BOARD OF COUNTY COMMISSIONERS
WARREN COUNTY, OHIO

Resolution

Number 03-1057 *Adopted Date* July 22, 2003

ADOPT RULES AND REGULATIONS FOR THE DESIGN OF STORM SEWER AND STORM WATER MANAGEMENT SYSTEMS

WHEREAS, Sections 307.37, 307.79, 711.10 and 711.01 of the Ohio Revised Code authorizes a Board of County Commissioners to adopt rules and regulations for the design of storm water management, and

WHEREAS, public hearings on said rules and regulations were held by the Warren County Board of Commissioners on July 1, 2003 and July 8, 2003; and after publication in compliance with ORC 307.37.

NOW THEREFORE BE IT RESOLVED, by the Warren County Board of Commissioners to adopt the rules and regulations under the title: "WARREN COUNTY RULES AND REGULATIONS FOR THE DESIGN OF STORM SEWER AND STORM WATER MANAGEMENT SYSTEMS"

BE IT THEREFORE RESOLVED, that these rules and regulations shall become effective on August 22, 2003, being 31 days following the date of adoption; and shall be administered by the County Engineer, as attached hereto and made a part hereof.

Mrs. South moved for adoption of the foregoing resolution, being seconded by Mr. Kilburn. Upon call of the roll, the following vote resulted:

Mr. Crisenbery – yea
Mr. Kilburn – yea
Mrs. South – yea

Resolution adopted this 22nd day of July 2003.

BOARD OF COUNTY COMMISSIONERS

Tina Davis, Clerk

/lkl

cc: Engineer (file)

WARREN COUNTY RULES AND REGULATIONS FOR THE DESIGN OF STORM SEWER AND STORMWATER MANAGEMENT SYSTEMS

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ARTICLE 600 - STORMWATER MANAGEMENT

CONTROL OF STORM SEWERS

ARTICLE 100

SECTION 101 - CONTROL

All storm sewers in the unincorporated area of Warren County shall be controlled by the Board of County Commissioners, Warren County, Ohio.

SECTION 102 - OWNERSHIP

All public or private storm sewers shall continue to be owned by the respective owners now owning same until such time as the Board of County Commissioners, by resolution agree to accept the private storm sewer system as public.

SECTION 103 - APPROVALS

No storm sewer shall be constructed within the jurisdiction of the Board of County Commissioners without the prior approval of the Warren County Engineer nor shall any final development plan be approved by the Regional Planning Commission until a preliminary drainage plan showing the method of disposition of storm water drainage be first approved by the Warren County Engineer. (See Sections 301 & 302)

SECTION 104 - CONNECTION TO STORM SEWERS

Any connection to a storm sewer within the jurisdiction of the Board of County Commissioners shall be subject to these rules and regulations.

SECTION 105 - EXTENSION / MODIFICATIONS

No extension or modification shall be made to any storm sewer under the jurisdiction of the Board of County Commissioners without the prior approval of the Warren County Engineer.

GENERAL POLICY

ARTICLE 200

SECTION 201 - EXISTING CONTOURS

No building shall be erected on any land nor shall any changes be made in the existing contours of any land, including any change in the course, width or elevation of any water course or drainage channel in any manner that will obstruct, interfere with, or change the drainage of such land, considering future development, without providing adequate drainage in connection therewith.

SECTION 202 - STORM SEWER SYSTEM

Every subdivision shall be provided with a storm water system capable of handling storm waters flowing onto the subdivision site from other areas as well as runoff from precipitation on the site itself. The drainage system shall discharge into a water course, drainage channel or other existing storm water facility without producing any adverse effect on adjacent or downstream properties.

SECTION 203 - GRADING

All parts of the subdivision shall be graded and drained to prevent the standing of storm water, except approved lakes, wetland areas or retention basins. Where necessary, drainage channels or storm sewers shall be provided to convey the water to an existing water course or outlet. The method and means of drainage, both paved and unpaved areas, shall be subject to approval by the County Engineer.

