Stormwater Management Ordinance

Penn Township
Snyder County, Pennsylvania

Adopted, December 20th, 2005

STORM WATER MANAGEMENT ORDINANCE

ORDINANCE NO. 2005 - 03

AN ORDINANCE OF PENN TOWNSHIP, SNYDER COUNTY, REQUIRING THE DESIGN AND IMPLEMENTATION OF STORM WATER MANAGEMENT FACILITIES IN THE EVENT OF LAND DEVELOPMENT, SUBDIVISION AND/OR CONSTRUCTION; PROVIDING STANDARDS FOR DETERMINING METHODS OF STORM WATER MANAGEMENT, AND STANDARDS FOR CONSTRUCTION AND MAINTENANCE OF FACILITIES; REQUIRING PLAN SUBMISSION AND APPROVAL; PROVIDING FOR FEES AND COSTS; AND SETTING FORTH ENFORCEMENT PROCEDURES AND PENALTIES.

Adopted December 20 , 2005

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PROCESS

for meeting

Stormwater Management Requirements

Minimize impervious areas and maximize infiltration to the greatest extent practical in order to recharge groundwater and reduce runoff.

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Calculate infiltration recharge volumes and compare with water quality (captured storm) volume.

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Utilize the site's natural characteristics to capture and treat the water quality volume not infiltrated.

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Compare pre and post-development hydrographs.

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If the post-development hydrograph peaks are still greater than pre-development, provide detention or other structural facilities as a last resort on remaining volumes of runoff.

ARTICLE I. GENERAL PROVISIONS

Section 101. Background

The governing body of Penn Township recognizes that:

A. Unmanaged or poorly managed stormwater can result in stream bank scour, stream destabilization, sedimentation, loss of groundwater recharge, loss of base flow, localized flooding, habitat modification and water quality and quantity impairment.

B. Conversely, stormwater that is managed through properly constructed and maintained best management practices (BMPs) can remove pollutants, facilitate groundwater recharge through retention and infiltration, provide stable flow for surface waters, and enhance the environmental integrity of water resources.

Section 102. Purpose

The purpose of this Ordinance is to promote health, safety, and welfare within the Township through provisions designed to:

A. Manage stormwater at the source and protect it as a resource, rather than regarding it as a waste to be quickly discharged and moved downstream.

B. Utilize and preserve the existing natural drainage systems.

C. Encourage recharge of groundwater and prevent degradation of groundwater quality.

D. Maintain existing flows and quality of streams.

E. Preserve and restore the flood-carrying capacity of streams.

F. Provide performance standards and design criteria for Township stormwater management and planning

G. Provide proper maintenance of all permanent stormwater facilities.

Section 103. Statutory Authority

Penn Township 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 by Act 170 of 1988, and Act 131 of 1992.

The Penn Township Supervisors remain the final approval authority for any storm water management plan or amendments to any plan implemented within Penn Township.

Section 104. Applicability

The following activities are defined as "Regulated Activities" under this Ordinance

A. Land development.

B. Subdivision.

C. Construction of new or additional impervious or semi-pervious surfaces.

D. Construction of new buildings or additions to existing buildings.

E. Diversion or piping of any natural or man-made stream channel.

F. Installation of stormwater management facilities or appurtenances thereto.

Section 105. Repealer

Any ordinance or ordinance provision of the Township inconsistent with any of the provisions of this Ordinance is hereby repealed to the extent of the inconsistency only.

Section 106. Severability

Should a court of competent jurisdiction declare any section or provision of this Ordinance invalid, such decision shall not affect the validity of any remaining provisions of this Ordinance.

Section 107. Compatibility with Other Ordinance Requirements

Approvals issued pursuant to this Ordinance do not relieve the Applicant of the responsibility to comply with or to secure required permits or approvals for activities regulated by any other applicable code, rule, statues, or ordinance.

ARTICLE II. DEFINITIONS

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

- Words in the present tense imply also the future tense.
- The singular includes the plural.
- The male gender includes the female gender.
- The word "person" includes an individual, incorporator's association, partnership or corporation.
- The term "shall" or "must" is always mandatory.

Accelerated Erosion – The removal of the surface of the land through the combined action of man's activity and the natural processes at a rate greater than would occur because of the natural process alone.

Accessory Structure – A structure detached from a principal building located on the same lot and customarily incidental and subordinate to the principal building or use.

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 or developer who has submitted a drainage plan for approval to engage in any regulated activities as defined in Section 104 of this Ordinance.

As-built Drawings – A set of engineering or site drawings that delineate the specific permitted stormwater management facility as actually constructed.

BMP (Best Management Practice) – Structures, facilities, and techniques to increase recharge of groundwater and to maintain or improve the water quality of surface runoff.

Buffer – See Riparian Buffer.

Channel Erosion – The widening, deepening, and headward cutting of small channels and waterways due to erosion caused by moderate to large floods.

Cistern – An underground reservoir or tank for storing rainwater.

Combined Sewers – A system that carries both sanitary sewage and stormwater runoff.

Conservation District – The Snyder County Conservation District.

Culvert – A structure with appurtenant works that 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.

Deed Restriction – See Restrictive Covenant.

Design Storm – The magnitude and temporal distribution of precipitation from a storm event measured in probability of occurrence (e.g., a 5-year storm) and duration (e.g., 24 hours), used in the design and evaluation of stormwater management systems.

Designee – The agent of Penn Township authorized to administer or enforce any provisions of this Ordinance.

Detention Basin – An impoundment structure designed to manage stormwater runoff by temporarily storing the runoff and releasing it at a predetermined rate.

Developer – A person, partnership, association, corporation, or other entity, or any responsible person therein or agent thereof, that undertakes any regulated activity of this Ordinance.

Development – See Land Development.

Development Site – The specific tract of land for which a regulated activity is proposed.

Discharge Easement – The grant of a property right to allow runoff in excess of the previous quantify and/or rate of flow.

Downslope Property Line – That portion of the property line of the lot, tract, or parcels of the land being developed located such that all overland or pipe flow from the site would be directed towards it.

Drainage Conveyance Facility – A stormwater management facility designed to transmit stormwater runoff, including streams, swales, pipes, conduits, culverts, storm sewers.

Drainage Easement – A right granted by a landowner to a grantee, allowing the use of private land for stormwater management purposes.

Drainage Permit – A permit issued by the Township after a drainage plan has been approved and issued prior to or with the final municipal approval.

Drainage Plan – The documentation of the stormwater management system to be used for a given development site, the contents of which are established in Section 602.

Earth Disturbance – Any activity, including construction, mining, timber harvesting, and grubbing which alters, disturbs, and exposes the existing land surface.

Easement – A right-of-way granted, but not dedicated, for limited use of private land for a public or quasi-public purpose (e.g., utility lines), and within which the owner of the property shall not erect any permanent structures.

Erosion – The movement of soil particles by the action of water, wind, ice, or other natural forces.

Erosion and Sediment Pollution Control Plan – A plan that is designed to minimize accelerated erosion and sedimentation and that must be submitted to and approved by the Snyder County Conservation District.

Existing Conditions – The initial condition of a project site prior to the proposed construction. If the initial condition of the site is undeveloped land, the land use shall be considered as "meadow" on "B" soils unless the natural land cover is proven to generate lower curve numbers in Rational "C" value, such as forested lands.

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 HUD Federal Insurance Administration Flood Hazard Boundary Map as being a special flood hazard area.

Floodway – The channel of the watercourse and those portions of the adjoining floodplains that are reasonably required to carry and discharge the 100-year frequency flood. Unless otherwise specified, the boundary of the floodway is as indicated on maps and flood insurance studies provided by FEMA.

Forest Management/Timber Operations – Planning and activities necessary for the management of forest land. These include silvicultural treatment, cutting budgets, logging road design and construction, timber harvesting, site preparation, and reforestation.

Freeboard – A vertical distance between the elevation of the design high water and the top of a dam, levee, basin, or diversion ridge. The space is required as a safety margin in a pond or basin.

Grade – A slope, usually of a road, channel, or natural ground specified in percent and shown on plans as specified herein.

Grassed Waterway – A natural or constructed waterway, usually broad and shallow, covered with erosion-resistant grasses, used to conduct surface water.

Groundwater Recharge – Replenishment of existing natural underground water supplies.

Groundwater Recharge Volume – The volume of water required to be recharged in order to help maintain existing groundwater tables.

Hydrologic – Refer to Soil Group

Impervious Surface – A surface that has been compacted or covered with material to the extent that it is highly resistant to infiltration by water, including paved streets, roofs, compacted stone, and sidewalks. In addition, the following shall be considered impervious surfaces when used by motor vehicles: graveled areas, paver blocks, bricks, and cobblestone.

Impoundment – A retention or detention basin designed to retain stormwater runoff and release it at a controlled rate.

Infiltration Structures – Structures (natural and manmade) designed to direct runoff into the ground in order to recharge aquifer(s) (e.g., French drains, seepage pit, and seepage trench).

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.

Intermittent Steams – Streams which flow only during wet seasons. The groundwater table generally is at or above the bottom of intermittent streams during wet seasons but drops below the stream bottom during dry seasons. Stream flow in intermittent streams is primarily due to precipitation but does have some groundwater contribution during wet seasons.

Land Development – (i) The improvement of one lot or two or more contiguous lots, tracts, or parcels of land for any purpose involving (a) group of two or more residential or nonresidential buildings, whether proposed initially or cumulatively, or a single nonresidential building on a lot or lots regardless of the number of occupants or tenure, or (b) the division or allocation of land or space, whether initially or cumulatively, 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/Earth Disturbance – Any activity involving grading, tilling, digging, or filling of ground or stripping of vegetation or any other activity that causes an alteration to the natural condition of the land.

Manning Equation in (Manning formula) – A method for calculation of velocity of flow in open channels based upon channel shape, roughness, depth of flow, and slope.

Municipality – Penn Township, Snyder County, Pennsylvania.

Nonpoint Source Pollution – Pollution that enters a water body from diffuse origins in the watershed and does not result from discernible, confined, or discrete conveyances.

NRCS – Natural Resource Conservation Services (previously SCS).

