursuant to the requirements of this chapter. It shall be unlawful to alter or remove any stormwater structure required by the approved stormwater management plan pursuant to this chapter, or to allow the property to remain in a condition which does not conform to the approved stormwater management plan.
- C. Inspections regarding compliance with the SWM Site Plan are a responsibility of the Municipality.
- D. Whenever the municipality finds that a person has violated a prohibition or failed to meet a requirement of this chapter, the municipality may order compliance by written notice to the responsible person. Such notice may require, without limitation:
- (1) The performance of monitoring, analyses, and reporting;
 - (2) The elimination of prohibited connections or discharges;
 - (3) Cessation of any violating discharges, practices, or operations;
 - (4) The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;
 - (5) Payment of a fine to cover administrative and remediation costs;
 - (6) The implementation of stormwater BMPs; and
 - (7) Operation and maintenance of stormwater BMPs.
- E. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violations(s). Said notice may further advise that, if applicable, should the violator fail to take the required action within the established deadline, the work may be done by the municipality or its designee and the expense thereof shall be charged to the violator.
- F. Failure to comply within the time specified shall also subject such person to the penalty provisions of this chapter. All such penalties shall be deemed cumulative and shall not prevent the municipality from pursuing any and all other remedies available in law or equity.
- G. Prior to revocation or suspension of a permit, the Municipality will schedule a hearing to discuss the noncompliance if there is no immediate danger to life, public health or property.

§ 183-35. Suspension and Revocation.

- A. Any approval or permit issued by the Municipality pursuant to this Ordinance may be suspended or revoked by the municipality for:
- (1) Noncompliance with or failure to implement any provision of the approved SWM Site Plan or O&M Agreement.

- (2) A violation of any provision of this Ordinance or any other applicable law, ordinance, rule, or regulation relating to the Regulated Activity.
 - (3) The creation of any condition or the commission of any act during the Regulated Activity which constitutes or creates a hazard, nuisance, pollution, or endangers the life or property of others.
- B. A suspended approval may be reinstated by the Municipality when:
- (1) The Municipality has inspected and approved the corrections to the violations that caused the suspension.
 - (2) The municipality is satisfied that the violation has been corrected.
- C. An approval that has been revoked by the Municipality cannot be reinstated. The applicant may apply for a new approval under the provisions of this Ordinance.
- D. If a violation causes no immediate danger to life, public health, or property, at its sole discretion, the Municipality may provide a limited time period for the owner to correct the violation. In these cases, the Municipality will provide the owner, or the owner's designee, with a written notice of the violation and the time period allowed for the owner to correct the violation. If the owner does not correct the violation within the allowed time period, the municipality may revoke or suspend any, or all, applicable approvals and permits pertaining to any provision of this Ordinance.
- E. Occupancy permit. An occupancy permit shall not be issued unless the applicant has complied with the provisions of this chapter.

§ 183-36. Penalties.

- A. Anyone violating the provisions of this Ordinance shall be guilty of a summary offense, and upon conviction, shall be subject to a fine of not more than \$300 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense and penalties shall be cumulative.
- B. In the event the owner, developer, occupant, applicant, property manager or other person responsible fails to comply with the terms of the chapter within the time specified by the municipal representative, the municipality may take any actions necessary to remove the public nuisance. The cost of removal of the violation shall be in addition to any penalties for violations for failure to comply.
- C. In addition, the municipality, through its solicitor, may institute injunctive, mandamus or any other appropriate action or proceeding at law or in equity for the enforcement of this Ordinance. Any court of competent jurisdiction shall have the right to issue restraining orders, temporary or permanent injunctions, mandamus or other appropriate forms of remedy or relief.
- D. The cost of removal, fine, and penalties hereinabove mentioned may be entered by the municipality as a lien against such property, or properties of individual members of a property owners' association, in accordance with existing provisions of law.

§ 183-37. Appeals. [Amended 9-25-2012 by Ord. No. 350]

- A. Any person aggrieved by any action of the municipality or its designee, relevant to the

provisions of this chapter, may appeal in writing, addressed to the Board of Review at the Township's business office, by filing the appeal within 30 days of that action.

- B. The Board of Review shall be the Loyalsock Township Building Code Board of Appeals.
- C. Hearings. The Board of Review shall conduct hearings and make decisions in accordance with the following requirements:
 - (1) Written notice shall be given to the appellant, the Zoning Officer, such other persons as the municipality shall designate by resolution, to any person who has made timely request for the same and to any other person as the Board of Review shall determine. Written notices shall be given at such time and in such manner as shall be prescribed by the rules of the Board of Review but shall not give less than 15 days notice of the said hearing.
 - (2) The municipality may set reasonable fees, by resolution, with respect to hearings before the Board of Review. Fees for such hearings may include compensation for the Secretary and members of the Board of Review, notice and advertising costs and necessary administrative overhead connected with the hearing. The cost, however, shall not include legal expenses of the Board of Review, expenses for engineering, architectural or other technical consultants or expert witness costs.
 - (3) The hearing shall be held within 60 days from the date of the appellant's request, unless the appellant has agreed, in writing, to the extension of time.
 - (4) The hearing shall be conducted by the Board of Review. Three members shall constitute a quorum.
 - (5) The decision of the Board of Review shall be made, in writing, within 30 days of the termination of the hearing and shall be communicated by first-class mail to the appellant and any other parties who have appeared at the addresses set forth by them.
 - (6) The parties to the hearing shall be the municipality, the appellant, any person affected by the appeal who has made timely appearance of record before the Board of Review, and any other person, including civic, community or state organizations permitted to appear by the Board of Review. The Board of Review shall have the power to require that all persons who wish to be considered parties enter appearance in writing.
 - (7) The Chairman or Acting Chairman of the Board of Review or presiding officer shall have the power to administer oaths and issue subpoenas to compel the attendance of the witnesses and the production of relevant document and papers, including witnesses and documents requested by the parties.
 - (8) The parties shall have the right to be represented by counsel and shall be afforded the opportunity to respond and present evidence and argument and cross-examine witnesses on all relevant issues.
 - (9) Formal rules of evidence shall not apply, but irrelevant, immaterial or unduly repetitious evidence may be excluded.

- (10) It is not necessary for the Board of Review to keep a stenographic record of the proceedings; however, any party desiring to keep a stenographic record will be allowed to do so at its expense, said stenographic record to be compiled by a properly recognized stenographer. Any parties ordering stenographic records shall pay their own costs.
- (11) The Board of Review shall not communicate directly or indirectly with any party or his representatives in connection with any issue involved except upon notice and opportunity for all parties to participate; shall not take notice of any communications, reports, staff memorandum or other materials, except advice from its Solicitor, unless the parties are afforded an opportunity to contest the material so noticed; and shall not inspect the site or its surroundings after the commencement of hearings with any party or his representative unless all parties are given an opportunity to be present.
- (12) Where legal counsel is desired, an attorney, other than the Solicitors of the municipality, may be appointed by the Supervisors to serve as counsel to the Board of Review.
- (13) Any person aggrieved by any decision of the Municipality, relevant to the provisions of this Ordinance, may appeal to the County Court of Common Pleas in the county where the activity has taken place within 30 days of the Municipality's decision.

ARTICLE IX

References

1. U.S. Department of Agriculture, National Resources Conservation Service (NRCS). *National Engineering Handbook*. Part 630: Hydrology, 1969-2001. Originally published as the *National Engineering Handbook*, Section 4: Hydrology. Available from the NRCS online at: <http://www.nrcs.usda.gov/>.
2. US Department of Agriculture, Natural Resources Conservation Service. 1986. *Technical Release 55: Urban Hydrology for Small Watersheds*, 2nd Edition. Washington, D.C.
3. Pennsylvania Department of Environmental Protection. No. 363-0300-002 (December 2006), as amended and updated. *Pennsylvania Stormwater Best Management Practices Manual*. Harrisburg, PA.
4. Pennsylvania Department of Environmental Protection. No. 363-2134-008 (March 31, 2012), as amended and updated. *Erosion and Sediment Pollution Control Program Manual*. Harrisburg, PA.
5. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, Hydrometeorological Design Studies Center. 2004-2006. *Precipitation-Frequency Atlas of the United States, Atlas 14*, Volume 2, Version 3.0, Silver Spring, Maryland. Internet address: <http://hdsc.nws.noaa.gov/hdsc/pfds/>.


Loyalsock Township Stormwater Management Ordinance
Ordinance Number 401

ENACTED and **ORDAINED** at a regular meeting of the

Loyalsock Township Board of Supervisors

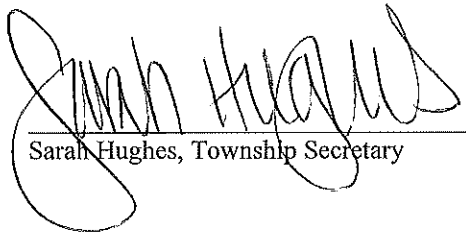
on this 24th day of September 2024

This Ordinance shall take effect immediately.



Paul Nyman, Chairman of the Board

ATTEST:



Sarah Hughes, Township Secretary

APPENDIX A

- I. STORMWATER MANAGEMENT COMPUTATIONAL VALUES.
 - Figure A-4: Design Storm Curves for Loyalsock Township
Lycoming County.
 - Table A-2: TR 55 Curve Numbers.
 - Table A-3: Rational Equation Runoff Coefficients.
 - Table A-4: Manning Roughness Coefficients.
 - Table A-5: Permissible Velocities for Channels.
 - A-5.1 - Bare Earth Channels.
 - A-5.2 - Lined with Vegetation.
 - A-5.3 - Rock Lined Channels and Riprap.
 - A-5.4 - Reno Mattress and Gabions.
 - Table A-6: Description of the Modified Puls Routing Method.
- II. DESIGN CRITERIA FOR DRAINAGE SWALES, PERENNIAL
STREAMS, CULVERTS, AND DRAINAGE CHANNELS.
- III. STORMWATER MANAGEMENT MEASURES.
- IV. DESIGN CRITERIA FOR FACILITIES TO ENCOURAGE
RECHARGE.
- V. GRADING AND LANDSCAPING.
- VI. STORM WATER MANAGEMENT PERFORMANCE STANDARDS.