SECTION 204 - REGARD TO TOPOGRAPHY

A storm sewer shall be constructed when its necessity has been determined from topographic data, prepared and presented by the developer's engineer.. Streets and lots shall be platted with appropriate regard for topography and storm water runoff, and in a manner to preserve streams, water courses, lakes, ponds, wooded areas and other natural features, where feasible. Land located in a regulated FEMA flood plain may be platted for any use not endangering the public health, safety or welfare, provided that all requirements of the Warren County Flood Damage Prevention Regulations are met.

SECTION 205 - STORM WATER OUTLET

All storm water shall be carried to an existing stream, watercourse or as close to the property line as practical, without damage to the adjacent property.

SECTION 206 - SANITARY SEWER

The storm water drainage system shall not be combined with any part of a sanitary sewer system, nor shall sanitary sewer water be discharged thereto.

SECTION 207 - EXISTING / PLANNED SYSTEMS

The storm water drainage system shall be designed to fit into existing or planned storm water drainage systems. The design, materials and construction of all parts of the drainage system shall satisfy the specifications of the Warren County Engineer and the Ohio Department of Transportation.

SECTION 208 - FOUNDATION/YARD DRAINS

No person shall install any pump, piping, apparatus, or other such system for discharging sump pump or down spout effluent within ten (10) feet of a public right of way or sidewalk without approval of plans by the County Engineer. The County Engineer may grant approval if the requested plan substantially conforms with one of the following modes of construction:

1) direct connection to a storm sewer or;
2) direct discharge into an approved natural drainage course.

The County Engineer may require the installation of a master sump pump drainage system to ensure the efficient removal of sump pump discharge where connection to storm sewers or discharge into an approved drainage course is not possible. The discharge of sump pump or downspout effluent onto a sidewalk, road surface or gutter is specifically prohibited. For the installation of a master sump pump system the following shall be followed:

1) The main trunk line shall be located no closer than twelve (12) inches behind the back of curb and at an approximate depth of two to three feet, and tied into the nearest catch basin, storm manhole, or storm line. No storm sewer receiving master sump pump drainage shall discharge into an open drainage course within the limits of the proposed development. If a pipe system, sized to carry only the master sump pump drainage, is incorporated into a drainage course, then the drainage course is no longer considered "open".
2) PVC pipe may be used for this installation.
3) Downspouts shall not be tied into this line.

PIPE CAPACITIES:

4" LINE		6" LINE	
GRADE	CONNECTIONS	GRADE	CONNECTION
1%	2	1%	7
2%	3	2%	10
3%	4	3%	12
4%	5	4%	14
5%	5	5%	16
6%	6	6%	18

Standard Y's should be installed where future sump pumps will be connected and marked in the field. Cleanouts should be spaced approximately every two hundred (200) feet.

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DRAINAGE PLAN

ARTICLE 300

SECTION 301 - PRELIMINARY DRAINAGE PLAN

A preliminary drainage plan, prepared by a Professional Engineer licensed in the State of Ohio, showing the following information shall be submitted to the County Engineer for preliminary approval.

1) Existing topography with contours shown at an interval of not greater than two (2) feet if the slope of the ground is fifteen (15) percent or less, and not Greater than five (5) feet where the slope is more than fifteen (15) percent.

2) Existing storm sewers, culverts and other physical features.

3) Location and size of all proposed storm water drainage facilities showing their connections with existing systems.

4) Show the routing of storm water through the site to the discharge point. This routing path shall be laid out in such a manner as to direct storm water into the retention or detention area prior to discharge.