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

Outfall – Point where water flows from a conduit, stream, or drain.

Outlet – Points of water disposal from a stream, river, lake, tidewater, or artificial drain.

Parking Lot Storage – The use of impervious parking areas as temporary impoundments with controlled release rates during rainstorms.

Peak Discharge – The maximum rate of stormwater runoff from a specific storm event.

Perennial Streams – Streams that flow year round. Perennial streams derive their flow from both groundwater and runoff, and the groundwater table never drops below the streambed.

Planning Commission – The Penn Township Planning Commission.

PMF (Probable Maximum Flood) – The flood that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible in any area. The PMF is derived from the probably maximum precipitation based on data obtained from the National Oceanographic and Atmospheric Administration (NOAA).

Rational Formula – A rainfall-runoff relation used to estimate peak flow.

Regulated Activities – Actions or proposed actions that have an impact on stormwater runoff and that are specified in Section 104 of this Ordinance.

Restrictive Covenant – A restriction on the use of land usually set forth in the deed. Restrictive covenants (a.k.a. deed restrictions) usually run with the land and are binding upon subsequent owners of the property.

Retention Basin – An impoundment in which stormwater is stored and not released during the storm event. Stored water may be released from the basin at some time after the end of the storm.

Return Period – The average interval, in years, within which a storm event of a given magnitude can be expected to recur. For example, the 25-year return period rainfall would be expected to occur on the average once every twenty-five years.

Riparian Buffer - A vegetative strip paralleling the banks of a perennial or intermittent stream or other water body (including wetlands and ponds). The buffer shall contain appropriate native vegetation throughout its width.

Riser - A vertical pipe extending form the bottom of a pond that is used to control the discharge rate from the pond for a specified design storm.

Rooftop Detention – Temporary ponding and gradual release of stormwater falling directly onto flat roof surfaces by incorporating controlled-flow roof drains into building designs.

Runoff – Any part of precipitation that flows over the land surface.

Sediment Basin – A barrier, dam, or retention or detention basin located and designed to retain rock, sand, gravel, silt, or other material transported by 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 facilities in accordance with the requirements of this Ordinance.

Sedimentation – The process by which matter is accumulated or deposited by the movement of water.

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.

Sheet Flow – Runoff that flows over the ground surface as a thin, even layer, not concentrated in a channel.

Soil-Cover Complex Method – A method of runoff computation developed by the NRCS that is based on relating soil type and land use/cover to a runoff parameter called Curve Number (CN).

Soil Group, Hydrologic – A classification of soils into four runoff groups, ranging from A soils, which are very permeable and produce little runoff, to D soils, which are not very permeable and produce much more runoff.

Spillway – A depression in the embankment of a pond or basin that is used to pass peak discharge greater than the maximum design storm controlled by the pond.

Storm Frequency – The number of times that a given storm "event" occurs or is exceeded on the average in a stated period of years. See "Return Period."

Storm Sewer – A system of pipes and/or open channels that conveys intercepted runoff and stormwater from other sources, but excludes domestic sewage and industrial wastes.

Stormwater – The total amount of precipitation reaching the ground surface.

Stormwater Management Facility – Any structure (natural or man-made) that conveys, stores, or otherwise affects stormwater runoff. Typical facilities include swales, detention and retention basins, open channels, storm sewers, pipes, and infiltration structures.

Stream Enclosure – A bridge, culvert, or other structure in excess of 100 feet in length upstream to downstream which encloses a regulated water of this Commonwealth.

Subdivision – The division or re-division of a lot, tract, or parcel of land by any means into two or more lots, tracts or parcels, including changes in existing lot lines for the purpose, whether immediate or future, of lease, transfer of ownership, or building or lot. However, the subdivision by lease of land for agricultural purposes into parcels of more than ten acres, not involving any new street or easement of access or any residential dwellings, shall be exempt.

Swale- A low-lying stretch of land that gathers or carries surface water runoff.

Timber Operations – See Forest Management.

Township – Refers to Penn Township, Snyder County, in the Commonwealth of Pennsylvania and its elected officials being the Penn Township Board of Supervisors.

TR-55 – A method for determining runoff volumes and rates developed by Natural Resource Conservation Services (NRCS).

Water Quality Volume – The storage volume needed to capture and treat the runoff from 90% of the average annual rainfall.

Watercourse – A channel or conveyance of surface water having defined bed and banks, whether natural or artificial, with perennial or intermittent flow.

Waters of the Commonwealth – Any and all rivers, streams, creeks, rivulets, 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.

Wetland – Those 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

Section 301. Exemptions

In some cases, the owner or developer will be exempt from the requirement of preparing a Drainage Plan. The following activities are exempt from the Drainage Plan requirement:

A. Use of land for gardening for home consumption.

B. Agriculture when compliance has been achieved in accordance with a Conservation Plan approved by the USDA (Snyder County) Natural Resources Conservation District. Stormwater management associated with CAOs and CAFOs is regulated by separate State and Federal statute.

C. Forest management operations that follow DEP's "Soil Erosion and Sedimentation (E&S) Control Guidelines for Forestry" and have an approved E&S Control Plan.

D. Any development adding less than the maximum allowable impervious coverage in the applicable zone.

E. While not required for the exempted activities listed above, all development should employ Best Management Practices to the greatest extent possible. These include protection of water quality and provision for maximum infiltration at the site.

F. No exemption shall apply to any new development.

G. An exemption shall not relieve that applicant from meeting the requirements for water quality and groundwater recharge such as;

   1.) Providing for infiltration capacity for the equivalent of 1.2 inches of runoff from all new impervious surfaces.

   2.) Providing a detention facility that will retain the equivalent of 1.2 inches of runoff from all new impervious areas for at least 24 hours plus fifteen (15%) percent additional capacity.

   3.) Providing buffer areas on the downstream side of any new impervious surfaces where the runoff discharges in a sheet flow manner. The buffer should be at least 20 feet wide and be a mixture of grass, shrubs and trees.

Section 302. General Requirements

A. The design of all stormwater management facilities shall incorporate sound engineering principles and practices. The Township shall reserve the right to disapprove any design that would establish or continue an adverse hydrologic or hydraulic condition.

B. This ordinance shall apply to the total proposed development even if development is to take place in stages. All phases, including temporary measures, must comply with this Ordinance. Areas initially designated to be gravel or crushed stone shall be assumed to be impervious.

C. All regulated activities that do not fall under the exemption criteria of Section 301 shall submit a Drainage Plan to the Township. See Article VI for Plan Requirements.

D. No removal of existing stormwater culverts is permitted.

E. State Permits

State permits are required as applicable. The developer shall secure all applicable State and Federal permits before final approval of the Drainage Plan is granted by the Township.

1. Any work within the "waters of the Commonwealth" (See definition) shall be subject to approval by PADEP through the Joint Permit Application process, or, where deemed appropriate by PADEP, through the General Permit process.
2. Any facilities regulated by this Ordinance that constitute water obstructions (culverts, bridges, outfalls) shall be designed in accordance with PADEP Chapter 105 and shall require a permit from PADEP.
3. Any stormwater management facilities regulated by this Ordinance that would be located on State highway rights-of-way shall be subject to approval by the Pennsylvania Department of Transportation (PADOT).

Section 303. Ground Water Recharge

Rationale: Recharging rainfall into the ground replenishes the groundwater that, in turn, provides base flow to streams, a process that keeps streams flowing during the dryer summer months and maintains groundwater for drinking purposes. Stormwater management measures such as porous pavement with underground infiltration beds and other BMPs can be designed to promote recharge.

Section 303A. Objectives

A. The developer shall retain and maximize the groundwater recharge capacity of the site to the maximum extent possible. Design of the infiltration/recharge facilities shall address the need to provide groundwater recharge to compensate for the reduction of percolation that occurs when the ground surface is paved and/or roofed over.

B. The developer is encouraged to submit innovative designs in order to maximize infiltration and recharge. A combination of BMPs that are responsive to the unique characteristics of the site is recommended.

Section 303B. Requirements

A. In developing the Drainage Plan, stormwater controls shall be selected according to the following order of preference:

1. Infiltration of runoff at or near the source.
2. Flow attenuation by use of above ground drainage areas.
3. Stormwater detention/retention structures.

B. The developer shall use the techniques or "credits" in Section 305 in order to maximize the Recharge Volume in the formula of Section 303C.

C. This ordinance requires developers to implement water quantity and quality controls to minimize impact on natural drainage systems. To achieve this, the developer shall utilize best management practices (BMPs) and conservation design including:

1. Minimization of impervious surfaces.
2. Maximization of infiltration of run off at or near the source.
3. A riparian buffer of natural vegetation along streams and tributaries
4. Roof drains shall not be connected to sanitary or storm sewer systems.

D. Infiltration BMPs shall be used to the maximum extent practicable to reduce volume increases and promote groundwater recharge. A combination of successive infiltration practices is recommended.

E. Justification shall be provided by the applicant for rejecting infiltration opportunities based on actual site conditions.

F. In selecting the appropriate Best Management Practices (BMPs), the developer shall consider:

1. Proximity to the Township's municipal wellhead (See Section 303B-H5)
2. Presence of limestone geology.
3. Permeability and infiltration rate of the site soils.
4. Depth to bedrock.
5. Seasonal high water table.
6. Slope, topography, and natural depressions.

G. A detailed soils evaluation shall be performed to determine the suitability of recharge facilities. The evaluation shall be performed by a qualified hydrogeologist and at a minimum, address soil permeability, depth to bedrock, presence of limestone, and subgrade stability.

H. Limestone Geology:

1. Limestone geology (karst bedrock) requires extreme caution because it is soluble and prone to form sinkholes. Groundwater can become polluted when storm runoff percolates into karst aquifers. The Engineer shall evaluate the possibility of groundwater pollution from all proposed facilities.
2. The Township Engineer and/or the Township supervisors may require a Hydrogeologic Study.
3. Whenever a basin is proposed in an area underlain by limestone, a geological evaluation of the proposed location shall be conducted. The design of all facilities over limestone formations, if approved, shall include measures to prevent groundwater contamination.
4. It shall be the developer's responsibility to verify if the site is underlain by limestone. The following note shall be attached to the Drainage Plan, signed and sealed by the developer's engineer, if a detention facility is proposed: "I certify that the proposed facility is/is not underlain by limestone."
5. The Township reserves the right to prohibit outright any basin to be located in the vicinity of a municipal well.