REG ION 3

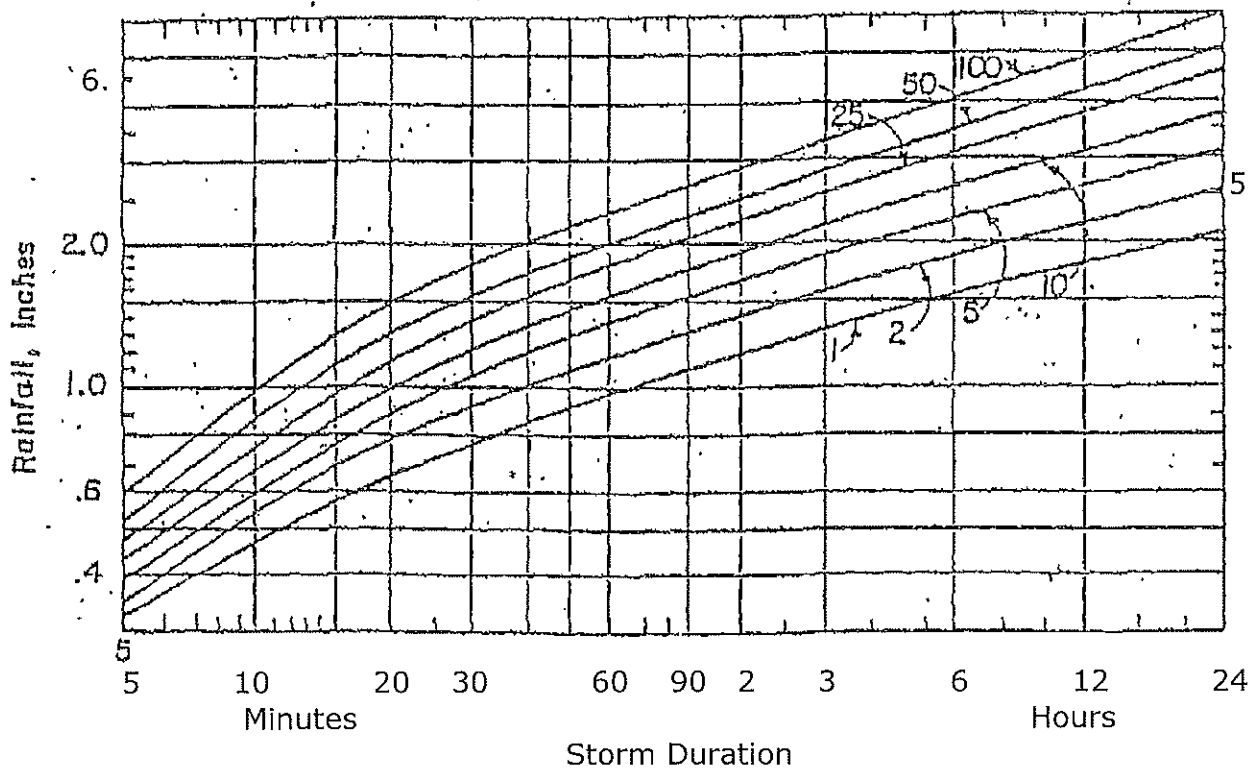
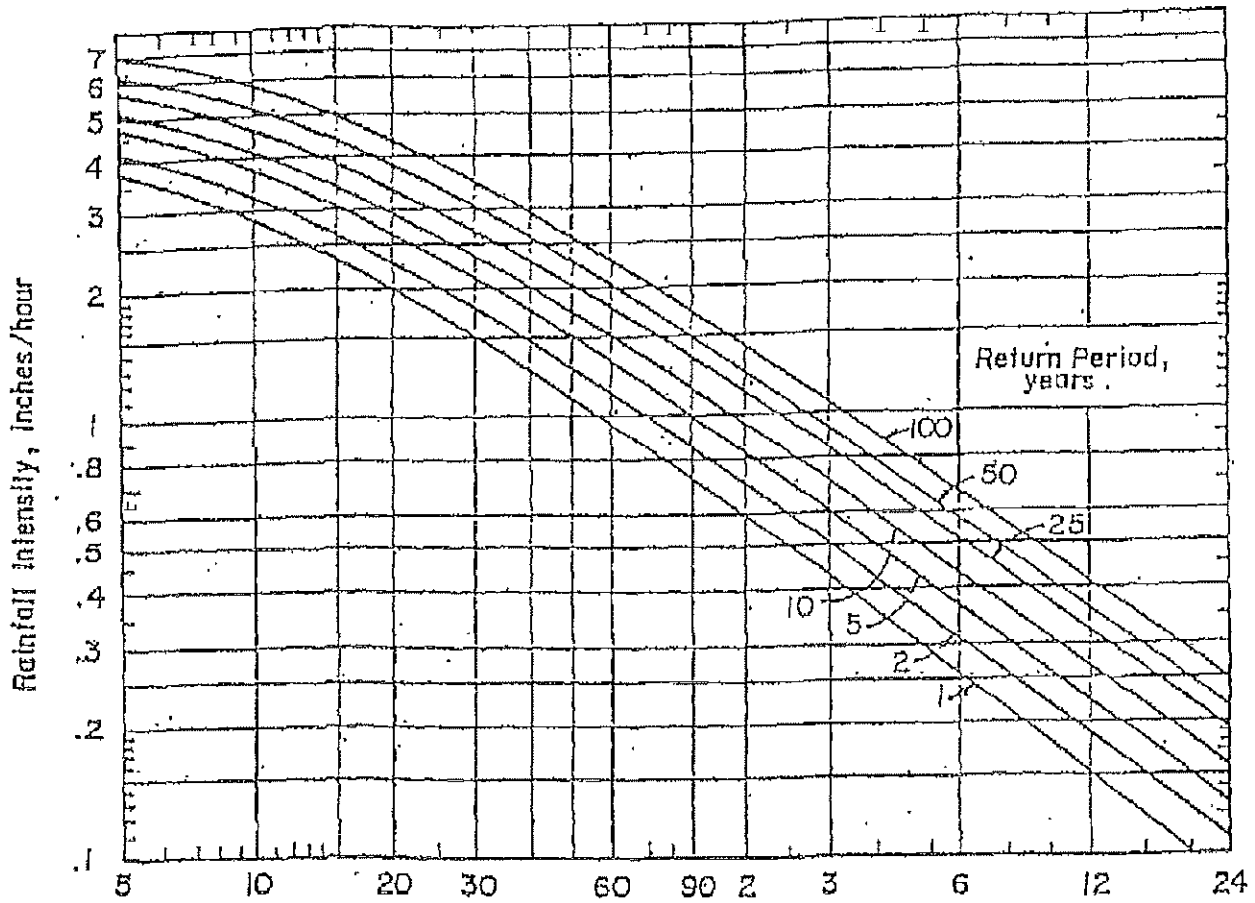


FIGURE A-1

Design Storm Curves for Region 3.

Source: Field Manual of Pennsylvania Department of Transportation Storm Intensity-Duration Frequency Charts, PDT-IDF, PA DOT, FHA, May 1986.

Table A-2

Runoff Curve Numbers and Average Imperviousness
For Various Land Uses by Hydrologic Soil Group

Cover Description Land Use / Cover Type	Average Imperviousness (%)	Curve Numbers For Hydrologic Soil Group			
		A	B	C	D
Open Space (lawns, parks, golf courses, cemeteries, etc.):					
Good condition (grass cover greater than 75%)	n/a*	39	61	74	80
Impervious Areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	n/a	98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (Excluding right-of way)	n/a	98	98	98	98
Paved; open ditches (Including right-of-way)	n/a	98	98	98	98
Gravel	n/a	76	85	89	91
Urban Districts:					
Commercial and business	85	89	92	94	92
Industrial	72	81	88	91	93
Residential Districts by Average Lot Size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Woods:					
	n/a	30	55	70	77
Brush:					
		35	56	70	77
Meadow: (In good condition)					
		30	58	71	78

*Not applicable.

Source: U.S. Department of Agriculture, Soil Conservation Service, Engineering Division, 1986, "Urban Hydrology for Small Watersheds," Technical Release 55, Washington D.C.

TABLE A-3
Runoff Coefficients for Rational Formula by Hydrologic Soil Group & Overland Slope (%)

Land Use	A			B			C			D		
	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+	0-2%	2-6%	6%+
Cultivated Land	0.08 ^a 0.14 ^b	0.13 0.18	0.15 0.22	0.11 0.16	0.15 0.21	0.21 0.28	0.14 0.20	0.19 0.25	0.26 0.34	0.18 0.24	0.23 0.29	0.31 0.41
Pasture	0.12 0.15	0.20 0.25	0.30 0.37	0.18 0.23	0.28 0.34	0.37 0.45	0.24 0.30	0.34 0.42	0.44 0.52	0.30 0.37	0.40 0.50	0.50 0.62
Open Space	0.10 0.14	0.16 0.22	0.25 0.30	0.14 0.20	0.22 0.28	0.30 0.37	0.20 0.26	0.28 0.35	0.38 0.44	0.24 0.30	0.30 0.40	0.40 0.50
Forest	0.05 0.08	0.08 0.11	0.11 0.14	0.08 0.10	0.11 0.14	0.14 0.18	0.10 0.12	0.13 0.18	0.16 0.20	0.12 0.15	0.16 0.20	0.20 0.25
Residential	0.25 0.33	0.20 0.37	0.31 0.40	0.27 0.35	0.30 0.39	0.35 0.44	0.30 0.38	0.33 0.42	0.38 0.49	0.33 0.41	0.38 0.45	0.42 0.54
Lot Size 1/8 Acre	0.22 0.30	0.26 0.34	0.29 0.37	0.24 0.33	0.29 0.37	0.33 0.42	0.27 0.38	0.31 0.40	0.36 0.47	0.30 0.38	0.34 0.42	0.40 0.52
Lot Size 1/3 Acre	0.19 0.28	0.23 0.32	0.26 0.35	0.22 0.30	0.26 0.35	0.30 0.39	0.25 0.33	0.28 0.38	0.34 0.45	0.28 0.38	0.32 0.40	0.39 0.50
Lot Size 1/2 Acre	0.16 0.25	0.20 0.29	0.24 0.32	0.19 0.28	0.23 0.32	0.28 0.36	0.22 0.31	0.27 0.35	0.32 0.42	0.28 0.34	0.30 0.38	0.37 0.48
Lot Size 1 Acre	0.14 0.22	0.12 0.26	0.22 0.28	0.17 0.24	0.21 0.28	0.26 0.34	0.20 0.28	0.25 0.32	0.31 0.40	0.24 0.31	0.29 0.35	0.35 0.46
Industrial	0.67 0.85	0.68 0.85	0.68 0.86	0.68 0.85	0.68 0.86	0.69 0.86	0.68 0.86	0.69 0.86	0.69 0.84	0.69 0.86	0.69 0.86	0.70 0.88
Commercial	0.71 0.88	0.71 0.88	0.72 0.89	0.71 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.89	0.72 0.90	0.72 0.89	0.72 0.89	0.72 0.90
Streets	0.70 0.76	0.71 0.77	0.72 0.79	0.71 0.80	0.72 0.82	0.74 0.84	0.72 0.84	0.73 0.85	0.76 0.89	0.73 0.89	0.75 0.91	0.78 0.95
Meadow	0.05 0.11	0.10 0.16	0.14 0.20	0.05 0.14	0.13 0.19	0.19 0.26	0.12 0.18	0.17 0.23	0.24 0.32	0.16 0.22	0.21 0.27	0.28 0.39
Parking	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97	0.85 0.95	0.86 0.96	0.87 0.97

^a Runoff coefficients for storm recurrence intervals less than 25 years.

^b Runoff coefficients for storm recurrence intervals of 25 years or more.