SECTION 302 – DETENTION WAIVER

A stormwater detention waiver may be granted if it can be demonstrated that the post-development runoff rates and volumes do not exceed those experienced prior to development. A written request for a waiver of detailed stormwater calculations must include preliminary stormwater calculations, prepared by a Professional Engineer, licensed in the State of Ohio. Preliminary stormwater calculations shall contain:

1) **Calculations of pre-development and post development area-weighted curve numbers (CN).** (This calculation shall be supported by appropriately labeled scaled drawings and/or maps) A waiver may be possible if the area-weighted post-development curve number (CN) is less than or equal to the area-weighted pre-development curve number (CN).

2) **Calculations of pre-development and post development times-of-concentration.** (Appropriately labeled, scaled drawings or maps shall support this calculation.) A waiver may be possible if the post –development time-of-concentration is greater than or equal to the pre-development time-of-concentration.

If only one of the above conditions is true, a stormwater detention waiver may still be possible if the calculated Post-development flows can be shown to be less than the calculated Pre-development flows. NRCS methodology is the preferred approach. Calculations shall cover 1 year, 2 year, 5 year, 10 year, 25 year, 50 year and 100 year storms. Other waiver arguments will be considered, on a case-by–case basis.

SECTION 303 - FINAL DRAINAGE PLAN

After approval of the preliminary drainage plan, the applicant shall submit the final drainage plan prior to or in conjunction with the construction plans along with storm drainage design computations. The plan shall be in compliance with the criteria outlined in these regulations. The County Engineer, prior to construction, must approve any deviation from the final drainage plan.

SECTION 304 - RECORD PLAN INFORMATION REQUIREMENTS

Prior to the release of the Maintenance Obligation (Bond) for a new subdivision or the issuance of a Certificate of Occupancy for a non-residential building, an acceptable record plan shall be prepared. The following information shall be obtained and the record plan prepared accordingly.

STREETS

If applicable, roadside ditches at 100-foot stations and the invert of each driveway culvert. The County Engineer may require the curb and road centerline elevations at 100-foot stations on roads with curb.

STORMWATER INFRASTRUCTURE

Catch basins and manholes – all invert elevations, top-of-casting elevations and all opening elevations.

Detention/Retention Facilities – all orifice invert elevations, all weir crest elevations. Sufficient spot elevations within each basin in order to prepare and show on the record plan a stage-storage table that contains: elevations at 1-foot increments, area at each elevation and volume at each elevation. Sufficient spot elevations along the top of the embankment and the emergency spillway.

Major Flood Routing Paths – sufficient spot elevations along the flood route to verify compliance with the approved grading plan.
As-built plans shall contain the following statement, sealed, signed and dated by a Surveyor or Engineer registered in the State of Ohio:

"I hereby certify that this Record Plan is based on field location of visible facilities and reflects the condition of the improvements as of _____. (Date)

_____
(Surveyor/Engineer)

SUBDIVISION IMPROVEMENT PLAN

ARTICLE 400

SECTION 401 - DRAWING AND SPECIFICATIONS

Detailed drawings and specifications together with storm drainage design computations of the storm drainage system shall be submitted to the County Engineer for approval. Drawings shall be on a standard size sheet, 24" x 36". Locations and profiles of the storm sewers, drainage channels, and structures shall be shown thereon. All existing and proposed topography shall be shown as prescribed in Section 300, Article 301.1, along with existing pavements, driveways, utilities, basins and other structures. Watercourses, marshes, land subject to flooding and any other significant physical items shall be shown in adequate detail. Plans and profiles of proposed storm sewers with grades and pipe dimensions shall be shown. These shall include manholes and connections to outlets, which might be beyond the project boundary. All existing and proposed open watercourses and drainage channels shall be shown in sufficient detail.

SECTION 402 -- FLOOD PLAIN LIMITS

The upper limits of flood plains shown on the flood plain maps adopted by Warren County shall be accurately shown on the plans.

SECTION 403 - STREETS

Streets constructed on land adjoining streams and watercourses shall be constructed a minimum of one and one half (1 ½) feet above the computed one hundred (100) year storm elevations. (BFE – Base Flood Elevation)

SECTION 404 - FILL AREAS

No part of a water course and flood plain cross section may be filled in unless the conveyance of pre-empted cross section is compensated for by an equivalent amount of channel and flood plain excavation either opposite or upstream of the filled area.