Section 303C. Groundwater Recharge Calculation Formula

A. Prior to performing groundwater recharge calculations, the developer shall study and use the techniques as described in Section 305. Preservation of natural features of the site will be "credited" to the developer, as described in that Section.

B. Infiltration BMPs shall meet the following minimum requirements:

1. A minimum of ten (10) feet between downspouts and roadways.
2. A minimum of forty-eight (48) inches between the bottom of any facility and the seasonal high water table or bedrock.
3. The facility shall be capable of completely infiltrating the impounded water within 48 hours.
4. BMPs shall have a clearance of 20 feet on the down-gradient side of a building foundation and 100 feet on the up-gradient side.

C. The size of recharge facilities shall be based upon the following formula:

$Re_v = [(S)(Rv)(A)]/12$
Where:
Re_v = Recharge Volume (acre-feet)
S = Soil specific recharge factor (inches)
Rv = Volumetric runoff coefficient
A = Site area contributing to the recharge facility (acres)
And where:
$R_v = 0.05 + 0.009 (I)$
I= percent impervious area
S is based upon hydrologic soil group (HSG) shown below:

Hydrologic Soil Group	Soil Specific Recharge Factor (S)
A	0.38 in.
B	0.25 in.
C	0.13 in.
D	0.06 in.

D. The recharge volume at the site shall be directed to the most permeable Hydrologic Soil Group (HSG) available. If more than one HSG is present, the composite recharge volume shall be computed based upon the proportion of total site area within each HSG.

Section 304. Water Quality

Rationale: Pollutants accumulate on impervious surfaces and their runoff tends to be greatest at the beginning of the storm event, or the "first flush" of runoff. The majority of pollutants, therefore, are being washed into streams during smaller storms. Capturing this first flush and/or smaller storms will allow stormwater to be detained and will allow pollutants to settle, thus allowing a cleaner outflow.

Section 304A. Objectives

A. Water quality volume is that storage capacity needed to treat the first 1.2 inches of runoff from the developed portion of the site. The developer will be calculating this volume in the formula described in Section 304C.

B. Water quality volume should be regarded and designed as a basic benefit of the development.

Section 304B. Requirements

A. Recharge Volumes shall be compared to Water Quality Volume (storage).

B. The developer shall use the techniques or credits in Section 305 to cause the Water Quality Volume to be equal or less than the Recharge Volume.

C. If the Recharge Volume is less than the Water Quality Volume, the remaining Water Quality Volume may be captured and treated as necessary by methods other than recharge/infiltration.

D. The following factors shall be considered when selecting BMPs for water quality:

- Protection of existing natural vegetation
- Protection of aquatic and wildlife habitat
- Stream bank erosion
- Peak discharge and required volume control
- Efficiency of the BMPs to mitigate water quality problems
- Recreational value
- Enhancement of aesthetic and property value
- Maintenance requirements

Section 304C. Water Quality Calculation Formula

A. Prior to performing calculations, the developer shall review and use the concepts described in Section 305. Preservation of natural features of the site will be "credited" to the developer as described in that Section.

B. The following formula shall be used to determine the Water Quality Volume (storage):

Volume (WQ_v) in acre-feet of storage:
$WQ_v = [(P)(R_v)(A) / 12$
WQ_v = Water Quality Volume
P = Rainfall Amount (90% of event producing this rainfall. See Appendix Table A)
A = Areas in acres
Rv = 0.05 + 0.009(I) where I is the impervious surface percentage.

C. The Recharge Volume (Re_v) computed under Section 303C is a component of the Water Quality Volume.

Section 305. Calculation of BMP Alternatives

Developers are encouraged to use the Best Management Practices in the Table below. Such practices should be considered in the early design phase and prior to computing the post-development hydrograph. References to "credit" in the Table refer to the potential Density Bonus described in Section 306.

BMP Technique	Description of Credit/Benefit
Natural Area Conservation	Conservation of natural areas such as forest, wetlands, or other sensitive areas in a protected easement thereby retaining their pre-development hydrologic and water quality characteristics. Using this credit, a designer may subtract conservation areas from total site area when computing the required water quality volume. **See Water Quality formula** Additionally, the post-development curve number (CN) for these areas may be assumed to be forest in good condition.
Disconnection of Rooftop Runoff	Credit is given when rooftop runoff is disconnected and then directed over a pervious area where it may either infiltrate into the soil or filter over it. Credit is typically obtained by grading the site to promote overland flow or by providing bioretention on single-family residential lots. If a rooftop area is adequately disconnected, the impervious area may be deducted from the total impervious cover. **See Recharge and Water Quality formulae.** Additionally, the post-development CNs for disconnected rooftop areas may be assumed to be forest in good condition.
Disconnection of Non-Rooftop Runoff	Credit is given for practices that disconnect surface impervious cover by directing it to pervious areas where it is either infiltrated or filtered through the soil. As with rooftop runoff, the impervious area may be deducted from the total impervious cover thereby reducing the required water quality volume. **See Recharge and Water Quality formulae.**
Stream Buffer Credit	Credit is given when a stream buffer effectively treats stormwater runoff. Effective treatment constitutes capturing runoff from pervious and impervious areas adjacent to the buffer and treating the runoff through overland flow across a grass or forested area. Areas treated in this manner may be deducted from total site area in calculating and may contribute to meeting requirements for groundwater recharge. **See Recharge formula.**
Grass Channel	Credit may be given when open grass channels are used to reduce the volume of runoff and pollutants during smaller storms. Use of grass channels will automatically meet the minimum groundwater recharge requirement. If designed according to appropriate criteria, these channels may meet water quality criteria for certain types of residential development. **See Recharge and Water Quality formulae.**
Environmentally Sensitive Rural Development	Credit is given when a group of environmental site design techniques are applied to low density or rural residential development. This credit eliminates the need for structural practices to treat both the required recharge volume Re_v and water quality volume. **See respective formulae.** The designer must still address the channel protection volume, the overbank protection and overbank/extreme flood event requirements for all roadway and connected impervious surfaces.

Source: Maryland Design Manual, "Model Stormwater Ordinance."

Section 306. Pre-Development vs. Post-Development

A. If it is shown, by meeting groundwater recharge and water quality requirements pursuant to Sections 303 and 304 that the post-development hydrographs attain a total match with the pre-development hydrographs, then the performance requirements of this Article will be considered met.

B. In the above calculation of hydrographs, the 2-, 10- and 100-year 24 hour storm events must be analyzed, as a minimum calculation.

C. If such infiltration and water quality volume control goal is <u>not</u> met, additional measures will be required to meet that criteria.

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If this standard is met, the supplemental requirements of Article IV may be unnecessary and the developer may proceed to Article V. Following compliance with Article V, the developer shall proceed to Article VI for preparation of the Drainage Plan.

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BONUS OPTION

If the developer is able to <u>exceed</u> the standard over pre-developed conditions by a minimum of 1% , by increasing the amount of infiltration over pre-development conditions, he may add a 5% density bonus to the development parcel, with the proviso that the 5% density is factored into the post-hydrograph and that no other environmental issues or problems are created as a result of the increased density.

ARTICLE IV. SUPPLEMENTAL STANDARDS

Rural areas lend themselves to infiltration measures that would allow proposed development to meet the pre-existing hydrograph. This results in benefits not only to the environment - - but also to the developer in reduced costs. However, if the developer finds that he cannot match hydrographs (as described in Article III) and must resort to other structural facilities, the standards and requirements of this Article shall apply.

Section 401. Methods of Calculation

A. Stormwater runoff may be calculated using a Soil Cover Complex methodology, subject to Township approval.

B. The peak discharges and volumes of runoff shall be determined by using the SCS TR-55 methodology for all watersheds unless other methods are approved by the Township.

Section 402. Criteria and Assumptions

A The goal for all development is that post-development peak rates of runoff be reduced back to or below the pre-development runoff rates. In attempting to attain this goal, analysis shall be shown for 2-, 10- and 100-year storm events.

B. The Table of rainfall depths for the design storm events is found in the Appendix.

Section 403. Storm Water Basins

A. Basins shall be designed with a minimum one foot (1') freeboard above the design elevation of the one hundred (100) year water surface at the emergency spillway.

B. Basins shall be designed to safely discharge the full 100-year peak discharge of a post-development storm event through an emergency spillway in a manner that will not damage the integrity of the basin.

C. Basins shall not be located over any existing or proposed utility line.

D. Storm water basins located in limestone geology or in sinkhole-prone areas may be prohibited outright by the Township. (See Section 303B-H5).

E. The Modified PULS Method of calculating routing or an acceptable engineering design method, approved by the Township, shall be used for detention basins.

F. Removal of sedimentation from detention basins shall be the responsibility of the Owner.

G. Basin discharge outlets shall be designed to release runoff reflecting pre-development characteristics.

H. Basins that are not designed to release all storm water shall be specifically identified as retention basins or permanent/wet ponds. All other basins shall have provisions for de-watering, particularly the bottom, and shall not create swamp and/or other conditions which are not maintainable. Low flow channels shall be used to de-water the bottom of a basin.

I. Basins that are viewed by the Township as a potential hazard shall be completely surrounded by a fence or wall at least six feet (6') in height, not have an opening larger than two inches (2") and have a self-closing and self-latching gate.

Section 404. Earth Fill Basins

A. Basins which are designed with earth-fill dams shall be designed by a registered professional engineer with experience in earth-filled dams and shall incorporate the following minimum standards:

1. The maximum water depth (measured from the base to the crest of the emergency spillway) shall not exceed six feet (6').
2. The minimum top width of all dams shall be ten feet (10').
3. The side slopes of earth-fill dams shall not be steeper than two (2) horizontal to one (1) vertical on both sides of the embankment.
4. A cutoff trench (soil key) of impervious material shall be provided under all dams.
5. All pipes and culverts through dams shall be reinforced concrete and contain drainage diaphragms for seepage control.
6. All riser pipes shall be reinforced cement concrete. Others may be approved by the Township on an individual basis.
7. Minimum floor elevations for all structures that would be affected by a basin, other temporary impoundment, or open conveyance systems where ponding may occur shall be two feet (2') above the 100-year water surface. If basement or underground facilities are proposed, detailed design information shall be required.