Sources: Rawls, W.L., S.L. Wang and R.R. McQueen, 1981, "Comparison of Urban Flood Frequency Procedures," Preliminary Draft, U.S. Department of Agriculture, Soil Conservation Service, Beltsville, MD.
A-4

Table A-4
Manning Roughness Coefficients

	Manning's n range	Manning's n range
I Closed Conduits:		
A. Concrete pipe	0.011-0.013	
I. Corrugated-metal pipe or pipe arch:		
1. 2-2/3 by 1/2 in. Corrugation (riveted pipe):		
a. Plain or fully coated	0.024	
b. Paved invert (range values are for 25 and 50 percent of circumference paved):		
(1) Flow full depth	0.021-0.018	
(2) Flow 0.8 depth	0.021-0.016	
(3) Flow 0.6 depth	0.019-0.013	
2. 6 by 2-in. corrugation (Field bolted)	0.030	
C. Cast-iron pipe, uncoated	0.013	
D. Steel pipe	0.009-0.011	
E. Monolithic concrete:		
1. Wood forms, rough	0.015-0.017	
2. Wood forms, smooth	0.012-0.014	
3. Steel forms	0.012-0.013	
F. Cemented masonry walls:		
1. Concrete floor and top	0.017-0.022	
2. Natural floor	0.019-0.025	
II Open Channels, Lined (straight alignment):		
A. Concrete, with surfaces as indicated:		
1. Formed, no finish	0.013-0.017	
2. Trowel finish	0.012-0.014	
3. Float finish	0.013-0.015	
4. Float finish, same gravel on bottom	0.015-0.017	
5. Gunite, good section	0.016-0.019	
6. Gunite, wavy section	0.018-0.022	
B. Concrete, bottom float finished, sides as indicated:		
1. Dressed stone in mortar	0.015-0.017	
2. Random stone in mortar	0.016-0.020	
3. Cement rubble Masonry	0.020-0.025	
4. Cement rubble masonry, plastered	0.016-0.020	
5. Dry Rubble (riprap)	0.020-0.030	
C. Gravel bottom, sides as indicated:		
1. Formed concrete	0.017-0.020	
2. Random stone in mortar	0.020-0.023	
3. Dry rubble (riprap)	0.023-0.033	
D Asphalt		
1. Smooth	0.013	
2. Rough	0.016	
E. Concrete-lined excavated rock:		
1. Good section	0.017-0.020	
2. Irregular section	0.022-0.027	
III. Open Channels, Excavated (straight alignment, natural lining):		
A. Earth, uniform section:		
1. Clean, recently completed	0.016-0.018	
2. Clean, after weathering	0.018-0.020	
3. With short grass, few weeds	0.022-0.027	
4. Gravelly soil, uniform section, clean	0.022-0.025	
B. Earth, fairly uniform section:		
1. No vegetation	0.022-0.025	
2. Grass, some weeds	0.025-0.030	
3. Dense weeds or aquatic plants in deep channels	0.030-0.035	
4. Sides clean gravel bottom	0.025-0.030	
5. Sides clean, cobble bottom	0.030-0.040	
C. Dragline excavated or dredged:		
1. No vegetation	0.028-0.033	
2. Light brush on banks	0.035-0.050	
D. Rock:		
1. Based on design section	0.035	
2. Based on actual mean section:		
a. Smooth and uniform	0.035-0.040	
b. Jagged and irregular	0.040-0.045	
E. Channels not maintained, weeds and brush uncut:		
1. Dense weeds, high as flow depth	0.080-0.120	
2. Clean bottom, brush on sides	0.050-0.080	
3. Clean bottom, brush on sides, highest stage of flow	0.070-0.110	
4. Dense Brush, high stage	0.100-0.140	
IV. Channels & Swales		
Vegetation (Values shown are for velocities of 2 & 6 fps.):		
A. Depth of flow up to 0.7 foot:		
1. Bermuda grass, Kentucky bluegrass, buffalo grass		
a. Mowed to 2 inches	0.045-0.070	
b. Length 4-6 inches	0.050-0.090	
2. Good stand, any grass:		
a. Length about 12 inches	0.090-0.180	
b. Length about 24 inches	0.150-0.300	
3. Fair stand, any grass:		
a. Length about 12 inches	0.080-0.140	
b. Length about 24 inches	0.130-0.250	
B. Depth of flow 0.7-1.5 feet:		
1. Bermuda grass, Kentucky bluegrass, buffalo grass:		
a. Mowed to 2 inches	0.035-0.050	
b. Length 4 to 6 inches	0.040-0.060	
2. Good stand, any grass:		
a. Length about 12 inches	0.070-0.120	
b. Length about 24 inches	0.100-0.200	
3. Fair stand, any grass:		
a. Length about 12 inches	0.060-0.100	
b. Length about 24 inches	0.090-0.170	
V. Street and Expressway Gutters:		
A. Concrete gutter, troweled finish	0.012	
B. Asphalt pavement:		
1. Smooth texture	0.013	
2. Rough texture	0.016	
C. Concrete gutter with asphalt pavement:		
1. Smooth	0.013	
2. Rough	0.015	
D. Concrete pavement:		
1. Float finish	0.014	
2. Broom finish	0.016	
E. For gutters with small slope; where sediment may accumulate, increase above values of x by		
	0.002	

Table A-4 (continued)
Manning Roughness Coefficients

Manning's <u>n</u> range	Manning's <u>n</u> range
Natural Stream Channels:	2. Cultivated areas:
A. Minor streams (surface width at flood stage less than 100 feet):	a. No crop.....0.030-0.040
1. Fairly regular section:	b. Mature row crops0.035-0.045
a. Same grass & weeds, little or no brush.....0.030-0.035	c. Mature field crops0.040-0.050
b. Dense growth of weeds, depth of flow materially greater than weed height.....0.035-0.050	3. Heavy weeds, scattered brush0.050-0.070
c. Some weeds, light brush on banks0.035-0.050	4. Light brush and trees:
d. Some weeds, heavy brush on banks.....0.050-0.070	a. Winter.....0.050-0.060
e. Some weeds, dense willows on banks.....0.060-0.080	b. Summer0.060-0.080
f. For trees within channel with branches, submerged at high stage, increase all above values by.....0.010-0.020	5. Medium to dense (brush):
2. Irregular sections, with pools, slight channel meander; increase values given in 1 a-e about.....0.010-0.020	a. Winter.....0.070-0.110
3. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stage	b. Slimmer.....0.100-0.160
a. Bottom of gravel, cobbles and few boulders.....0.040-0.050	6. Dense willows, summer, not bent over by current0.150-0.200
b. bottom of cobbles, with large boulders0.050-0.070	7. Cleared land w/ tree stumps, 100 - 150 per acre:
B. Flood plains (adjacent to natural streams):	a. No sprouts0.040-0.050
1. Pasture, no brush:	b. With heavy growth of sprouts0.060-0.080
a. Short grass.....0.030-0.035	8. Heavy stand of timber, a few down trees, little undergrowth:
b. High grass.....0.035-0.050	a. Flood depth below branches.....0.100-0.120
	b. Flood depth reaches branches0.120-0.160
	C. Major streams (surface width at flood stage more than 100 ft.): Roughness coefficient is usually less than for minor streams of similar description on account of less effective resistance offered by irregular banks or vegetation on banks. Values of n may be somewhat reduced. Follow recommendation in publication cited if possible. The value of n for larger streams of most regular section, with no boulders or brush, may be in the range of.....0.028-0.033

MANNING'S ROUGHNESS COEFFICIENTS FOR SHEET FLOW (n¹)

SURFACE DESCRIPTION

SURFACE DESCRIPTION

Smooth Surfaces (concrete, asphalt, Gravel, or bare soil)	0.011
Shallow (no residue)	0.05
Cultivated Soils:	
Residue cover 20%	0.06
Residue cover 20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses	0.24
Bermuda grass	0.41

Range (normal)	0.13
Woods:	
Light underbrush	0.40
Dense underbrush	0.80

Source: Chow, V. T., 1959, "Open Channel Hydraulics," McGraw Hill, New York.

TABLE A-4 (CONTINUED)
ROUGHNESS COEFFICIENTS "n"
FOR MANNING'S EQUATION

DESCRIPTION	"n"
Smooth - wall Plastic Pipe	0.011
Concrete Pipe	0.012
Smooth - lined Corrugated Water Pipe	0.012
Corrugated Plastic Pipe	0.024
Annular Corrugated Steel and Aluminum Alloy Pipe (Plain or Polymer Coated) 2-2/3 x 1/2 Corrugations	0.024
3"x 1" Corrugations	0.027
5" x 1" Corrugations	0.025
6" x 2" Corrugations	0.033
Helically Corrugated Steel and Aluminum Alloy Pipe (Plain or Polymer Coated) 3" x 1", 5" x 1"; or 6" x 2" Corrugations	0.024
Helically Corrugated Steel and Aluminum Alloy Pipe (Plain or Polymer Coated) 2 2/3 x 1/2 Corrugations	
a. Lower Coefficients ^o	
18" Diameter	0.014
24" Diameter	0.016
36" Diameter	0.019
48" Diameter	0.020
60" Diameter	0.021
Higher Coefficients ^A	0.024
Annular or Helically Corrugated Steel or Aluminum Alloy Pipe Arches or Other Non-Circular Metal Conduit (Plain or Polymer Coated)	0.024
Vitrified Clay Pipe	0.012
Ductile Iron Pipe	0.013

^oUse the lower coefficient if any one of the following conditions apply:

- a. A storm pipe longer than 20 diameters, which directly or indirectly connects to an inlet or manhole, located in swales adjacent to shoulders in cut areas, shoulders in cut areas or depressed medians.
- b. A storm pipe which is specially designed to perform under pressure.

^AUse the higher coefficient if any one of the following conditions apply:

- a. A storm pipe which directly or indirectly connects to an inlet or manhole located in highway pavement sections or adjacent to curb or concrete median barrier.
- b. A storm pipe which is shorter than 20 diameters long.
- c. A storm pipe which is partly lined helically corrugated metal pipe.

In considering each factor more critical judgement is necessary if it is kept in mind that any condition that causes turbulence and retards flow results in a greater value of "n".

Outlet velocity for bituminous paved invert shall be determined based on a 25% reduction in Manning's roughness coefficient "n",

Source: Pennsylvania department of transportation Design Manual, Part 2, January 1990.

Soil Materials	n*	Clear Water (V fps)	Water Transporting Colloidal Silts (V fps)
Fine sand; non-colloidal	.020	1.50	2.50
sandy loam; non-colloidal	.020	1.75	2.50
Silt loam, non-colloidal	.020	2.00	3.00
Alluvial silts, non-colloidal	.020	2.00	3.50
Ordinary firm loam	.020	2.50	3.50
Stiff clay, very colloidal	.025	3.75	5.00
Alluvial silts, colloidal	.025	3.75	5.00
Shales and hardpan	.025	6.00	6.00
Fine Gravel	.020	2.50	5.00
Graded loam - cobbles (when non-colloidal)	.030	3.75	5.00
Graded silt - cobbles (when non-colloidal)	.030	4.00	5.50
Coarse gravel, non-colloidal	.025	4.00	6.00
Cobbles and shingles	.035	5.00	5.50

Values assume good to excellent construction techniques which produce uniform channel dimensions. Values should be modified by use of SCS Engineering Handbook /5, Supplement B, for other construction conditions.

Cover	Slope Range Percent	Permissible Velocity ft./sec.	
		Erosion Resistant Soil	Easily Eroded Soil
Kentucky Bluegrass Tall Fescue	<5	7 ³	5
	5-10	6 ³	4
	> 10	5	3
Grass mixture Reed Canarygrass	<5	5	4
	5-10	4	3
Sericea Lespedeza Weeping Lovegrass Redtop Red Fescue	<5	3.5	2.5
Annuals temporary cover only Sudangrass	<5	3.5	2.5

(clayey) fine grain soils and coarse grain soils with a plasticity index of 10 to 40 (CL, CE, SC, & GC) that do not meet the requirements for erosion resistant soils.

Velocities exceeding 5 ft./sec only where good cover and proper maintenance can be obtained.

MSA No.	Graded Rock Size (In.)			Permissible Velocity fps*
	Max	D_{50}	Min.	
R-1	1.5	.75	NO. 8	2.5
R-2	3	1.50	1	4.5
R-3	6	3	2	6.5
R-4	12	6	3	9.0
R-5	18	9	5	11.5
R-6	24	12	7	13.0
R-7	30	15	12	14.5

* Permissible velocities based on rock at 165 lbs. per cubic foot. Adjust velocities for other rock weights used. See Figure 4.6

TABLE A-5.4 Maximum Permissible Velocities for Reno Mattress & Gabions

Type	n	Thickness(in)	Rock fill Gradation (in)	Permissible* Velocity - fps
Reno Mattress	.025	6	3 - 6	13.5
	.025	9	3 - 6	16.0
	.025	12	4 - 6	18.0
Gabion	.027	18 +	5 - 9	22.0

*Permissible velocities may be increased by the introduction of sand mastic grout. Refer to Manufacturers recommendation / specifications for permissible velocities.

SOURCE: PA DER Bureau of Soil and water Conservation Erosion and Sediment Pollution Control Program Manual, April 1990.
refer to this reference for additional stipulations in the use of Tables A-5.1 through A-5.4.