SECTION 405 - EASEMENTS

Utility and drainage easements shall be provided where necessary, as determined by the Warren County Engineer. When a storm sewer or drainage structure is located outside a public right of way or public utility easement they shall follow a lot line, where practical, and in all cases be within a minimum of a twenty (20) foot wide drainage easement. No trees, shrub or structure shall be placed within such easement, and the proper authorities may have free access to, and use of, the easement at any time.

SECTION 406 - RELATION TO STREAMS AND WATER COURSES

Where it is deemed necessary, when a proposed street parallels or is located near an existing stream or water course, furnish profiles at the top bank of the stream and compute water elevations and invert elevations of the stream or water course. Show relations of proposed street grade to existing profiles of the stream or watercourse. Street construction shall not enroach on the approved limit of the stream or watercourse.

SECTION 407 - STORM SEWER PROFILES

Storm sewers, when not included in the street profile, shall be shown in profile with the following information:

.01) Profile of existing ground at storm sewer centerline.
.02) Profile of proposed finish grade.
.03) Percent of grade of proposed storm water.
.04) Dimensions of proposed pipe or structure.
.05) Show stations every one hundred (100) feet and at all structures and appurtenances.
.06) Show street inlets with type and manholes, together with proposed elevations.

SECTION 408 - DATUM FOR ELEVATIONS

Give datum reference used for elevations and correlate to U.S.G.S. datum.

SECTION 409 - GRADING PLAN

The grading plan shall show existing contour lines at two (2) foot intervals, proposed finished contour lines, spot elevations and existing and finished contours and elevations on streets to be graded.

SECTION 410 - GRADING AREAS

All graded areas are to be designed and maintained to prevent excessive erosion and runoff. Drainage swales, temporary retention dams and the like are to be installed during the grading operation. All slopes and graded areas are to be seeded in accordance with the Warren County Erosion and Sediment Control Regulations (Section 303 or most current).

SECTION 411 - MUD AND DEBRIS

Until the Board of County Commissioners accepts the subdivision, the developer shall take such measures as are necessary to prevent excessive erosion of graded surfaces, and to prevent the deposit of soil and debris from entering onto public streets, into drainage channels, sewers or onto adjoining land.

SECTION 412 – MAJOR STORM ROUTES

The proposed routing of major storms (100 year frequency and greater) shall be shown on the plan. All major storm routes shall be within an easement of appropriate width. The easement width shall be sufficient to contain the 100 year storm.

BASIC DESIGN CRITERIA

ARTICLE 500

SECTION 501 - QUANTITY OF RUNOFF

.01 Each portion of the storm water drainage system shall be capable of handling the peak flows of runoff as determined by the "Rational Method", (Q=CIA), TR-20, TR-55 or other approved methodology.

The Warren County Engineer may, from time to time, obtain hydrologic studies within the unincorporated areas of the County and developers may be required to participate financially in these hydrologic studies. The amount of financial participation shall be proportional to area of the developer's project in relation to the area of the watershed under study. The Warren County Engineer may submit the approved hydrologic study to the Board of County Commissioners for incorporation into these regulations. Once a study has been incorporated into these regulations the results and recommendations of the study may supersede the minimum requirements specified herein. A list of studies that have been incorporated into these regulations can be found in Appendix B.