B. The Township may, upon recommendation of the Township Engineer, impose additional requirements on earth-fill dams for the safety and welfare of the Township.

Section 405. Collection Facilities: Design Storm and Minimum Pipe Size

A. The design of stormwater collection facilities shall be based upon the peak flow from a twenty-five (25) year storm.

B. All developments shall include design provisions that allow for the overland conveyance of the post development one-hundred (100) year peak flows through the site without damage to private or public property. The entire 100-year storm event shall be directed to the detention basin and not allowed to bypass the basin.

C. Overland conveyance may be accomplished by the general site layout and grading, designing the conveyance facilities to handle said storm or by the use of overflow conveyance channels. If this cannot be accomplished, the point of discharge for the 100-year event should be evaluated to determine whether additional controls are required to prevent flooding and erosion.

D. Stormwater pipe collection and conveyance systems shall have a minimum diameter of fifteen inches (15").

Section 406. Capacities

The capacities of the pipes, gutters, inlets, culverts, outlet structures and swales shall consider all possible hydraulic conditions and the following are minimum design standards:

A. Swales and roadside gutters shall consider channel velocity and stability.

B. The "n" factors to be used for paved or rip-rap swales or gutters shall be based on the latest edition of the DEP *Erosion and Sediment Pollution Control Program Manual.*

C. The "n" factors for corrugated metal pipe shall be based upon the manufacturer's standard.

D. The velocity of any piped storm water conveyance system shall be a minimum of two and one-half feet (2 1/2') per second.

E. Culverts shall be designed for 25-year storm events. Basin discharge systems shall be designed for 100-year storm events. Inlet capacity shall be based on design standards of the latest edition of the PADOT *Design Manual Part 2 Highway Design, Chapter 10.*

Section 407. Storm Water Flow Along Streets and Access Drives

A. Inlets shall be at the curb line and are not permitted along the curb at an intersection.

B. Inlets shall be located away from the side lot line to avoid conflicts with driveways.

C. Flow depths for a ten (10) year storm with a five (5) minute duration shall not exceed five inches (5") in a swale condition, two inches (2") in a gutter condition, and one-half inch (1/2") across intersections and travel lanes.

D. In no case shall inlets be spaced more than four hundred (400') apart.

Section 408. Manhole Locations

A. Manholes shall not be spaced more than four hundred feet (400') apart.

B. Manholes shall be placed at change points in the horizontal or vertical direction of storm sewers.

C. Inlets may be substituted for manholes where appropriate.

Section 409. Material Specifications

All material and installations must comply with the latest edition of PADOT Publication 408. Calculations may be required.

Section 410. Surface Flow Characteristics

The maximum swale, gutter, or curb velocity of runoff shall be maintained at levels that result in a stable condition both during and after construction. Stable conditions are:

A. The channel banks do not erode, nor does the channel cross-section change.

B. Sediment bars do not develop.

C. Erosion does not occur around culverts and bridges or elsewhere.

D. Gullies do not form or enlarge due to uncontrolled runoff.

Section 411. Grass-lined Channels

A. Velocity in grass channels shall not exceed:
   1. Three feet (3') per second where only sparse vegetation can be established and maintained because of shade or soil condition.
   2. Four feet (4') per second where normal growing conditions exist and vegetation is to be established by seeding.
   3. Five feet (5') per second where a dense, vigorous sod is established or can be quickly established or where water can be temporarily diverted during establishment of vegetation, utilizing netting and mulch.

B. Where bends occur, the velocities listed above shall be divided by the following factor:

Degrees of Bend	Velocity/Factors
0 to 30	1.50
30 to 60	1.75
60 to 90	2.00
90 and over	2.50

C. Where the velocity of runoff exceeds the allowable velocity, erosion protection must be provided, including appropriate design information.

Section 412. Adjacent Land

A. Stormwater runoff shall be handled on the subject property to the greatest extent possible. However, if runoff cannot be accommodated on site by infiltration or other means, the following requirements shall pertain to adjacent land:
   1. Runoff shall flow into a natural waterway, into an existing stormwater facility, or onto an adjacent property in no greater volume or peak discharge than the pre-development flow.
   2. The existing points of concentrated drainage that discharge onto adjacent property shall not be altered without permission of the adjacent property owner(s) and shall be subject to any applicable discharge criteria specified in this Ordinance.
   3. If existing diffused flow is to be concentrated and discharged onto adjacent property, the Developer must prove that no erosion, sedimentation, flooding or other negative impact will result.
   4. A drainage release shall be obtained from the affected downstream property owner(s).

B. The Township, upon recommendation of its Engineer, may require a "Downstream Hydraulic Capacity Analysis" in areas where existing upland drainage currently exceeds capacities downstream.

ARTICLE V. EROSION AND RELATED CONDITIONS

Section 501. Erosion and Sedimentation Requirements

A. The area of development disturbance shall be kept to a strict minimum and natural vegetation shall be retained/protected to the greatest extent possible.

B. Whenever vegetation and topography are to be disturbed, such activity must be in conformance with Chapter 102, Title 25, Rules and Regulations, Part I, PADEP, Subpart C, Article II, Water Resources, Chapter 102, "Erosion Control," and in accordance with the Snyder County Conservation District.

C. Along any "waters of the Commonwealth" (see definitions), a riparian buffer of at least 50 feet shall be maintained or established in natural vegetation. **Note: This includes intermittent streams and un-named tributaries.**

D. If the developer has installed infiltration BMPs, they shall be protected from sedimentation and compaction during the construction phase, so as to maintain their maximum infiltration capacity.

E. Infiltration BMPs shall not be constructed nor receive runoff until the entire contributory drainage area to the infiltration BMP has received final stabilization.

Section 502. Wetlands

A. When there is a question whether wetlands may be involved, it is the responsibility of the Developer to show that the land in question cannot be classified as a wetland, otherwise approval to work in the area must be obtained from PADEP.

B. Any facilities located in wetlands shall be subject to approval by PADEP through the Joint or the General Permit process.

Section 503. Floodplain

A. Proposed development in the floodplain shall conform to the Penn Township Floodplain Ordinance. The Zoning Officer will use the Floodway Boundary and Floodway Map (FBFM) to determine if the proposed construction is in the floodplain. FBFMs were prepared using the National Geodetic Vertical Datum of 1929.

B. If development is proposed in the floodplain, the plan shall demonstrate that the proposed uses do not increase the height or frequency of floodplain water. The proposed uses shall be installed so as to withstand the maximum volume, velocity, and force of floodplain water, are flood and flotation proof, do not create unhealthy or unsanitary conditions, and do not degrade quality of surface water, or the quality of groundwater.

Section 504. Steep Slopes

The following stormwater management standards shall apply to all land that contains areas of fifteen percent (15%) or greater slope:

A. Soils Report – A soils engineering report prepared by a professional with extensive expertise in soil geology and construction shall be submitted for all construction and/or modifications to the existing topography and/or vegetative cover. The report shall include:
   1. the nature, types, distribution and stability of the surface and subsurface soils for load bearing, stability and compaction
   2. extent, description and location of exposed rock and bedrock
   3. erodability of surface soil;
   4. depth to seasonal high water table.

B. Construction Prohibition – All construction and improvements are prohibited in areas with a pre-development slope of twenty-five (25%) percent or greater.

C. Setback –No change in existing topography may occur within twenty-five (25) feet of any neighboring property for those portions of the site with slopes of 15% or greater.

D. Design Information – A detailed description shall be provided for construction methods to attain the following:
   1. Protect and stabilize areas of high potential for soil erosion.
   2. Accommodate storm water runoff.
   3. Assure structural safety and minimize harm to the environment.
   4. Protect and preserve on-site and off-site natural wildlife habitat.
   5. Protect and preserve on-site and off-site water quality.
   6. Protect steep slopes on adjoining properties.

ARTICLE VI. DRAINAGE PLAN REQUIREMENTS

Section 601. General Requirements

A. Until the Owner or Developer has received written approval for a Drainage Plan from the Township Supervisors, there shall be no commencement of land disturbance, no issuance of any building permit, and no final approval of subdivision and/or land development plans.

B. The Plan(s) of the project shall be submitted on 24' x 36' or 30' x 42' sheets and prepared in a form that meets the requirements of the Recorder of Deeds of Snyder County.

Section 602. Drainage Plan Contents

The Drainage Plan shall consist of all applicable maps, plans, calculations, assumptions, criteria, soil surveys, construction specifications, notes and state permits. The Plan will clearly show the location of all stormwater facilities and recharge areas. Plan contents are as follows:

A. Drainage Plan Application form.

B. Certification of Ownership and Acknowledgement of Application form.

C. A soil erosion and sedimentation control plan with all reviews and approvals.

D. All required permits from PADEP and PADOT, as appropriate.

E. A map showing the location of regional highways, adjacent municipalities and any manmade or natural features beyond the site that could be affected by the project.

F. The name of the development, the name and address of the owner, the name of the individual or firm preparing the plan, the date of submission and expected timetable.

G. A graphic and written scale of one (1) inch equals no more than fifty (50) feet; for tracts of twenty (20) acres or more, the scale shall be one (1) inch equals no more than one hundred (100) feet.

H. A North arrow.

I. The total tract boundary and size with distances and bearings.

J. Existing natural vegetation, including trees and hedgerows, to be preserved.

K. Existing streams, lakes, ponds with a delineated fifty (50) foot buffer. **Note: This includes intermittent streams and unnamed tributaries.**

L. Delineation of floodplain and floodway and, if applicable, demonstration of compliance with Section 503 of this Ordinance.

M. An overlay showing soil names and boundaries.

N. The locations of all existing and proposed utilities, sanitary sewers, and water lines within fifty (50) feet of property lines.