Description of the Modified Puls Routing Method

Flood routing through a pond or reservoir is based on the principle that inflow minus outflow equals the change in storage. Defining inflow as I , outflow as O , and storage as S , and assigning the subscripts 1 and 2 to the beginning and end of a time interval, we can write

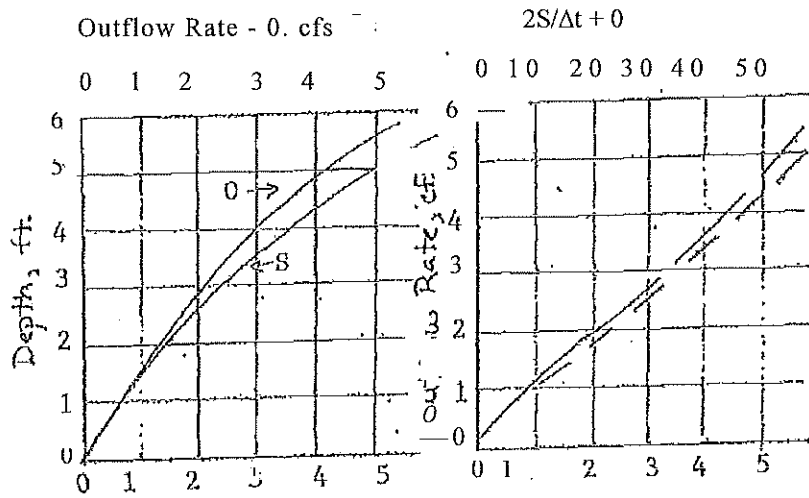
$$(I_1 + I_2)/2 - (O_1 + O_2)/2 = S_2 - S_1$$

The entire inflow hydrograph must be known. We should also know what the values of O and S are at the beginning of the runoff event. That leaves one equation and two **unknowns** (O and S). To obtain a solution, the unknowns in ea. 1 are moved to the right side, giving the equation

$$I_1 + I_2 - (2S/\Delta t)_1 - O_1 = (2S/\Delta t)_2 + O_2 \quad (2)$$

To solve ea. (2) either one more equation or a graph relating $2S/\Delta t + O$ vs O are needed. By surveying the pond topography and applying standard hydraulic equations to the pond's outlet structure, curves can be constructed relating both the storage volume and the outflow rate to pond depth, as shown in Fig. 1. By reading values of S and O at various elevations, a curve relating O to S can be constructed as shown in Fig. 2. This curve is further modified into a curve describing $2S/\Delta t + O$ vs O , as also shown in Fig. 2. The routing process can now proceed as illustrated in the Table below,

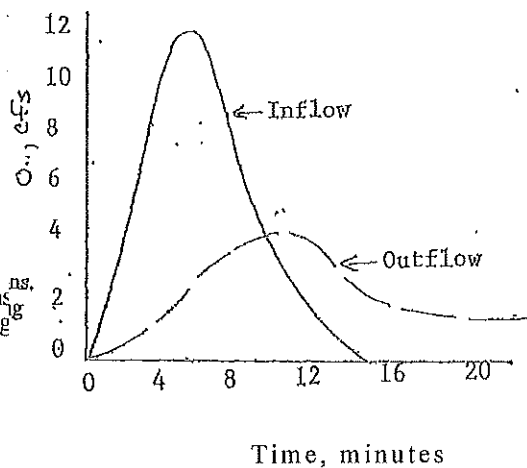
1. Select a convenient time increment, and tabulate the inflow hydrograph.
2. Start with a known initial pond level, usually the bottom, and list the corresponding initial outflow and storage in row 1. With these data compute $2S/\Delta t - O$ and enter the value in Col. 3,
3. Compute $2S/\Delta t + O$ by ea. 2 and enter the value in Col. 4 in row 2.
4. Find O from the graph in Fig. 2 and enter the value in Col. 5 in row 2.
5. Compute $2S/\Delta t - O = 2S/\Delta t - 2O$ and enter the value in Col. 3, row 2.
6. Redefine subscripts 1 and two for the next step and go back to step 3, Repeat the steps until you reach the bottom of the inflow hydrograph.



Routing Table

t	X	2s/Δt-O	2S/Δt+O	O	S
sec	cfs	cfs	cfs	cfs	cu. ft.
0	0	0	-0	0	0
120	4	2.8	4.0	0.5	
240	10	13.5	16.8	1.5	
360	12	29.2	35.5	3.2	
480	7	39.4	48.2	4.4	Max. S =
600	3	40.4	49.4	4.5	= 2694 CF
720	1	36.0	44.2	4.1	Max. Depth =
840	0	30.4	37.0	3.3	= 5.2 ft,
960	0	24.8	30.4	2.8	
1080	0	20.2	24.8	2.3	
1200	0	16.4	20.2	1.9	

Inflow and Outflow Hydrographs



Storage S is not needed in the routing steps, except to establish the initial conditions at the point of maximum outflow, however, it is useful to know the corresponding maximum storage volume and depth.

II. DESIGN CRITERIA FOR DRAINAGE SWALES, PERENNIAL STREAMS, CULVERTS, AND DRAINAGE CHANNELS.

A. DRAINAGE SWALES:

Criteria:

1. Where vegetated drainage swales are used in lieu of or in addition to storm sewers, they shall be designed to carry the 10-year discharge without erosion, and also to increase the time of concentration, reduce the peak discharge and velocity, and permit the water to percolate into the soil.
2. The maximum encroachment of water on the roadway pavement along roadside swales in cut areas shall not exceed half of a through traffic lane during a 10-year frequency storm of five (5) minute duration. Frequent and/or sustained flooding of the sub-base shall be avoided.
3. Swales shall be designed in accordance with Design of Roadside Channels with Flexible Linings, Hydraulic Engineering Circular No. 15 (US DOT, FHA). Inlets shall be provided to limit the shoulder encroachment and water velocity.
4. The side slope for any vegetated drainage channel requiring mowing of the vegetation shall have a maximum grade of three (3) horizontal to one (1) vertical on those areas to be mowed.
5. Erosion Prevention: All drainage swales shall be designed to prevent the erosion of the bed and bank areas. Suitable temporary and/or permanent stabilization during vegetative cover establishment shall be provided to prevent erosion.
6. Storm sewers or drainage swales shall discharge to a detention or retention basin to attenuate the peak rate and volume, respectively of stormwater runoff, except as provided in the plan.
7. Design Standard: Because of the critical nature of vegetated drainage channels, the design of all vegetated channels shall, as a minimum, conform to the design procedures outlined in 'the Erosion and Sediment Pollution Control Program Manual (PA DEP). Other sources of design information for

vegetated swales are provided in Appendix A, Section II, Subsection B.2 of this Ordinance.

Guidelines:

1. Deed restrictions may be required on property(ies) containing drainage swales and/or perennial streams. When required, these deed restrictions shall specify that no property owner obstruct or alter any drainage swale or perennial stream identified in the stormwater management plan.

B. CULVERTS AND DRAINAGE CHANNELS:

Criteria:

1. Design Flow Standard: Culverts and drainage channels shall be designed to carry flow rates determined as outlined in Article III of this Ordinance.
2. Several acceptable sources outline design procedures for drainage channels with flexible linings, including the following:

Design of Roadside Channels with Flexible Linings
Hydraulic Engineering Circular No. 15
U.S. Department of Transportation
Federal Highway Administration

3. Erosion Prevention: All drainage channels shall be designed to prevent the erosion of the bed and bank areas. Suitable bank stabilization shall be provided where required to prevent erosion of the drainage channels.
 - a. The maximum velocities permitted for lined water carrying channels shall be in accordance with the values presented in Table A-5 of Appendix A, Section I of this Ordinance.
 - b. A minimum grade of one (1) percent is desirable for all drainage channels.
4. Pipe Capacity: The capacity of all pipe culverts shall, as a minimum, provide the required carrying capacity as determined by the following sources:

Hydraulic Charts for Selection of Highway

Culverts

Hydraulic Engineering Circular No. 5
United States Department of Commerce
Bureau of Public Roads

Capacity Charts for the Hydraulic Design of
Highway

Culverts

Hydraulic Engineering Circular No. 10
United States Department of Commerce
Bureau of Public Roads

Hydraulic Design of Improved Inlets for Culverts

Hydraulic Engineering Circular No. 13
Federal Highway Administration

Reference to publications and source documents in this section shall be deemed to include any amendments and/or revisions thereto.

5. Minimum Grade and Size: All storm drain culvert pipes shall be designed to, maintain a minimum grade of one-half ($1/2$) percent. All storm pipes shall have a minimum inside diameter of fifteen (15) inches or a cross-sectional area of one hundred seventy-six (176) square inches, except that pipes under a twenty-five foot or greater fill shall not be less than twenty-four (24) inches or a cross-sectional area of four hundred fifty-three (453) square inches, and shall consist of reinforced concrete.
6. Where storm sewers discharge into existing drainage channels at an angle greater than thirty (30) degrees from parallel with the downstream channel flow, the far side bank shall be stabilized by the use of riprap or masonry, and/or concrete walls, the stabilization shall be designed to prevent erosion and frost heave under and behind the stabilizing media.

Guidelines:

1. Pipe Arches: Where headroom is restricted, equivalent pipe arches may be used in lieu of circular pipe.

STORMWATER MANAGEMENT MEASURES

A. DESIGN OF DETENTION BASINS:

Criteria:

1. All detention basin storage shall be designed by hydrograph routings. Hydrographs shall be developed from methods outlined in Section 1.4 under the approval of the Municipal Engineer. Hydrographs shall be routed through the basin or stormwater management facility using the Modified Puls Method, or other appropriate routing method approved by the Municipality or the Municipal Engineer.

B. BASIN DESIGN:

Criteria:

The design criteria contained in Article. III, Section 183.11 of this Ordinance, shall be used in the design of all detention basins in the Municipality.

1. Riser: Where a riser is provided at the outlet of the detention basin, the riser shall be constructed of metal or concrete as approved by the Municipal Engineer. Risers shall be designed so that the rate of outflow is controlled by the pipe barrel through the basin berm when the depth of the water within the basin exceeds the height of the riser, or by accurately sized orifices. All metal risers, where approved for use, shall be suitably coated to prevent corrosion, A trash rack or similar appurtenance shall be provided to prevent debris from entering the riser. All metal risers shall have a concrete base attached with a watertight connection, and such base shall be of sufficient weight to prevent flotation of the riser, and to prevent movement due to frost. Concrete risers shall have a footer to prevent movement due to frost. An anti-vortex device, consisting of a thin vertical plate normal to the basin berm, shall be provided on the top of all metal risers. Suitable perforated metal riser designs are outlined in the following sources:

Erosion and Sediment Pollution Control Program Manual (PA DEP).

2. Overflow Spillway: Overflow spillways shall be incorporated into the design of all basins, and shall be

constructed of reinforced concrete, vegetated earth, or riprap in accordance with generally accepted engineering practice. All overflow spillways shall be constructed so that the detention basin berm is protected against erosion. The minimum capacity of all overflow spillways shall be the peak flow rate from the 100-year design storm. The dimensions of the overflow spillways can be determined from the Erosion and Sediment Pollution Control Program Manual (PA DEP). Overflow spillways shall extend along the upstream and downstream berm embankment slopes. Protection should be provided on the upstream embankment a minimum of three (3) feet below the spillway crest elevation. The downstream slope of the spillway shall as a minimum extend to the toe of the berm embankment. The overflow spillway shall not discharge over un-compacted earthen fill and/or easily erodible material. The Municipal Engineer may require the use of open concrete lattice blocks, stone riprap, or concrete spillways when slopes would exceed four (4) feet horizontal to one (1) foot vertical, and spillway velocities might exceed Natural Resource Conservation Service standards for the particular soils involved.

Where the overflow spillways, are not practical, then an overflow structure shall be provided. Such overflow structure shall be sized to convey the routed 100-year design storm for the situation where all other outlets (e.g. orifices and weirs) are clogged, or otherwise not functioning. The Municipal Engineer may approve the use of this sizing criteria for overflow spillways that cannot practically be designed to convey the 100-year peak design flow.