SECTION 502 - RUNOFF COEFFICIENT "C"

.01 The following are acceptable coefficients for Warren County.
Slopes-Flat, less than 2% - Steep, greater than 7%

CHARACTERISTICS	**RUNOFF COEFFICIENTS**	
	< 2%	**7%**
Parks, cemeteries, golf courses, Lawns, playgrounds, unimproved land	0.35	0.50
Business	0.70	0.85
Residential (Single Family)	0.50	0.60
Residential (Multi Family)	0.70	0.85
Industrial (Light)	0.70	0.90
Industrial (Heavy)	0.80	1.00
Commercial/Office (Light)	0.70	0.90
Commercial / Office (Heavy)	0.80	1.00
Woodland	0.20	0.40
Grassland (Pasture)	0.25	0.45
Cropland (Row Crops)	0.40	0.50
Impervious Surface	0.90	0.95

The above shall be increased to allow a composite "C" value based on percentage of impervious surface.

SECTION 503 - RAINFALL DATA

Rainfall intensity, duration and frequency data shall be obtained from the " Rainfall Atlas of the Midwest, 1992" (Bulletin 71). Data considered pertinent to Warren County, Ohio is available in Appendix A.

SECTION 504 - STORM SEWERS

.01) Pipe used for storm sewers shall comply with current Ohio Department of Transportation Specifications and shall have a minimum inside diameter of twelve (12) inches.

.02) The pipe shall meet the design specifications for loading and depth of cover.

.03) Storm sewers shall be designed on a minimum of twenty-five (25) year frequency at full flow capacity.

.04) The minimum grade is determined by velocity. Minimum of 2 feet per second.

.05) Inlet spacing shall be a maximum for three hundred (300) feet. The Warren County Engineer may waive this requirement if sufficient information is presented.

SECTION 505 - ROADWAY CULVERTS/BRIDGES

.01) Culverts shall be designed to accomodate a 100 year frequency storm without encroaching onto the roadway. All culverts shall conform to the current Ohio Department of Transportation specifications.

SECTION 506 - HEADWALLS

.01) Standard headwalls or wing walls shall be constructed at the outfall of all storm sewers.

SECTION 507 - DRAINAGE EASEMENTS

.01) When a storm drainage system (pipe or ditch) is outside the road right of way or public Utility easement, a storm drainage easement shall be provided and identified as such on the record plat.

.02) The minimum width of said easement shall be twenty (20) feet.
.03 Easement widths for ditches and natural drainage courses shall be determined by use of the following formula:

Ew = 120DA^0.43 where:

Ew = Easement Width, feet

DA = Drainage Area, square miles

SECTION 508 - OPEN DITCHES / CHANNELS

The Manning Formula (V =(1.486/n) (R^0.667) (S^0.5) in conjunction with Q = AV) may be used to determine flow in open ditches and channels.

.01) The following are acceptable coefficients for "n"

LINING	"n"	LINING	"n
Bare Earth	.02	Concrete	.015
Seeded	.03	bituminous	.018
Sod	.04	Grouted Rip Rap	.02
Jute Mat.	.04	Rock Channel Protection	
Excelsior Mat.	.04	for ditches	.06
		For large channels	.04

.02) Side slopes shall be 2:1 or flatter.

.03) The minimum grade shall be one percent. Where flatter grades are necessary, sewers or paved flow lines may be required.

.04) Ditches along roadway where velocities are five (5) feet per second or less shall be sodded. Ditches with a velocity of over five (5) feet per second shall be lined.

.05) Ditches not along a roadway with a velocity of two (2) feet per second may be seeded.

.06) Natural stream and watercourses throughout the development shall not be disturbed unless permission granted by the County Engineer.

.07) Any channel running through the proposed development shall have the rate of runoff determined on a one hundred (100) year frequency. All proposed buildings affected by the channel flood plain shall be checked such that the minimum building opening elevation is above the one hundred (100) year flood elevation.

SECTION 509 - ROCK CHANNEL PROTECTION

Rock channel protection is used to control erosion at the outlet of culverts and storm sewers, or for lining ditches on steep grades. There are four types of rock channel protection that are used in various situations. The use of the proper type at culvert and storm sewer outlets can be determined from Figure 1107-1. (See Appendix A) Type A is generally used beyond the outlet of the larger conduits having outlet velocities in excess of twelve (12) feet per second and Type B or C for conduits having lesser velocities. Type C and D may be used to line roadside ditches, as required.