O. Proposed type and amount of impervious area that would be added.

P. Proposed structures, roads, paved areas, and buildings.

Q. Existing and final contours at intervals at two feet. In areas of steep slopes (greater than 15 percent), five-feet contour intervals may be used.

R. Horizontal and vertical profiles of all open channels, including hydraulic capacity.

S. Overland drainage paths.

T. A fifteen foot wide access easement around all stormwater management facilities that would provide ingress to and egress from a public right-of-way.

U. An Operation and Maintenance (O&M) Plan indicating the location and responsibility for maintenance of stormwater management facilities.

V. A signature block for the Township Engineer(s) stating that on the date of signature, Engineer has reviewed and certified that the Drainage Plan meets all design standards and criteria of this Ordinance.

W. The location of all erosion and sedimentation control facilities, if any.

X. A geologic assessment of the effects of runoff in limestone areas, if applicable, as specified in Section 303B(G) of this Ordinance.

Y. A written justification for any detention basins proposed for the project, explaining why such facilities are necessary.

Section 603. Plan Submission

A. For any activities that require a PADEP Joint Permit Applicant regulated under Chapter 105 or 106, require a PADOT Highway Occupancy Permit, or require any other state or federal permit, the permit(s) shall be part of the Plan.

B. Four (4) copies of the Drainage Plan shall be submitted and distributed as follows:

1. Two (2) copies to the Township accompanied by the requisite Review Fee.
2. One (1) copy to the Township Engineer.
3. One (1) copy to the County Planning Commission/Department.

Section 604. Plan Review

A. When requested by the Township Supervisors, the Township Engineer will review the Drainage Plan for consistency with this Ordinance.

B. When directed by the Township Supervisors, the Township Engineer will review the Drainage Plan for compliance with the municipal subdivision and land development ordinance provisions not addressed by this Ordinance.

C. The Township Engineer shall notify the Municipality in writing whether the Drainage Plan is consistent with this Ordinance. If the Township determines the Plan to be consistent, the Township will forward an approval letter to the Developer with a copy to the Township Engineer.

D. At the direction of the Township Supervisors, the Township Engineer may forward a disapproval letter (if the Township determines the Plan to be noncompliant) to the Developer

with a copy to the Township citing the reason(s) for the disapproval. Any disapproved Drainage Plans may be revised by the Developer and resubmitted.

E. For land development or building construction, at the direction of the Township Supervisors, the Township Engineer will notify the Building Permit Officer in writing whether the Drainage Plan is consistent with this Ordinance and forward a copy of the approval/disapproval letter to the Developer

F. For activities requiring a PADEP Joint Permit Application, the Township Supervisors may request that the Township Engineer notify PADEP whether the Drainage Plan is consistent with this Ordinance and forward a copy of the review letter to the Township and the Developer. PADEP may consider the Engineer's comments in determining whether to issue a permit.

G. The Township shall not approve any subdivision or land development if the Drainage Plan has been found to be inconsistent with this Ordinance.

H. The Building Permit Office shall not issue a building permit if the Drainage Plan has been found to be inconsistent with this Ordinance, as determined by the Township Supervisors and Township Engineer. All required permits from PADEP must be obtained prior to issuance of a building permit.

I. The Developer shall be responsible for completing an "As-Built Survey." The Survey and an explanation of any discrepancies with the design plans shall be submitted to the Township Engineer for review and recommendations to the Township Supervisors. The Township Supervisors will review the "As-Built Survey" and the recommendations of the Township Engineer before giving final approval. In no case shall the Township approve the As-Built Survey until it receives a copy of any applicable permit from PADOT or PADEP.

J. The Township's approval of a Drainage Plan shall be valid for three (3) years. This period shall commence on the date that the Township signs/approves the Drainage Plan. If facilities included in the approved Drainage Plan have not been constructed, or if an As-Built Survey has not been approved within this three-year period, then the Township may consider the Drainage Plan disapproved and may revoke any and all permits.

Section 605. Plan Modification

A. Any modification to a submitted Drainage Plan that involves a change in stormwater facilities or techniques, that involves the relocation or re-design of facilities, or change that is necessary because soil or other conditions are not as stated on the Drainage Plan, shall be cause to require a resubmission of the modified Drainage Plan consistent with this Ordinance and be subject to review as specified in this Ordinance.

B. A modification to an already approved or disapproved Drainage Plan shall be submitted to the Township, accompanied by the applicable review fee.

C. A modification to a Drainage Plan for which the Township has not taken a formal action shall be submitted to the Township, accompanied by the applicable Review Fee.

Section 606. Resubmission of Disapproved Drainage Plans

A. A disapproved Drainage Plan may be resubmitted, with the revisions addressing the Engineer's concerns documented in writing.
B. The applicable Township Review Fee must accompany such a resubmitted Plan.

ARTICLE VII. FEES AND EXPENSES

Section 701. General

A. The fee required by this Ordinance is the Township Review Fee and is established to defray review costs incurred by the Township and its Engineer.

B. The fee shall be paid by the Applicant.

Section 702. Drainage Plan Review Fee

A. The Township has established a Review Fee Schedule by resolution of the Township based on the size of the Regulated Activity and based on the cost of reviewing Drainage Plans.

B. The Township may periodically update the Review Fee Schedule to ensure that review costs are adequately reimbursed.

Section 703. Expenses Covered by Fee

The fees required by this Ordinance shall, at a minimum, cover:

A. Administrative/clerical Costs.

B. The review of the Drainage Plan by the Township and its Engineer.

C. The site inspections including, but not limited to, pre-construction meetings, inspections during construction of stormwater facilities and appurtenances, and final inspection upon completion of the stormwater facilities and drainage improvements.

D. Review of the "As-Built" Survey.

E. Any additional work required to enforce any permit provisions regulated by this Ordinance, correct violations, and assure proper completion of stipulated remedial actions.

Section 704. Fee Submittal

A. The fee along with the Schedule of Fees form (see Section 705) shall be attached to the Drainage Plan Application form (see Appendix).

B. Forms are available from the Township Secretary or may be reproduced from this Ordinance.

Section 705. Schedule of Fees

Subdivision/Development Name: _____

Date of Fee Submittal: _____

Owner: _____ Engineer: _____

1. Fee: Land use

1a.	Residential Subdivision or land development	$100	
or 1b.	Commercial/industrial land development	$200	subtotal 1: $_____

2. Fee: Relative amount of earth disturbance

2a.	Residential		
	no road	$0	
	road <500 l.f.	$25	
	road 500-2,640 l.f.	$250	
	road >2,640 l.f.	$400	
or 2b.	Commercial/industrial and other		
	impervious area <5,000 s.f.	$50	
	impervious area 5,000-43,560 s.f.	$200	
	impervious area >43,560 s.f.	$400	subtotal 2: $_____

3. Fee: Relative size of project

3a.	Total tract area < 1 ac.	$50	
	1-5 ac	$100	
	5-25 ac.	$125	
	25-100 ac.	$150	
	>100 ac.	$200	subtotal 3: $_____

4. Fee: Stormwater control measure

4a.	Detention basins & other controls which require a review of hydraulic routings. ($ per control)	$500 subtotal 4a: $_____
4b.	Other control facilities which require storage volume calculations but no hydraulic routings. ($ per control)	$100 subtotal 4b: $_____

5. Fee: Site inspections ($ per inspection, anticipate 2) $50 X 2 subtotal 5: $_____

TOTAL $_____

ARTICLE VIII. MAINTENANCE RESPONSIBILITIES

Section 801. Performance Guarantee

The applicant shall provide a financial guarantee to the Township for the timely installation and proper construction of all stormwater management controls equal to 110% of the full construction cost of the required controls.

Section 802. Maintenance Responsibilities

A. The Drainage Plan for the development site shall contain an operation and maintenance (O&M) plan to be reviewed by the Township Engineer, who will make recommendations to the Township Supervisors. The O&M Plan shall outline required routine maintenance actions and schedules necessary to insure proper operation of the facility(ies).

B. The Drainage Plan shall establish responsibilities for the continuing operating and maintenance of all proposed stormwater control facilities.

C. If a development site is to be maintained in a single ownership or if sewers and other public improvements are to be privately owned and maintained, then the operation and maintenance of stormwater facilities shall be the responsibility of the owner or private management entity.

D. The Township, upon recommendation of its Engineer, shall make the final determination on the continuing maintenance responsibilities prior to final approval of the Drainage Plan. [The Township reserves the right to accept the ownership and operating responsibility for any or all of the stormwater management controls.]

Section 803. Maintenance Agreement for Privately Owned Stormwater Facilities

A. Prior to final approval of the Drainage Plan, the owner shall sign and record a maintenance agreement covering all stormwater facilities that are to be privately owned. Said agreement, designated as Appendix C, is attached and made part hereto.

B. Other items may be included in the agreement where determined necessary for satisfactory maintenance of all facilities.

C. The maintenance agreement shall be subject to the review and approval of the municipal solicitor and governing body.

Section 804. Municipal Stormwater Maintenance Fund [OPTION]

A. Stormwater control facilities may be dedicated to and maintained by the Township at the option of the Township. In this event, persons installing the facilities shall be required to pay a specified amount to the Township Stormwater Maintenance Fund to help defray costs of periodic inspections and maintenance expenses. The amount of the deposit may be determined by the following method or an alternative process acceptable to the Township:

   1. If the storage facility is to be owned and maintained by the municipality, the deposit shall cover the estimated costs for maintenance and inspections for ten (10) years. At the direction of the Township Supervisors, the Township Engineer will establish the estimated costs utilizing information submitted by the applicant.

2. The amount of the deposit to the fund shall be converted to present worth of the annual series values (i.e., amortized replacement cost). At the direction of the Township Supervisors, the Township Engineer shall determine the present worth equivalents, which shall be subject to the approval of the municipal governing body.

B. If a storage facility is proposed that also serves as a recreation facility (e.g., ball field, lake), the Township may reduce the amount of the maintenance deposit based upon the value of the land for public recreation.

Section 805. Post-Construction Maintenance Inspections

A. Basins should be inspected by the responsible entity (including the Township Engineer for dedicated facilities) on the following basis:

1. Annually for the first 5 years.
2. Once every 3 years thereafter,
3. During or immediately after a 50-year or greater storm event.