3. Antiseep Collars: Antiseep collars shall be installed around the principal pipe barrel within the normal saturation zone of the detention basin berms. The antiseep collars and their connections to the pipe barrel shall be watertight. The antiseep collars shall be designed in accordance with antiseep collar design criteria in Maryland Standards and Specifications for Soil Erosion and Sediment Control (MD DOE). The maximum spacing between collars shall be fourteen (14) times the minimum projection of the collar measured perpendicular to the pipe.
4. Freeboard: Freeboard is the difference between the design flow elevations in the overflow spillway and the top of the

settled detention basin embankment. The minimum freeboard shall be one (1) foot.

5. Slope of Detention Basin Embankment: The toe of any fill slope, and the top of any cut slope shall be located a minimum of ten (10) feet from any property line. Whenever possible the side slopes and basin shape shall be amenable to the natural topography. Straight side slopes and rectangular basins shall be avoided whenever possible.
 - a. Exterior slopes of compacted soil shall not exceed three (3) feet horizontal, to one (1) foot vertical, and may be further reduced if the soil has unstable characteristics.
 - b. Interior slopes of the basin shall not exceed three (3) feet horizontal to one (1) foot vertical, except with approval of the Municipality.
 - c. Where concrete, stone, or brick walls are used with side slopes proposed to be steeper than three (3) feet horizontal to one (1) foot vertical, the basin shall be fenced by a permanent wire fence forty-two (42) inches in height and a ramp constructed of durable, non-slip material to a grade of less than ten (10) percent for maintenance vehicles shall be provided for access into the basin.
6. Width of Berm: The minimum top width of detention basin berms shall be ten (10) feet.
7. Slope of Basin Bottom: The bottom of the basin should be sloped at a minimum grade of two (2) percent toward the basin outlet structure in order to ensure proper drainage of the detention basin. However, the Municipality and/or the Municipal Engineer may allow basins to be designed and constructed with bottom slopes less than two (2) percent as a best management practice.
 - a. Inlet and outlet structures should be located at maximum distances from one another. The Municipal Engineer may require a rock filter berm, rock-filled gabions, or suitable landscaping or vegetative material between inlet and outlet structures as a best management practice.

- b. A collecting swale or low flow channel and/or underdrain shall be provided to drain basins designed for use as recreational facilities and should be sloped at a minimum grade of one (1) percent toward the basin outlet structure.
- 8. Energy Dissipators: Energy dissipating devices (riprap, end sills, etc.)- shall be placed at all stormwater discharge points.
- 9. The distance from the highest free water surface of any detention basin or drainage facility to a dwelling unit shall be a minimum of fifty (50) feet.
- 10. Landscaping and Grading of Detention Basins: All landscaping and grading standards particularly applicable to detention basins are included in Appendix A, Section V of this Ordinance.
- 11. Construction of Basins:
 - a. A quality control program is critical for embankment fills. Therefore, wherever embankment fill material in excess of three (3) feet is to be used, each layer of compacted fill should be tested to determine its density per ASTM D 1556, ASTM D 2922, or ASTM D 3017. The density of each layer shall be ninety-eight (98) percent of a standard Proctor analysis per ASTM D698. The depth of each fill layer (measured loose) should not exceed six inches. Fill material containing particles ranging from small gravel or coarse sand to fine sand and clay in the desired proportion is acceptable. Fill material should contain approximately twenty (20) percent clay particles by weight. Using the unified soil classification system, SC (clayey sand), GC (clayey gravel), and CL ("low liquid limit" clay) are among the preferred types of embankment soils. The area on which the fill material will be placed shall be scarified prior to the placement of fill materials.
 - b. Compaction test reports shall be kept on file at the site and be subject to review at all times with copies being forwarded to the Municipal Engineer.

- c. When rock is encountered during the excavation of a detention basin, it should be removed to an elevation of at least twelve (12) inches below the proposed basin floor if the basin will function to enhance stormwater quality (when a manufactured liner will be used, rock shall be excavated to an elevation of 24" to 30" below the proposed basin floor).
 - d. Temporary and permanent grasses or stabilization measures shall be established on the sides and base of all earthen basins within fifteen (15) days of construction.
12. Design Information: As part of the Stormwater Management Plan and Report, all design information shall be submitted including, but not limited to, the following:
- a. General description of proposed facilities and the operation of the stormwater management measures.
 - b. All computations of the stormwater runoff before and after construction, including all supporting material.
 - c. The stormwater plan must include a discussion of how it will function during construction and includes supporting documentation.
 - d. A sketch of the berm embankment and outlet structure indicating the embankment top elevation, embankment side slopes, top width of embankment, overflow spillway elevation, perforated riser dimensions, pipe barrel dimensions, and dimensions and spacing of antiseep collars.
 - e. Design computations for the pipe barrel and riser.
 - f. A plot or table of the stage-storage (acre-feet versus elevation) and all supporting computations.
 - g. Flood routing computations.
 - h. A detailed plan of the trash rack and anti-vortex device.

- i. A plan, at a scale of one (1) inch equals fifty (50) feet or larger showing the grading, landscaping, and fencing around the detention basin.

Soils Investigation Report, as required and outlined in Article II, Section 3, Subsection 3.4 of this Ordinance.

13. The Engineering Field Manual for Conservation Practices Part 1 of 2 (USDA, NRCS), and the Urban Drainage Design Manual (HEC-22, US DOT, FHA) contain design, construction, and maintenance guidelines that are applicable to detention basins.

Guidelines:

1. Depth of Detention or Retention; as a component of the Stormwater Plan, the design engineer should include a safety plan related to the depth of water in the detention basin.
2. Within sensitive Karst areas, the Municipal Engineer may require basins to contain an impervious liner. The liner may be of the impervious membrane type, placed in accordance with the manufacturer's recommendations, or an improved alternative, as approved by the Municipal Engineer. Alternatively, the Municipal Engineer may require details for repairing sinkholes in lieu of an impervious liner. Such sinkhole repair details shall be mentioned in a stormwater management maintenance plan.
3. Inspections may be conducted by the Municipal Engineer during the construction of the stormwater management basin and facilities. Such inspections do not constitute approval of construction methods and materials.

IV.

DESIGN CRITERIA FOR FACILITIES TO ENCOURAGE RECHARGE

A. DESIGN OF SEEPAGE PITS AND SEEPAGE TRENCHES FOR INFILTRATION OF ROOF DRAINAGE:

Criteria:

1. These structures shall be designed to assimilate, in seventy two (72) hours, a volume of water equal to 0.2 cubic feet per square foot of roof coverage (i.e., length x width of building space covered).
2. The soils on which a seepage pit or trench are located shall have a minimum infiltration rate of 0.27 inches per hour based upon soils data obtained by direct testing methods in accordance with procedures outlined in the Technical Manual for Sewage Enforcement Officers (PA DEP).
3. The porosity of the gravel or rock to be used in seepage pits must be specified in the plan. The rock or gravel shall be covered with a ground stabilization fabric, including the following trade names: Mirafi. 500 (Monsanto), Typer (DuPont), Bidim (trade name), Supac (trade name), or equivalent.
4. Seepage pits or seepage trenches shall not be installed on slopes greater than twenty (20) percent.
5. Seepage Pits or the drains to them must contain a sediment trap which can be maintained regularly. All downspouts should have leaf strainers to prevent leaves from clogging the seepage pit.
6. Seepage pits connected to roof drains shall be located at least ten feet from basement walls and downhill from the building,
7. The bottom of a seepage pit shall be at least two (2) feet above seasonal high water table and bedrock or be shown to be otherwise capable of handling required design volumes.

Guidelines:

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1. Stormwater runoff capacity may be distributed among several seepage pits, trenches, or berms so long as total assimilative capacity of all structures equals the required volume.
2. Where adequate seepage pit capacity is difficult to achieve with a rock-filled pit, a concrete (or equivalent material) culvert pipe with a lid may be placed vertically over a stone bed to provide storage capacity; alternatively, a septic tank-type structure operating as a cistern with discharge to the seepage pit may be used.
3. The longer dimension of seepage pits or seepage trenches should parallel the slope where slopes exceed five (5) percent.
4. The use of a "perforated" or porous pipe leading to the seepage pit is encouraged.
5. In all cases, an overflow system should be provided to accommodate heavy rains in excess of the design criteria.

B. DESIGN OF SEEPAGE PITS AND SEEPAGE TRENCHES - OTHER THAN ROOF DRAINAGE:

Criteria:

1. Where seepage pits or trenches will be used for infiltration of stormwater runoff from grassed areas or streets, their design shall generally follow the guidelines of Appendix A, Section IV, Subsection A of this Ordinance.

Guidelines:

1. Seepage trenches for such flows shall be located in diversion channels where feasible.
2. Seepage pits be installed in drainage swales uphill of check dams or small detention facilities.

C. DESIGN OF CISTERNS OF WATER STORAGE FACILITIES:

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Criteria:

1. These structures shall either be located within a building or below frost level where they will be protected against freezing. They shall be designed to hold 0.2 cubic feet of water per square foot of roof coverage.
2. Access to the structures by insect or animal vectors shall be controlled by screens or other obstructions.
3. Facilities to be used for water supply purposes shall comply with plumbing code regulations for cross-connections.
4. Roof top storage must comply with all building code regulations on load limitations and other related factors.
5. All water storage facilities shall be equipped to divert flows in excess of their holding capacity to appropriate areas of discharge. If water stored in cisterns will not be used for non-potable water supply purposes, the facility shall be designed to drain down within seventy-two (72) hours through a seepage bed.

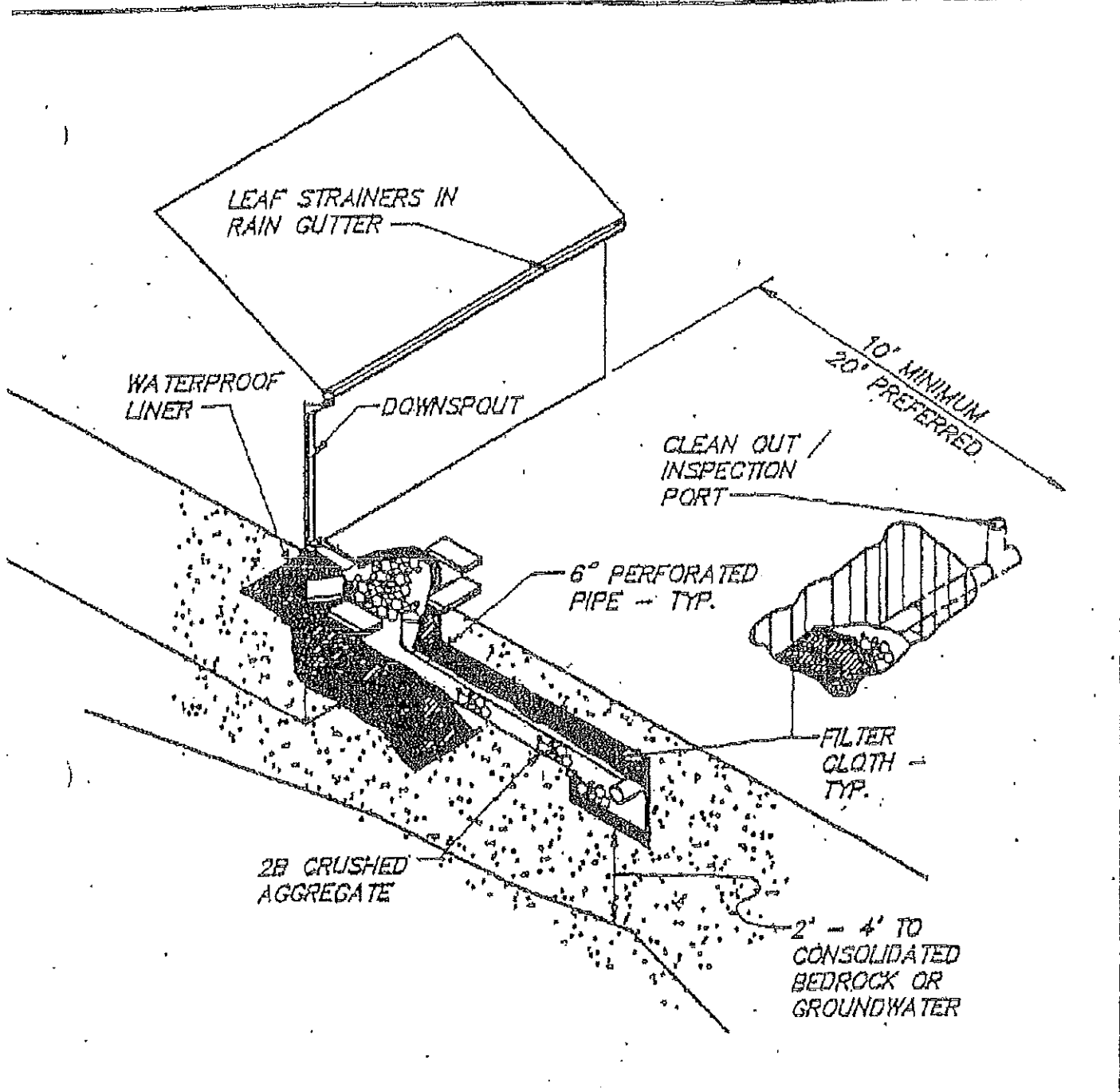
Guidelines:

1. Facilities should have a means of access for cleanout of accumulated debris or sediment.
2. Septic tank-type structures are recommended for smaller facilities.