STORMWATER RUNOFF CONTROL
IN THE UNINCORPORATED PORTIONS OF
WARREN COUNTY, OHIO

ARTICLE 600

SECTION 601 - FINDINGS AND PURPOSE

.01 The Board of Commissioners of Warren County finds that the stream channels and waters of Warren County are limited resources to be protected and that their natural quality is of primary significance in promoting and maintaining the health, safety and general well-being of all life and inhabitants within its jurisdictional boundaries.

.02 It further finds that such channels and waters may become despoiled due to increased sediment depositions caused by accelerated storm water runoff resulting from the disruption and alteration of the natural surface character of the land site development activities.

.03 Therefore, the purpose of this Resolution is to establish standards, principles and procedures by which Warren County can regulate site development activities which cause or may cause off-site impact potentials at lower elevations and the flooding of watercourses.

.04 Standards in this Resolution are thus intended to protect persons and property from adverse storm water runoff erosion impacts which may result from site development.

SECTION 602 - DEFINITIONS

.01 Approving Agent(s): Warren County Engineer, or other entity or agency so designated.

.02 Channel: a natural stream that conveys water; a ditch or channel excavated for the flow of water.

.03 Construction: the erection, alteration, repair, renovation, demolition or removal of any building or structure; and the clearing, stripping, excavation, filling, grading and regulation of sites in connection therewith.

.04 Developer: Any individual, subdivider, firm, association, syndicate, partnership, corporation, trust or any other legal entity commencing proceedings under this resolution to effect the development of land for himself or for another.

.05 Development: the division of land into two or more parcels, then carrying out of any building, or the making of material change in the use or appearance of any structure above or below ground surface land through activities of construction, erection or alteration.

.06 Development Area: any contiguous area owned by one person or operated as one development unit included within the scope of these regulations, upon which earth-disturbing activities are planned or underway.

.07 Ditch: an open channel either dug or natural, for the purpose of drainage or irrigation with intermittent flow. (See stream, drainage, and grassed waterway.)

.08 Drainageway : an area of concentrated water flow other than a river, stream, ditch or grassed waterway.

.09 Earth-Material : soil, sediment, rock, sand, gravel and organic material or residue associated with or attached to the soil.

.10 Erosion: (1) the wearing away of the land surface by running water, wind, ice or other geological agents, including such processes as gravitational creep; (2) detachment and movement of soil or rock fragments by wind, water, ice or gravity.

.11 Fill: any act by which earth, sand, gravel, rock or any other material is placed, pushed, dumped, pulled, transported or moved to a new location above the natural surface of the ground or on top of the stripped surface and shall include the conditions resulting therefrom. The difference in elevation between a point on the original ground and a designated point of higher elevation on the final grade. The material used to make a fill.

.12 Finished Grade: the final grade or elevation of the ground surface conforming to the approved grading plan.

.13 Floodplain Scour: the abrading and wearing away of the nearly level land situated on either side of a channel due to overflow flooding.

.14 Grading: the stripping, cutting, filling, stockpiling or any combination thereof of earth disturbing activity inclusive of land in its cut or filled conditions.

.15 Hazard : any danger to public health, welfare or safety including exposure to risk or damage to property or liability for personal injury; or risk of harm to land, air or water resulting in environmental degradation. Hazards can include flooding and ponding compaction and settling, landslides, earthquakes, toxic chemicals, radiation, fire and disease.

.16 Mulching : the application of suitable materials on the soil surface to conserve moisture, hold soil in place and aid in establishing plant cover.

.17 Nuisance : a public nuisance as know by common law or in equity jurisprudence.

.18 Permanent Vegetation : producing long term vegetative cover, e.g., bluegrass, tall fescue, crown vetch, etc.

.19 Permittee : any person to whom approval of a site plan according and pursuant to this Resolution is granted, or who is subject to inspection under it.