B. The inspector shall submit a report to the Township regarding the condition of the facility and recommending necessary repairs, if needed.

ARTICLE IX. ENFORCEMENT AND PENALTIES

Section 901. Right-of-Entry

Upon presentation of proper credentials, the duly-authorized representative of the Township may enter at reasonable times upon any property to inspect the condition of the stormwater facilities in regard to any aspect regulated by this Ordinance.

Section 902. Notification

In the event that a person fails to comply with the requirements of this Ordinance, the Township shall provide written notification of the violation. Such notification shall set forth the nature of the violation(s) and establish a time limit for correction of these violation(s). Failure to comply within the time specified shall subject such person to the penalty provision of this Ordinance. All such penalties shall be deemed cumulative and shall not prevent the Township from pursuing any and all other remedies. It shall be the responsibility of the owner of the real property to comply with the terms and conditions of this Ordinance.

Section 903. Enforcement

The Township is hereby authorized and directed to enforce all of the provisions of this Ordinance. All inspections regarding compliance with the Drainage Plan shall be the responsibility of the Township Engineer or other party as designated by the Township.

A. A set of plans approved by the Township shall be on file at the site throughout the duration of the construction activity. Periodic inspections may be made by the Township during construction.

B. Adherence to Approved Plan

   It shall be unlawful for any person, firm or corporation to undertake any regulated activity on any property except as provided for in the approved Drainage Plan and pursuant to the requirements of this Ordinance. It shall be unlawful to alter or remove any control structure required by the Drainage Plan pursuant to this Ordinance or to allow the property to remain in a condition which does not conform to the approved Drainage Plan.

C. At the completion of the project, and as a prerequisite for the release of the performance guarantee, the owner or his representatives shall:

   1. Provide a certification of completion from an engineer, architect, surveyor or other qualified person verifying that all permanent facilities have been constructed according to the plans and specifications and approved revisions thereto.
   2. Provide a set of as-built drawings.

D. After receipt of the certification by the Township, a final inspection shall be conducted by the Township to certify compliance with this Ordinance.

E. Prior to revocation or suspension of a permit, the Township will schedule a hearing to discuss the non-compliance if there is no immediate danger to life, public health or property.

F. Suspension and Revocation of Permits

1. Any permit issued under this Ordinance may be suspended or revoked by the Township for:
   a) Non-compliance with or failure to implement any provision of the permit.
   b) A violation of any provision of this Ordinance or any other applicable law, ordinance, rule or regulation relating to the project.
   c) The creation of any condition or the commission of any act during construction or development which constitutes or creates a hazard or nuisance, pollution, or endangers the life or property of others.
2. A suspended permit shall be reinstated by the Township when:
   a) The Township Engineer has inspected and approved the corrections to the stormwater management and erosion and sediment pollution control measure(s), or the elimination of the hazard of nuisance, and/or;
   b) The Township Supervisors are satisfied that the violation of the ordinance, law, rule or regulation has been corrected.
   c) A permit, which has been revoked by the Township, cannot be reinstated. The applicant may apply for a new permit under the procedures outlined in this Ordinance.

G. Occupancy Permit

1. An occupancy permit shall not be issued unless the certification of compliance has been secured.
2. The occupancy permit shall be required for each lot owner and/or developer for all subdivisions and land development in the Township.

Section 904. Public Nuisance

A. The violation of any provision of this Ordinance is hereby deemed a Public Nuisance.

B. Each day that a violation continues shall constitute a separate violation.

Section 905. Penalties

A. Anyone violating the provisions of this Ordinance shall be guilty of a misdemeanor, and upon conviction shall be subject to a fine of not more than $25 for each violation, recoverable with costs. Each day that the violation continues shall be a separate offense.

B. In addition, the Township, 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.

Section 906. Appeals

A. Any person aggrieved by any action of the Township or its designee may appeal to the Township within thirty (30) days of that action.

B. Any person aggrieved by any decision of the Township may appeal to the Snyder County Court of Common Pleas within thirty (30) days of the Township's decision.

ENACTED and ORDAINED at a regular meeting of the Penn Township Board of Supervisors on the 20th day of December, 2005. This Ordinance shall take effect immediately.

PENN TOWNSHIP
BOARD OF SUPERVISORS

Fred Ulrich, Chairman

Attest:

Roy A. Knause

Roy A. Knause, Supervisor

Robin M Bieber

Robin Bieber, Secretary

Jon Payne, Supervisor

PENN TOWNSHIP SNYDER SEAL COUNTY PENNSYLVANIA

APPENDIX

Drainage Plan Application
Certification of Ownership and Application Acknowledgment
Maintenance and Monitoring Agreement
90% Rainfall Rule
Table: Runoff Curve numbers
Table: Rationale Formula Runoff Coefficients
Table: Manning Roughness Coefficients
Table: Rainfall Amounts
Table: Soil Types
Table: Soil and Water Features

APPENDIX · DRAINAGE PLAN APPLICATION

DRAINAGE PLAN APPLICATION

Application is hereby made for review of the Stormwater Management and Erosion and Sedimentation Control Plan and related data as submitted herewith in accordance with Township Stormwater Management and Earth Disturbance Ordinance.

_____ final plan _____ preliminary plan _____ sketch plan

Date of submission _____ submission no._____

1. Name of subdivision or development _____

2. Name of applicant _____ telephone no._____

_____

(If a corporation, list the corporation name and the names of two officers of the corporation)

Address _____

_____ Zip_____

Applicants interest in subdivision or development_____ (if other than property owner give owners name and address)

3. Name of property owner _____ Telephone no. _____

address _____

_____ Zip_____

4. Name of engineer or surveyor _____telephone no _____

address _____

_____ Zip _____

5. Type of subdivision or development proposed:

_____ single-family lots	_____ townhouses	_____ commercial (multi-lot)
_____ two family lots	_____ garden apartments	_____ commercial (one-lot)
_____ multi-family	_____ mobile-home park	_____ industrial (multi-lot)
_____ cluster type lots	_____ campground	_____ industrial (one-lot)
_____ planned residential development	_____ other (_____)	

6. Lineal feet of new road proposed? _____ l.f.

7. Area of proposed and existing impervious area on entire tract.

a. Existing (to remain)_____ s.f. _____% of property

b. Proposed _____ s.f. _____% of property

8. Stormwater

a. Does the peak rate of runoff from proposed conditions exceed that flow which occurred for pre-development conditions for the designated design storm?

b. Design storm utilized (on-site conveyance systems) 25-year (24 hr.)

- no. of subareas _____
- watershed name_____
- other explain:

c. Type of proposed runoff control

d. Does the proposed stormwater control criteria meet the requirements/guidelines of the stormwater ordinances? _____

- If not, what waivers are requested? _____
- reasons why? _____

_____

e. Was TR-55, June 1986 utilized in determining the time of concentration? _____
f. Is a hydraulic routing through the stormwater control structure submitted? _____

g. Is a construction schedule or staging attached in narrative and on plans? _____
h. Is a recommended maintenance program attached in narrative? _____

9. Erosion and sediment pollution control (E&S)

a. Has the stormwater management and E&S plan, supporting documentation and narrative been submitted to the Snyder County Conservation District?_____

b. Total area of earth disturbance _____ Ac.

10. Wetlands

a. Have the wetlands been delineated by someone trained in wetland delineation? _____

b. Have the wetland lines been verified by a state or federal permitting authority? _____

c. Have the wetland lines been surveyed? _____

d. Total acreage of wetland within the property _____

e. Total acreage of wetland to be disturbed _____

f. Supporting documentation

11. Filing

a. Has the required fee been submitted? _____

Amount $_____

b. General comments about stormwater management at development:

CERTIFICATE OF OWNERSHIP AND ACKNOWLEDGMENT OF APPLICATION:

COMMONWEALTH OF PENNSYLVANIA, COUNTY OF _____

On this the _____ day of _____, 20_____, before me, the undersigned officer, personally appeared _____ who being duly sworn, according to law, deposes and says that _____ owners of the property described in this application and that the application was made with_____ knowledge and/or direction and does hereby agree with the said application and to the submission of the same.

Property Owner(s)

My Commission Expires _____, 20_____

_____Notary Public

THE UNDERSIGNED HEREBY CERTIFIES THAT TO THE BEST OF HIS KNOWLEDGE AND BELIEF THE INFORMATION AND STATEMENTS GIVEN ABOVE ARE TRUE AND CORRECT.
SIGNATURE OF APPLICANT_____

This Information To Be Completed By The Municipality

_____ municipal official submission receipt

Date complete application received _____ Plan number_____

Fees _____ Date fees paid _____ Received by _____

Official submission receipt date

_____

Received by _____

Appendix

STANDARD BEST MANAGEMENT PRACTICES MAINTENANCE AND MONITORING AGREEMENT

THIS AGREEMENT, made and entered into this _____ day of _____, 200__, by and between _____, (hereinafter the "Landowner"), and _____, _____ County; Pennsylvania, (hereinafter "Municipality");

WITNESS:

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 Subdivision/Land Management Plan (hereinafter "Plan") for the property identified herein, which is expressly made a part hereof, as approved or to be approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of Best Management Practices (BMP's); and

WHEREAS, the Municipality and the Landowner, his successors and assigns agree that the health, safety, and welfare of the residents of the Municipality require that on-site stormwater Best Management Practices be constructed and maintained on the Property: and

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

- BMP – Best Management Practice.
- 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
- Stormwater Structures and Facilities shall include, but not be limited to, detention and retention basins, and BMP'S.

WHEREAS, the Municipality requires, through the implementation of the _____ Subdivision and Land Development Plan, that stormwater management BMP's as required by said Plan and the Municipal Ordinance be constructed and adequately maintained by the Landowner, his successors and assigns. The Plan shall include, but not be limited to, the BMP site location, plan view and cross sectional drawings as appropriate, design calculations, material specifications, and any maintenance requirements imposed by the Municipality or its Designated Representatives, and

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

1. The onsite BMP facility shall be constructed by the Landowner in accordance with the plans and specifications identified in the Plan.