D. OTHER METHODS OF STORMWATER INFILTRATION

1. Other methods of stormwater infiltration including: multiple, staged, or extended detention (i.e. greater than 24 hours), wet ponds with stormwater detention capabilities, infiltration trenches and basins, porous pavement, and vegetative practices including urban forestry, basin landscaping or shallow marsh creation may be used. Suggested guidelines and design criteria for these alternatives are outlined in the publications Controlling Urban Runoff - A Practice Manual for Planning and Designing Urban BMPs (Metropolitan Washington Council of Governments), Standards and Specifications for Infiltration Practices (MD DNR), and the Pennsylvania Handbook of Best Management Practices for

Developing Areas (CH2M Hill, Pennsylvania Association of Conservation Districts). All design methods and selected alternates shall have prior approval of the Municipal Engineer.

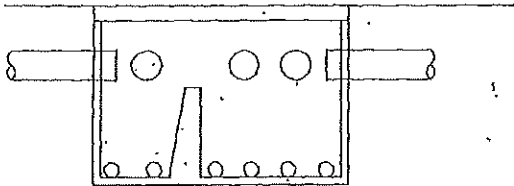
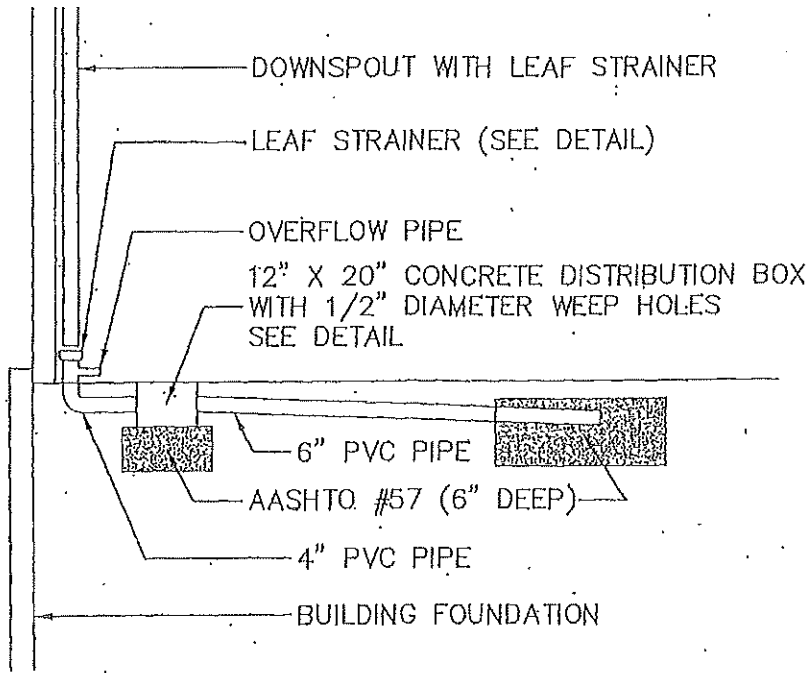


ROOF RUNOFF INFILTRATION TRENCH

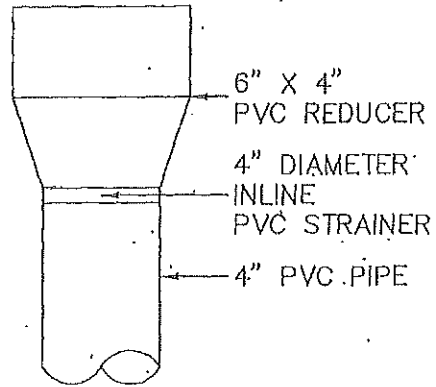
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Fig. 1



DISTRIBUTION BOX DETAIL
(NOT TO SCALE)



LEAF STRAINER DETAIL
(NOT TO SCALE)

OPTIONAL SEDIMENTATION TRAP
(NOT TO SCALE)

V. GRADING AND LANDSCAPING

A. CUTS:

Criteria:

No excavation should be made with a cut face steeper than three (3) feet horizontal to one (1) foot vertical, except under the conditions that the material in which the excavation is made is sufficiently stable to sustain a slope of steeper than three (3) feet horizontal to one (1) foot vertical; or as otherwise approved by the Municipality. Earth retaining structures will be required if a stable slope cannot be maintained. Any earth retaining structure design must be reviewed and approved by the Municipal Engineer. The top of the slope of headwall of any cut must be located a minimum of ten (10) feet from property lines.

B. FILLS:

Criteria:

No fill shall be made which creates any exposed surface steeper in slope than three (3) feet horizontal to one (1) foot vertical, except where the fill is located so that settlement, sliding, or erosion will not result in property damage or be a hazard to adjoining property, streets, or buildings; or as otherwise approved by the Municipality. For an exposed surface steeper than 3:1 to be permitted, the applicant must provide documentation that the 3:1 slope is not a safety concern.

Guidelines:

A concrete or stone masonry wall designed and constructed in accordance with these specifications and standards may be required to support the face of the fill where the above-specified slopes are exceeded.

C. RETAINING WALLS:

Criteria:

All retaining walls shall be designed as per the procedures outlined in the American Association of State Highway Officials, Standard Specifications for Highway Bridges, 1973, and as may be amended from time to time.

D. PLANTING:

Criteria:

1. Grassed or Grass/Ground Cover Combinations:

All such areas specified on proposed or approved plans shall be prepared, installed, and maintained in accordance with Pennsylvania Department of Transportation, Form 408 Specifications.

2: Open Space, Storm Drainage, and Retention Areas:

- a. Planting Requirement: All areas proposed for recreational use, whether active or passive, shall be planted to effectively naturalize the areas to become an integral and harmonious element in the natural landscape.
- b. Drainage Channels and Retention Areas: All storm drainage channels and retention areas, whether existing or proposed, shall be graded and planted to effectively naturalize area(s) so as to become an integral and harmonious part of the landscape by contour and type of plant material employed.
- c. Vegetative Filter Path: To work properly, a filter strip must be (1) equipped with some sort of level spreading device, (2) densely vegetated with a mix of erosion resistant plant species that effectively bind the soil, (3) graded to a uniform, even, and relatively low slope, (4) be at least as long as the contributing area, and (5) top soil within the vegetative filter path be 12" to 18" deep.

A dense cover of erosion resistant grass suitable to existing site conditions shall be established including: Kentucky 31 Tall Fescue, where drought resistance is required, or Reed Canary grass, where water tolerance is required.
- d. Top Soil: A minimum of six (6) inches of topsoil material shall be placed on all areas affected by the basin construction (bottom of basin, side slopes, top of berm, etc.). The material must meet the

requirements of the Pennsylvania Department
of Transportation, Form 408 Specifications.

Guidelines:

1. Crown Vetch: Detention basins may be seeded with crown vetch, or turfed if, in the opinion of the Municipality, a crown vetch covering would reduce the use of the detention basin for recreational purposes or would be unsightly.
2. Fence or Screening: A fence or suitable vegetative screening may be provided, as required by the Municipality, around all detention basins. All fencing should be at least three and one-half (3½) feet in height as approved by the Municipality. A vegetative screening of suitable landscaping plant material in or around a detention basin may also be required. Vegetative screenings should generally provide a barrier to prevent entrance to, and effectively naturalize the appearance of, the detention basin area.

Combinations of grassed areas and densely planted shrub areas consisting of species suited to use in the highway environment are encouraged. Species of raspberry (*Rubus* spp.) are recommended.

Rock filter check dams are encouraged for use as level spreaders.

E. BUILDING SITE EXCAVATION AND SURFACE
STORMWATER RUNOFF:

Criteria:

1. If temporary or permanent diversion channels or berms have not been established during general site preparation, diversion channels or berms shall be installed whenever slopes exceed ten (10) percent above or below proposed excavation areas.

Installation shall occur prior to or concurrent with excavations or other earthmoving on the uphill or downhill sides of the building location and any other areas to be disturbed. This requirement may be waived, if it would result in the destruction of trees and shrubs. In all cases, hay bales or silt fence shall be installed and maintained downhill of all

excavations and until the diversion channels or berms required by the Municipal Engineer have been stabilized.

2. All exposed earth shall be stabilized with appropriate grasses or other materials no later than fifteen (15) days after construction.

Guidelines:

1. Earth excavated for foundations or other reasons should be used for construction of diversion berms or decentralized detention basins.

VI. STORMWATER MANAGEMENT PERFORMANCE STANDARDS.

The stormwater management performance standards presented below vary depending upon location. For areas within the Grafius Run, McClures Run, and Miller's Run watersheds, the watershed specific stormwater management performance standards are the result of hydrologic modeling and analysis. For areas located outside of the Grafius Run, McClures Run, and Miller's Run watersheds, the general stormwater management performance standards are based on the current practice of limiting future (post-development) peak stormwater runoff rates to one-hundred (100) percent of existing condition (pre-development) rates.

The watershed specific and general stormwater management performance standards for each of the four design storm events in the following table are percent of existing condition (pre-development) peak stormwater runoff rates:

<i>Design Storm Event</i>	<i>Within Grafius Run & McClures Run Watersheds</i>	<i>Miller's Run Watershed</i>	<i>Outside of Grafius Run, McClures Run & Miller's Run Watersheds</i>
1-year	50%	50%	100%
10-year	50%	75%	100%
25-year	75%	100%	100%
100-year	75%	100%	100%

APPENDIX B

SUPPLEMENTAL STANDARDS AND CRITERIA

The following technical reference materials (including any amendments and/or revisions thereto) are hereby incorporated into this Ordinance for information purposes, and to govern the hydrologic and hydraulic design provisions contained herein:

Controlling Urban Runoff – A Practice for Planning and Designing Urban Best Management Practices, Metropolitan Washington, Council of Governments, July 1987.

Specifications, Publication 408 (as amended), Commonwealth of Pennsylvania, Department of Transportation, 1994.

Design and Construction of Urban Stormwater Management Systems, American Society of Civil Engineers and The Water Environment Federation, 1992,

Design of Roadside Channels with Flexible Linings (Hydraulic Engineering Circular No. 15), United States Department of Transportation, Federal Highway Administration, April 1988.