2. The Landowner shall maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality and in accordance with the specific maintenance requirements noted on the Plan which is attached hereto as Appendix A and made part hereof.

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 identification, 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 maintain the BMP(s) as shown on the Plan in good working order acceptable to the Municipality, the Municipality 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 incurred within 10 days of receipt of invoice from the Municipality.

6. The intent and purpose of this Agreement is to insure 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 nonpoint source pollution runoff.

7. The Landowner, its executors, administrators, assigns, and other successors in interests, shall indemnify the Municipality's employees and designated representatives against 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 among the land records of _____ 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)

County of _____, Pennsylvania

I, _____, 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 _____, 200_.

_____

NOTARY PUBLIC

(SEAL)

TABLE .
RUNOFF CURVE NUMBERS
(FROM NRCS (SCS) TR-55)

LAND USE	HYDROLOGIC CONDITION	RUNOFF CURVE NUMBER FOR INDICATED HYDROLOGIC SOIL GROUP			
		A	B	C	D
Open Space:					
Poor Condition (grass cover < 50%)		68	79	86	89
Fair Condition (grass cover 50% to 75%)		49	69	79	84
Good Condition (grass cover > 75%)		39	61	74	80
Impervious Areas					
Paved parking lots, roof, driveways		98	98	98	98
Streets and roads:					
Paved; w/ curbs and storm sewers		98	98	98	98
Paved; w/ open ditches		83	89	92	93
Gravel		76	85	89	91
Dirt		72	82	87	89
Urban Districts:					
Commercial and Business		89	92	94	95
		81	88	91	93
Residential Districts by average lot size:					
1/8 acre or less (town houses)		77	85	90	92
¼ acre		61	75	83	87
1/3 acre		57	72	81	86
½ acre		54	70	80	85
1 acre		51	68	79	84
2 acres		47	66	77	82
Newly graded areas (pervious area, no vegetation)		81	89	93	95
Agricultural Lands:					
Fallow:					
Bare soil		77	86	91	94
Crop residue cover	Poor	76	85	90	93
Crop residue cover	Good	74	83	88	90
Pasture, grassland, or range	Poor	68	79	86	89
Pasture, grassland, or range	Fair	49	69	79	84
Pasture, grassland, or range	Good	39	61	74	80
Agricultural Lands (continued):					
Row Crops:					
Straight row	Poor	72	81	88	91
Straight row	Good	67	78	85	89

LAND USE	HYDROLOGIC CONDITION	RUNOFF CURVE NUMBER FOR INDICATED HYDROLOGIC SOIL GROUP			
		A	B	C	D
Straight row and crop residue cover	Poor	71	80	87	90
Straight row and crop residue cover	Good	64	75	82	85
Contoured	Poor	70	79	84	88
Contoured	Good	65	75	82	86
Contoured and crop residue cover	Poor	69	78	83	87
Contoured and crop residue cover	Good	64	74	81	85
Contoured and terraced	Poor	66	74	80	82
Contoured and terraced	Good	62	71	78	81
Contoured, terraced & crop residue	Poor	65	73	79	81
Contoured, terraced & crop residue	Good	61	70	77	80
Small Grain:					
Straight row	Poor	65	76	84	88
Straight row	Good	63	75	83	87
Straight row and crop residue	Poor	64	75	83	86
Straight row and crop residue	Good	60	72	80	84
Contoured	Poor	63	74	80	85
Contoured	Good	61	73	81	84
Contoured and crop residue	Poor	62	73	81	84
Contoured and crop residue	Good	60	72	80	83
Contoured and terraced	Poor	61	72	79	82
Contoured and terraced	Good	59	70	78	81
Contoured, terraced & crop residue	Poor	60	71	78	81
Contoured, terraced & crop residue	Good	58	69	77	80
Meadow or Legumes:					
Straight row	Poor	66	77	85	89
Straight row	Good	58	72	81	85
Contoured	Poor	64	75	83	85
Contoured	Good	55	69	78	83
Contoured and terraced	Poor	63	73	80	83
Contoured and terraced	Good	51	67	76	80
Meadow, continuous grass, protected from grazing and mowed for hay		30	58	71	78
Brush – brush/weed mixture	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	30	48	65	73
Woods and grass combination (orchard)	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	30	55	70	77

LAND USE	HYDROLOGIC CONDITION	RUNOFF CURVE NUMBER FOR INDICATED HYDROLOGIC SOIL GROUP			
		A	B	C	D
Farmsteads – buildings, lanes, driveways, and surrounding lots		59	74	82	86

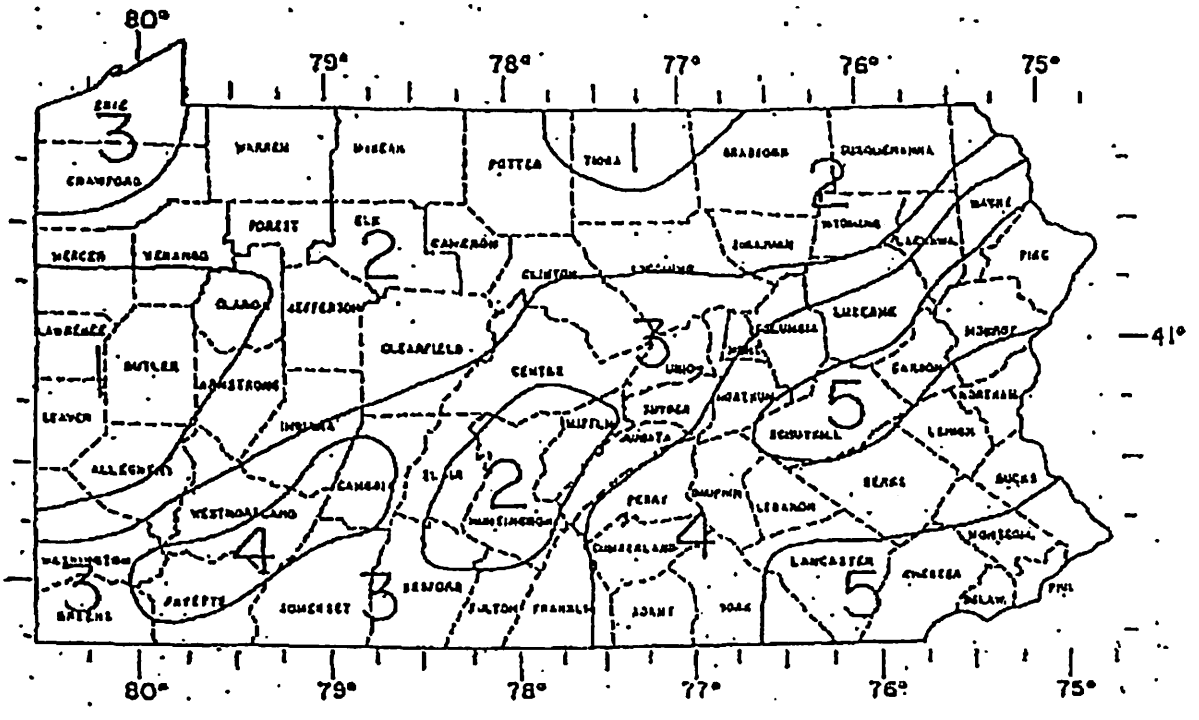
TABLE
RATIONAL FORMULA RUNOFF COEFFICIENTS

TYPE OF DRAINAGE AREA	RUNOFF COEFFICIENT
Lawns:	
Sandy soil, flat, <2%	0.05-0.10
Sandy soil, average, 2-7%	0.10-0.15
Sandy soil, steep, >7%	0.15-0.20
Heavy soil, flat, <2%	0.13-0.17
Heavy soil, average, 2-7%	0.18-0.22
Heavy soil, steep, >7%	0.25-0.35
Business:	
Downtown areas	0.70-0.95
Neighborhood areas	0.50-0.70
Residential:	
Single-family areas	0.30-0.50
Multi units, detached	0.40-0.60
Multi units, attached	0.60-0.75
Suburban	0.25-0.40
Apartment dwelling areas	0.50-0.70
Industrial:	
Light areas	0.50-0.80
Heavy areas	0.60-0.90
Parks, Cemeteries	0.10-0.25
Playgrounds	0.20-0.35
Railroad Yard Areas	0.20-0.40
Unimproved Areas	0.10-0.30
Streets:	
Asphaltic	0.70-0.95
Concrete	0.80-0.95
Brick	0.70-0.85
Drives and Walks	0.75-0.85
Roofs	0.75-0.95

TABLE
MANNING ROUGHNESS COEFFICIENTS

PIPE MATERIAL OR CHANNEL LINING	ROUGHNESS COEFFICIENT
Cast Iron Pipe	0.013
Concrete Pipe	0.012
Corrugated Metal Pipe	0.024
Corrugated Metal Pipe – Paved Invert	0.019
High Density Polyethylene Pipe (HDPE) – Smooth Lined	0.012
High Density Polyethylene Pipe (HDPE) – Corrugated	0.018
Plastic Pipe (PVC, SDR, S&D)	0.011
Earth-lined Channel (few rocks)	0.020
Earth-bottomed Channel with Rock Sides	0.030
Grass-lined Channel	0.050

Appendix



Hydrologic Regions With Uniform Rainfall (PennDOT Field Manual, May 1986)

24-Hour Storm Values Representing 90 % of Annual Rainfall

Rainfall Region	Inches
1	1.13
2	1.48
3	1.60
4	1.95
5	2.04

Appendix

SOIL TYPES

AbB—Albrights silt loam, 3 to 8 percent slopes.....
AnA—Allenwood gravelly silt loam, 0 to 3 percent slopes.....
AnD—Allenwood gravelly silt loam, 15 to 25 percent slopes.....
AoB—Allenwood and Washington soils, 3 to 8 percent slopes .....
AoC—Allenwood and Washington soils, 8 to 15 percent slopes .....
ArA—Alvira silt loam, 0 to 3 percent slopes.....
ArB—Alvira silt loam, 3 to 8 percent slopes.....
ArC—Alvira silt loam, 8 to 15 percent slopes.....
AsB—Alvira very stony silt loam, 0 to 8 percent slopes.....
Ba—Barbour soils, frequently flooded.....
Bb—Barbour-Linden complex, rarely flooded.....
Bd—Basher soils, frequently flooded .....
BeB—Bedington silt loam, 3 to 8 percent slopes.....
BkB—Berks shaly silt loam, 3 to 8 percent slopes.....
BkC—Berks shaly silt loam, 8 to 15 percent slopes ..
BkD—Berks shaly silt loam, 15 to 25 percent slopes
BuB—Buchanan gravelly loam, 3 to 8 percent slopes.....
BuC—Buchanan gravelly loam, 8 to 15 percent slopes.....
BxB—Buchanan very stony loam, 0 to 8 percent slopes.....
BxD—Buchanan very stony loam, 8 to 25 percent slopes.....
CaB—Calvin-Klinesville shaly silt loams, 3 to 8 percent slopes .....
CaC—Calvin-Klinesville shaly silt loams, 8 to 15 percent slopes .....
CaD—Calvin-Klinesville shaly silt loams, 15 to 25 percent slopes .....
DeF—Dekalb extremely stony sandy loam, steep.....
Dy—Dystrochrepts, bouldery.....
EsB—Elliber cherty silt loam, 3 to 8 percent slopes ..
EsC—Elliber cherty silt loam, 8 to 15 percent slopes
EsD—Elliber cherty silt loam, 15 to 25 percent slopes.....
EtB—Elliber very cherty silt loam, 3 to 8 percent slopes.....
EtC—Elliber very cherty silt loam, 8 to 15 percent slopes.....
EtD—Elliber very cherty silt loam, 15 to 25 percent slopes.....
EtF—Elliber very cherty silt loam, 25 to 70 percent slopes.....
EvB—Evendale cherty silt loam, 3 to 8 percent slopes.....
HaB—Hagerstown silt loam, 3 to 8 percent slopes....
HaC—Hagerstown silt loam, 8 to 15 percent slopes..
HaD—Hagerstown silt loam, 15 to 25 percent slopes.....
HtB—Hartleton channery silt loam, 3 to 8 percent slopes.....
HtC—Hartleton channery silt loam, 8 to 15 percent slopes.....
HtD—Hartleton channery silt loam, 15 to 25 percent slopes.....
HuB—Hazleton and Clymer extremely stony sandy loams, 0 to 8 percent slopes .....
HuD—Hazleton and Clymer extremely stony sandy loams, 8 to 25 percent slopes .....
HuF—Hazleton and Clymer extremely stony sandy loams, 25 to 80 percent slopes .....
Hv—Holly silt loam.....
Hy—Holly silt loam, ponded.....
Hz—Holly silt loam, rarely flooded.....
KmB—Kreamer cherty silt loam, 3 to 8 percent slopes.....
KmC—Kreamer cherty silt loam, 8 to 15 percent slopes.....
LaB—Laidig gravelly loam, 3 to 8 percent slopes .....
LaC—Laidig gravelly loam, 8 to 15 percent slopes....
LbB—Laidig extremely stony loam, 0 to 8 percent slopes.....
LdD—Laidig and Meckesville extremely stony soils, 8 to 25 percent slopes.....
LnB—Leck Kill shaly silt loam, 3 to 8 percent slopes
LnC—Leck Kill shaly silt loam, 8 to 15 percent slopes.....
LnD—Leck Kill shaly silt loam, 15 to 25 percent slopes.....
LtC—Leetonia extremely stony loamy sand, 0 to 15 percent slopes .....
MkB—Meckesville silt loam, 3 to 8 percent slopes....
MkC—Meckesville silt loam, 8 to 15 percent slopes..
MoA—Monongahela silt loam, 0 to 3 percent slopes
MoB—Monongahela silt loam, 3 to 8 percent slopes
OpB—Opequon silty clay loam, 3 to 8 percent slopes.....
OpD—Opequon silty clay loam, 8 to 25 percent slopes.....
OpE—Opequon silty clay loam, 25 to 50 percent slopes.....
Pa—Pits .....
Qu—Quarries .....
Ru—Rubble land .....
RwC—Rushtown very shaly silt loam, 8 to 25 percent slopes .....
ShA—Shelmadine silt loam, 0 to 3 percent slopes ....
ShB—Shelmadine silt loam, 3 to 8 percent slopes ....
SmB—Shelmadine very stony silt loam, 0 to 8 percent slopes .....
Ug—Udifluvents and Fluvaquents, gravelly .....
UoB—Ungers very stony loam, 3 to 8 percent slopes.....
UoD—Ungers very stony loam, 8 to 25 percent slopes.....
UoE—Ungers very stony loam, 25 to 50 percent slopes.....
Ur—Urban land.....
WaB—Washington silt loam, wet substratum, 3 to 8 percent slopes .....
WbA—Watson silt loam, 0 to 3 percent slopes .....
WbB—Watson silt loam, 3 to 8 percent slopes .....
WbC—Watson silt loam, 8 to 15 percent slopes.....
WeB—Weikert shaly silt loam, 3 to 8 percent slopes
WeC—Weikert shaly silt loam, 8 to 15 percent slopes.....
WeD—Weikert shaly silt loam, 15 to 25 percent slopes.....
WkE—Weikert and Klinesville shaly silt loams, steep
WsA—Wheeling soils, 0 to 3 percent slopes .....
WsB—Wheeling soils, 3 to 8 percent slopes .....
WsC—Wheeling soils, 8 to 15 percent slopes .....

TABLE --SOIL AND WATER FEATURES

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AbB---------- Albrights	C	None--------	---	---	0.5-3.0	Perched	Nov-Mar	>60	---	Moderate	High-----	High.
AnA, AnD---------- Allenwood	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
AoB*, AoC*:												
Allenwood--------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	High.
Washington-------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Low.
ArA, ArB, ArC, AsB---------- Alvira	C	None--------	---	---	0.5-1.5	Perched	Oct-May	>60	---	High-----	High-----	High.
Ba*---------- Barbour	B	Frequent----	Brief to long.	Dec-Apr	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Bb*:												
Barbour----------	B	Rare--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Linden----------	B	Rare--------	---	---	3.0-6.0	Apparent	Nov-Mar	>60	---	Moderate	Low------	High.
Bd*---------- Basher	B	Frequent----	Brief to long.	Dec-Apr	1.0-3.0	Apparent	Dec-May	>60	---	High-----	Moderate	Moderate.
BeB---------- Bedington	B	None--------	---	---	>6.0	---	---	>48	Soft	Moderate	Low------	High.
BkB, BkC, BkD----- Berks	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	High.
BuB, BuC, BxB, BxD---------- Buchanan	C	None--------	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	Moderate	High-----	High.
CaB*, CaC*, CaD*:												
Calvin----------	C	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Low------	Moderate.
Klinesville------	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	High.
DeP---------- Dekalb	C	None--------	---	---	>6.0	---	---	20-40	Hard	Low------	Low------	High.
Dy*. Dystrochrepts												

TABLE --SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
EsB, EsC, EsD, EtB, EtC, EtD, EtF---------- Elliber	A	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
EvB---------- Evendale	C	None--------	---	---	0.5-1.5	Perched	Nov-Mar	>48	Soft	High-----	High-----	High.
HaB, HaC, HaD----- Hagerstown	C	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	Moderate	Low.
HtB, HtC, HtD----- Hartleton	B	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Low------	High.
HuB*, HuD*, HuF*: Hazleton---------	B	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	Low------	High.
Clymer----------	B	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	Low------	High.
Hv---------- Holly	B/D	Frequent----	Brief to long.	Nov-May	0-0.5	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
Hy---------- Holly	D	Frequent----	Very long	Sep-Jun	+1-0.5	Apparent	Jan-Dec	>60	---	High-----	High-----	Moderate.
Hz---------- Holly	B/D	Rare--------	Brief to long.	Nov-May	0-0.5	Apparent	Nov-May	>60	---	High-----	High-----	Moderate.
KmB, KmC---------- Kreamer	C	None--------	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	High-----	High-----	Moderate.
LaB, LaC, LbB----- Laidig	C	None--------	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	Moderate	Moderate	High.
LdD*: Laidig----------	C	None--------	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	Moderate	Moderate	High.
Meckesville------	C	None--------	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	Moderate	Moderate	High.
LnB, LnC, LnD----- Leck Kill	B	None--------	---	---	>6.0	---	---	>40	Soft	Moderate	Low------	Moderate.
LtC---------- Leetonia	C	None--------	---	---	>6.0	---	---	>40	Hard	Low------	Low------	High.
MkB, MkC---------- Meckesville	C	None--------	---	---	2.5-4.0	Perched	Nov-Apr	>60	---	Moderate	Moderate	High.
MoA, MoB---------- Monongahela	C	None--------	---	---	1.5-3.0	Perched	Dec-Apr	>60	---	Moderate	High-----	High.
OpB, OpD, OpE----- Opequon	C	None--------	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate	Low.

TABLE --SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
Pa*. Pits												
Qu*. Quarries												
Ru*. Rubble land												
RwC---------- Rushtown	A	None--------	---	---	>6.0	---	---	>60	---	Low------	Low------	Moderate.
ShA, ShB, SmB----- Shelmadine	D	None--------	---	---	0-0.5	Perched	Sep-Jun	>60	---	High-----	High-----	High.
Ug*: Udifluvents.												
Fluvaquents.												
UoB, UoD, UoE----- Ungers	B	None--------	---	---	>6.0	---	---	>40	Hard	Moderate	Low------	High.
Ur*. Urban land												
WaB---------- Washington	C	None--------	---	---	1.5-3.0	Apparent	Nov-Apr	>60	---	Moderate	Moderate	Low.
WbA, WbB, WbC----- Watson	C	None--------	---	---	1.5-3.0	Perched	Nov-Mar	>60	---	Moderate	Moderate	Moderate.
WeB, WeC, WeD----- Weikert	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
WkE*: Weikert----------	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	Moderate.
Klinesville------	C/D	None--------	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate	High.
WsA*, WsB*, WsC*-- Wheeling	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.