Design Manual Part 2, Highway Design, Publication 13, Commonwealth of Pennsylvania, Department of Transportation, January 1990.

Drainage of Highway Pavements (Hydraulic Engineering Circular No. 12), United States Department of Transportation, Federal Highway Administration, March 1984:

Engineering Field Manual for Conservation Practices - Part 1 of 2, United States Department of Agriculture, Natural Resource Conservation Service, July 1984.

Engineering Standard and Specifications, United States Department of Agriculture, Natural Resource Conservation Service, May 1977.

Erosion and Sediment Pollution Control Program Manual, Pennsylvania Department of Environmental Protection, April 1990.

Field Manual of Pennsylvania Department of Transportation Storm Intensity Duration Frequency Charts, Department of Civil Engineering and Institute for Research on Land and Water Resources, Pennsylvania State University, University Park, PA, 1986.

Flood Hazard Boundary Map; for Loyalsock Township; PA; United States Department of Housing and Urban Development; Federal Insurance Administration; April 15, 1977.

Guidelines for Erosion and Sediment Control Planning and Implementation, United States Government Printing Office, Washington, DC, EPA-R2-72-015, August 1972.

Maryland Standards and Specifications for Soil Erosion and Sediment Control, Maryland Department of the Environment, Soil Conservation Service, State Soil Conservation Committee, April 1983.

National Engineering Handbook, Section 4, Hydrology, United States Department of Agriculture, Natural Resource Conservation Service, August 1972.

Pennsylvania Handbook of Best Management Practices for Developing Areas, CH2M Hill, Pennsylvania Association of Conservation Districts, Spring 1998.

Practices in Detention of Urban Stormwater Runoff, Special Report. No. 43, American Public Works Association, June 1974.

The Rational Formula Revisited, Ronald L. Rossmiller, Ph.D., P.E., Proceedings International Symposium on Urban Storm Runoff, University of Kentucky, Lexington, Kentucky, July 28-31, 1980.

Soil Survey of Lycoming County, Pennsylvania, United States Department of Agriculture, Natural Resource Conservation Service, November 1986.

Standards for Roadway Construction, Series RC-0 to 100, Publication 72, Commonwealth of Pennsylvania, Department of Transportation, May 1983.

Standards and Specifications for Infiltration Practices, Maryland Department of Natural Resources, Water Resources Administration, 1984.

Title 25 Rules and Regulations, Chapter 105, Dam Safety and Waterway Management; Commonwealth of Pennsylvania, Department of Environmental Protection; January 30, 1993.

Urban Drainage Design Manual, Hydraulic Engineering Circular Number 22, United States Department of Transportation, Federal Highway Administration, November 1996.

Urban Hydrology for Small Watersheds, Technical Release No. 55, United States Department of Agriculture, Natural Resource Conservation Service, June 1986.

Urban Stormwater Management, American Public Works Association, 1981.

APPENDIX C

STORMWATER MANAGEMENT PLAN CHECKLIST

<i>Item</i>	<i>Check If Included</i>	<i>Drawing / Report</i>	<i>Sheet/ Page</i>
Name of the proposed development, property owners name and address and the individual or firm preparing the plans			
Date of submission and revision			
Graphic & written scale and north arrow			
Total tract boundary with distances marked			
Key map showing all existing natural and man-made features			
Topographic conditions			
Drainage areas and subareas affecting the site			
Existing and proposed use, including the total area of impervious surfaces after construction			
Existing soil type, karst formations, flood plain boundaries, sinkholes, undrained depressions, rock outcrops, streams, drainage courses and wetlands			
Complete drainage system for the site .			
Location and selected plant material used for vegetation filter paths to sinkholes			
Stormwater management off-site, a note on the plan referring to location and agreement indicating responsibility for conveyance to and maintenance of the facilities			
Proposed easement locations			
A statement signed by the landowner, acknowledging the stormwater management system is to be maintained in accordance with the approved ownership and maintenance program and remain a permanent fixture			
Name of the permanent watercourse to which the stormwater from the site will drain			
The location of all erosion and sedimentation control facilities			
Horizontal location and vertical profiles of all open channels, including hydraulic capacities			
A note indicating that as-built drawings will be submitted by the developer for the stormwater facilities prior to occupancy or the release of the surety bond			
Signature block for the Registered Professional preparing the stormwater management plan			
Signature block for the Township Engineer reviewing the stormwater management plan			
Locations for roof leaders to underground basins, infiltration trenches and cisterns			
Obtain all necessary approvals and permits from the Pennsylvania Department of Environmental Protection			
An analysis of the impact of detained stormwater flows on downstream areas within the watershed			
Erosion and sediment pollution control plan			
General description of proposed facilities and the operation of the runoff control measures			
Computations of the stormwater runoff before, during intermediate stages of the construction, and after construction			
Discussion of how the stormwater management plan will function during construction with supporting documentation			
Sketch of the berm embankment and outlet structure indicating the top elevation, side slopes, top width, emergency spillway, trash racks, perforated riser dimensions, pipe barrel dimensions and spacing of the antiseep collar			
Design computations for the pipe barrel and riser			
Chart of or table of the stage-storage (acre-feet vs. elevation) and all supporting computations & routing computations			
Detailed plan of the trash rack and-anti-vortex device			
Drawing at a scale of one inch equals fifty feet or larger showing the grading,			

APPENDIX D

GROUND WATER RECHARGE AND WATER QUALITY REQUIREMENTS FOR REGULATED EARTH DISTURBANCE ACTIVITIES

I. Groundwater Recharge for Regulated Earth Disturbance Activities

Maximizing the groundwater recharge capacity of the area being developed is required. Design of the infiltration facilities shall consider groundwater recharge to compensate for the reduction in the recharge that occurs when the ground surface is disturbed or impervious surface is created. It is recommended that roof runoff be directed to infiltration BMPs that may be designed to compensate for the runoff from parking areas. These measures are required to take advantage of utilizing any existing recharge areas.

Infiltration may not be feasible on every site due to site-specific limitations such as soil type. If it cannot be physically accomplished, then the design professional shall be responsible to show that this cannot be physically accomplished. If it can be physically accomplished, then the volume of runoff to be infiltrated shall be determined from A.2 below depending on demonstrated site conditions and shall be the greater of the volumes.

A. Minimum Requirements - Infiltration BMPs shall meet the following minimum requirements:

1. Infiltration BMPs intended to receive runoff from developed areas shall be selected based on suitability of soils and site conditions and shall be constructed on soils that have the following characteristics:
 - a. A minimum depth of 24 inches between the bottom of the BMP and the limiting zone.
 - b. An infiltration rate sufficient to accept the additional stormwater load and dewater completely as determined by field tests conducted by the Applicant's design professional.
 - c. The recharge facility shall be capable of completely retaining and infiltrating the required Recharge Volume (Re_v) within four (4) days (96 hours).
 - d. Pre-treatment shall be provided prior to infiltration.
2. The size of the recharge facility shall be based upon the following volume criteria:

Recharge may not be feasible on every site due to site-specific limitations such as soil type. If it cannot be physically accomplished, then the design

professional shall be responsible to show that this cannot be *physically* accomplished. If it can be physically accomplished, then the volume of runoff to be recharged shall be determined from A.2.a and A.2.b depending on demonstrated site conditions and shall be the greater of the two volumes.

a. NRCS Curve Number equation.

The NRCS runoff shall be utilized to calculate infiltration requirements (P) in inches.

For zero runoff. Eqn: D-1	$P = I \text{ (Infiltration) (in)} = (200 / \text{CN}) - 2$
------------------------------	---

Where: P = I = infiltration requirement (in)
CN = SCS (NRCS) curve number of the land area that will be converted to impervious surface

This equation is displayed graphically in, and the infiltration requirement can be determined from Figure D-1.

The recharge volume (Re_v) required would therefore be computed as:

$\text{Re}_v = I * \% \text{ impervious area}$	Eqn: D-2
--	----------

Where: I = infiltration requirements (in.) or

$\text{Re}_v = I \text{ (inches)} * \text{ impervious area (Square Feet)} / 12 \text{ (inches)} - \text{ Cubic Feet (CF)}$
--

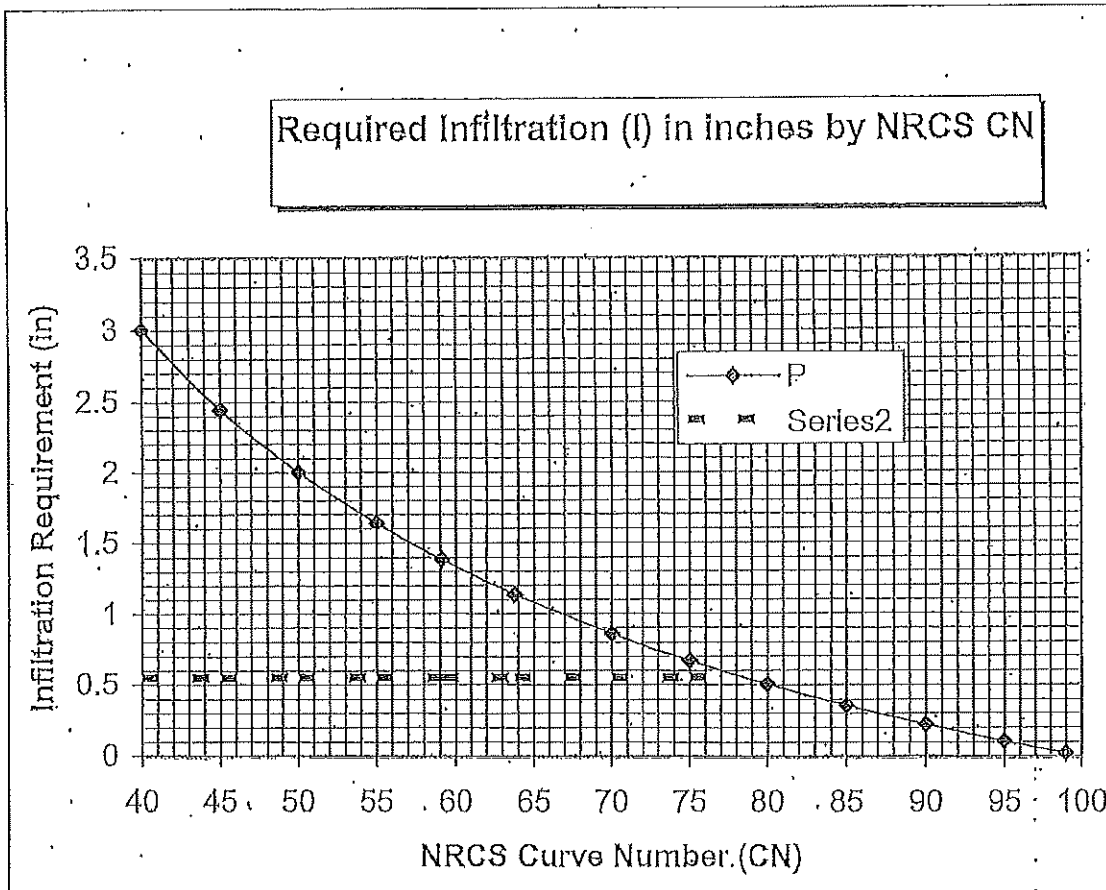


Figure D-1. Infiltration requirement based upon NRCS Curve Number.

b. Watershed Water Budget Goals.

It has been determined that recharging 0.55 inches of runoff from the impervious areas will aid in maintaining the hydrologic regime of the watershed. If the goals of Section 183-14 cannot be achieved, then 0.55 inches of rainfall shall be recharged from all impervious areas, up to an existing site conditions curve number of 78. Above a curve number of 78, Equation D-1 or the curve in Figure D-1 should be used to determine the recharge requirement.

Where: $I = 0.55$ inches

The recharge volume (Re_v) required would therefore be computed as:

$$Re_v = I \text{ (inches)} * \text{ impervious area (Square Feet)} / 12 \text{ (inches)} = \text{Cubic Feet (CF)}$$

The recharge values derived from these methods are the minimum volumes the Applicant must control through a recharge BMP facility. However, if a site has areas of soils where additional volume of recharge can be achieved, the applicant is encouraged to recharge as much of the stormwater runoff from the site as possible.

B. Soils - A detailed soils evaluation of the project site shall be required to determine the suitability of infiltration facilities. The evaluation shall be performed by a qualified design professional and at minimum address soil permeability, depth to bedrock, and subgrade stability. The general process for designing the infiltration BMP shall be:

1. Analyze hydrologic soil groups as well as natural and man-made features within the site to determine general areas of suitability for infiltration practices. In areas, where development on fill material is under consideration, conduct geotechnical investigations of sub-grade stability; infiltration may not be ruled out without conducting these tests.
2. Provide field tests such as double ring infiltrometer or hydraulic conductivity tests (at the level of the proposed infiltration surface) to determine the appropriate hydraulic conductivity rate. Percolation tests are not recommended for design purposes.
3. Design the infiltration structure for the required retention (Re_v) volume based on field determined capacity at the level of the proposed infiltration surface.
4. If on-lot infiltration structures are proposed by the Applicant's design professional, it must be demonstrated to the Municipality that the soils are conducive to infiltrate on the lots identified.

C. Stormwater Hotspots — Below is a list of examples of designated hotspots. If a Site is designated as a hotspot, it has important implications for how stormwater is managed. First and foremost, untreated stormwater runoff from hotspots shall not be allowed to recharge into groundwater where it may contaminate water supplies. Therefore, the Re_v requirement shall NOT be applied to development sites that fit into the hotspot category (the entire WQ_v must still be treated). Second, a greater level of stormwater treatment shall be considered at hotspot sites to prevent pollutant wash-off after construction. The Environmental

Protection Agency's (EPA) NPDES stormwater program requires some industrial sites to prepare and implement a stormwater pollution prevention plan.

Examples of hotspots:

- Vehicle salvage yards and recycling facilities
- Vehicle fueling stations
- Vehicle service and maintenance facilities
- Vehicle and equipment cleaning facilities
- Fleet storage areas (bus, truck, etc.)
- Industrial sites based on Standard Industrial Codes
- Marinas (service and maintenance)
- Outdoor liquid container storage
- Outdoor loading/unloading facilities
- Public works storage areas
- Facilities that generate or store hazardous materials
- Commercial container nursery
- Other land uses and activities as designated by an appropriate review authority

The following land uses and activities are not normally considered hotspots:

Residential streets and rural highways
Residential development
Institutional development
Office developments
Non-industrial rooftops
Pervious areas, except golf courses and nurseries (which may need an integrated pest management (IPM) plan).

While large highways (average daily traffic volume (ADT) greater than thirty thousand (30,000)) are not designated as stormwater hotspots, it is important to ensure that highway stormwater management plans adequately protect groundwater.

- D. Extreme caution shall be exercised where infiltration is proposed in storm water protected areas as defined by the local Municipality or water authority.
- E. Infiltration facilities shall be used in conjunction with other innovative or traditional BMPs, stormwater control facilities, and nonstructural stormwater management alternatives.
- F. Extreme caution shall be exercised) where salt or chloride (municipal salt storage) would be a pollutant since soils do little to filter this pollutant, and it

may contaminate the groundwater. The qualified design professional shall evaluate the possibility of groundwater contamination from the proposed infiltration facility and perform a hydrogeologic justification study if necessary.

- G. The infiltration requirement in HQ or EV waters shall be subject to the Department's Chapter 93 Anti-degradation Regulations.
- H. An impermeable liner will be required in detention basins where the possibility of groundwater contamination exists. A detailed hydrogeologic investigation may be required by the Municipality.
- I. The Municipality shall require the Applicant to provide safeguards against groundwater contamination for land uses that may cause groundwater contamination should there be a mishap or spill.

II. Water Quality Requirements

To control post-construction stormwater impacts from regulated earth disturbance activities, state water quality requirements can be met by BMPs, including site design, which provide for replication of pre-construction stormwater infiltration and runoff conditions so that post-construction stormwater discharges do not degrade the physical, chemical, or biological characteristics of the receiving waters. As described in the DEP Comprehensive Stormwater Management Policy (#392-0300-002; September 28 2002), this may be achieved by the following:

- Infiltration: replication of pre-construction stormwater infiltration conditions,
- Treatment: use of water quality treatment BMPs to ensure filtering out of the chemical and physical pollutants from the stormwater runoff, and
- Stream bank and Stream bed Protection: management of volume and rate of post-construction stormwater discharges to prevent physical degradation of receiving waters (e.g., from scouring).

- A. Developed areas shall provide adequate storage and treatment facilities necessary to capture and treat stormwater runoff. The retention volume computed under I above, may be a component of the water quality volume if the Applicant chooses to manage both components in a single facility. If the retention volume is less than the water quality volume, the remaining water quality volume may be captured and treated by methods other than infiltration BMPs. The required water quality volume (WQv) is the storage capacity needed to capture and treat a portion of stormwater runoff from the developed areas of the site.

To achieve this goal, the following criterion is established:

The following calculation formula is to be used to determine the water quality storage volume (WQv) in acre-feet of storage:

$$WQv = [(P)(Rv)(A)] / 12$$

WQv = Water quality volume (acre-feet)

P = 1 inch

A = Area of the project contributing to the water quality BMP (acres)

Ry = $0.05 + 0.009(I)$ where I is the percent of the area that is impervious surface $((\text{impervious area}/A)*100)$

This volume requirement can be accomplished by the permanent volume of a wet basin or the detained volume from other BMPs. Where appropriate, wet basins shall be utilized for water quality control and shall follow the guidelines of the BMP manuals referenced in Ordinance Appendix B.

Release of water can begin at the start of the storm (i.e., the invert of the water quality orifice is at the invert of the facility). The design of the facility shall provide for protection from clogging and unwanted sedimentation.

- B. For areas within defined special protection subwatersheds that include EV and HQ waters, the temperature and quality of water and streams shall be maintained through the use of temperature sensitive BMPs and stormwater conveyance systems.
- C. To accomplish the above, the Applicant shall submit original and innovative designs to the municipal Engineer for review and approval. Such designs may achieve the water quality objectives through a combination of different BMPs.
- D. If a perennial or intermittent stream passes through the site, the Applicant shall create a stream buffer extending a minimum of fifty (50) feet to either side of the -top-of-bank of the channel. The buffer area shall be maintained with and encouraged to use appropriate native vegetation (refer to Appendix H of the Pennsylvania Handbook of Best Management Practices for Developing Areas for plant lists). If the applicable rear or side yard setback is less than fifty (50) feet, the buffer width may be reduced to twenty-five (25) percent of the setback to a minimum of ten (10) feet. If an existing buffer is legally prescribed (i.e., deed, covenant, easement, etc.) and it exceeds the requirements of this Ordinance, the existing buffer shall be maintained. This does not include lakes or wetlands.

APPENDIX E

STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM
BMPs) OPERATION AND
MAINTENANCE (O&M) AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____
20_____, by and between _____, (hereinafter the
"Landowner"), and _____, Lycoming County,
Pennsylvania; (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by
deed in the land records of _____ County, Pennsylvania, Deed Book
_____ at Page _____, (hereinafter "Property").

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

WHEREAS, the SWM BMP Operation and Maintenance Plan approved by
the Municipality (hereinafter referred to as the "O&M Plan") for the property identified
herein, which is attached hereto as Appendix A and made part hereof, as approved by
the Municipality, provides for management of stormwater within the confines of the
Property through the use of BMPs; and

WHEREAS, the Municipality, and the Landowner, his successors and assigns,
agree that the health, safety, and welfare of the residents of the Municipality and the
protection and maintenance of water quality require that on-site SWM BMPs be
constructed and maintained on the Property; and

WHEREAS, for the purposes of this agreement, the following definitions
shall apply:

BMP — "Best Management Practice," activities, facilities, designs, measures or
procedures used to manage stormwater impacts from land development, to protect
and maintain water quality and groundwater recharge and to otherwise meet the
purposes of the Municipal Stormwater Management Ordinance, including but not
limited to infiltration trenches, seepage pits, filter strips, bio-retention, wet ponds,
permeable paving, rain gardens, grassed swales, forested buffers, sand filters and

detention basins.

Infiltration Trench —A BMP surface structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer,

Seepage Pit —An underground BMP structure designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or groundwater aquifer;

Rain Garden — A BMP overlain with appropriate mulch and suitable vegetation designed, constructed, and maintained for the purpose of providing infiltration or recharge of stormwater into the soil and/or underground aquifer; and

WHEREAS, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the Landowner, his successors and assigns

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

1. The Landowner shall construct the BMP(s) in accordance with the plans and specifications identified in the SWM Site Plan.
2. The Landowner shall operate and maintain the BMP(s) as shown on the SWM Site Plan in good working order acceptable to the Municipality and in accordance with the specific operation and maintenance requirements noted on the approved O&M Plan.
3. The Landowner hereby grants permission to the Municipality, its authorized agents and employees, to enter upon the property, at reasonable times and upon presentation of proper credentials, to inspect the BMP(s) whenever it deems necessary. Whenever possible, the Municipality shall notify the Landowner prior to entering the property.
4. In the event the Landowner fails to operate and maintain the BMP(s) per paragraph 2, the Municipality or its representatives may enter upon the Property and take whatever action is deemed necessary to maintain said BMP(s). This provision shall not be construed to allow the Municipality to erect any permanent structure on the land of the Landowner. It is expressly understood and agreed that the Municipality is under no obligation to maintain or repair said facilities, and in no event shall this Agreement be construed to impose any such obligation on the Municipality.

5. In the event the Municipality, pursuant to this Agreement, performs work of any nature, or expends any funds in performance of said work for labor, use of equipment, supplies, materials, and the like, the Landowner shall reimburse the Municipality for all expenses (direct and indirect) incurred within 10 days of receipt of invoice from the Municipality.
6. The intent and purpose of this Agreement is to ensure the proper maintenance of the onsite BMP(s) by the Landowner; provided, however, that this Agreement shall not be deemed to create or effect any additional liability of any party for damage alleged to result from or be caused by stormwater runoff.
7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall release the Municipality from all damages, accidents, casualties, occurrences or claims which might arise or be asserted against said employees and representatives from the construction, presence, existence, or maintenance of the BMP(s) by the Landowner or Municipality. In the event that a claim is asserted against the Municipality, its designated representatives or employees, the Municipality shall promptly notify the Landowner and the Landowner shall defend, at his own expense, any suit based on the claim. If any judgment or claims against the Municipality's employees or designated representatives shall be allowed, the Landowner shall pay all costs and expenses regarding said judgment or claim.
8. The Municipality shall inspect the BMP(s) at a minimum of once every three years to ensure their continued functioning.

This Agreement shall be recorded at the Office of the Recorder of Deeds of Lycoming County, Pennsylvania, and shall constitute a covenant running with the Property and/or equitable servitude, and shall be binding on the Landowner, his administrators, executors, assigns, heirs and any other successors in interests, in perpetuity.

ATTEST:

WITNESS the following signatures and seals:

(SEAL)

For the Municipality:

(SEAL)

For the Landowner:

ATTEST:

_____ (City, Borough, Township)

_____, a Notary Public in and for the County

and State aforesaid, whose commission expires on the _____ day of

_____, 20_____ do hereby certify that

_____ whose name(s) is/are signed to the

foregoing Agreement bearing date of the _____ day of _____

20_____ has acknowledged the same before me in my said County and State.

GIVEN UNDER MY HAND THIS _____ day of _____, 20_____.

NOTARY PUBLIC

(SEAL)