.20 Person : any individual, corporation, partnership, joint venture, agency, unincorporated association, municipal corporation, county or state agency within Ohio, the federal government or any combination thereof.

.21 Plan: as used this Resolution shall mean the Stormwater Management Plan.

.22 Plans: profiles, typical cross sections, working drawings and supplemental drawings of site, grading, drainage and runoff and sedimentation control plans, vicinity map, soil map, and other plans as approved or exact reproductions thereof, which show the location, character, dimensions and details of the work.

.23 Public Waters: those waters within lakes (except private ponds and lakes on single properties), rivers, streams, ditches, and / or waters leaving that respective property.

.24 Runoff : the portion of rainfall, melted snow or irrigation water that flows across the ground surface and eventually is returned to streams.

a. Accelerated Runoff - increased rate and volume of runoff due to less permeable surface primarily caused by urbanization.
b. Peak Rate of Runoff - the maximum rate of runoff for any 24 Hour storm of a given frequency.

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

.26 Site : any lot or parcel of land or a series of lots or parcels of land adjoining or contiguous or joined together under one ownership where clearing, stripping, grading or excavating is performed.

.27 Slope: the face of an embankment or cut section; any ground whose surface makes an angle with the plane of the horizon. Slopes are usually expressed in a percentage based upon vertical differences in feet per 100 feet of horizontal distance.

.28 Storm Frequency : the average period of time in years within which a storm of a given duration and intensity can be expected to be equaled or exceeded.

.29 Stream : a body of water running or flowing on the earth's surface or channel in which such flow occurs. Flow is continuous or seasonally intermittent.

.30 Subdivision : the division of any parcel of land shown as a unit or as contiguous units on the last preceding tax roll, into tow or more parcels, sites, or lots, any one of which is less than five acres for the purpose, whether immediate or future of transfer of ownership; provided, however, that the division or partition of land into parcels of more than five acres not involving any new streets or easement of access, and the sale or exchange of parcels between adjoining lot owners, where such sale or exchange does not create additional building sites, shall be exempted; or the improvement of one or more parcels of land for residential, commercial or industrial structures or groups of structures involving the division or allocation of land for the opening, widening or extension of any street or streets, except private streets serving industrial structures; the division or allocation of land as open spaces for common use by owners, occupants or lease holders or as easements for the extension and maintenance of public sewer, water, storm drainage or other public facilities.

.31 Subsoil : that part of the soil below the surface soil or plow layer.

.32 Surface soil: the uppermost part (5 to 8 inches) of the soil commonly stirred by tillage implements or its equivalent in uncultivated soils.

.33 Swale: a low lying stretch of vegetated land which gathers and carries surface water runoff at a reduced rate of flow and conveys it downstream at less erosive velocities.

.34 Temporary Vegetation : short-term vegetative cover used to stabilize the soil surface until final grading and installation of permanent vegetation i.e., oats rye or wheat.

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

.36 Urban Land Use: existing or proposed developments listed within the intent and scope chapter (Article 603) of this resolution.

.37 Watercourse: any natural or artificial waterway (including, but not limited to, streams, rivers, creeks, ditches, channels, canals, conduits, culverts, drains, drainageways, waterways, gullies, ravines or washes) in which waters flow in a definite direction or course either continuously or intermittently and including any area adjacent thereto which is subject to inundation by reason of overflow of flood water.

SECTION 603 SCOPE AND INTENT

.1 This Resolution shall apply to both the development and redevelopment of land proposed for the following types of public and private urban land use : which are,

.01 land used or being developed for residential, commercial office or industrial purposes, including subdivision and land development proposals for non-farm uses in rural areas.

.02 land used or being developed for recreation, wildlife, or natural purposes, including agricultural areas proposed for conversion to such uses.

.2 Any person or persons proposing to develop or redeveloped land within Warren County for any of the uses listed in Section 603.1 shall design and implement a Stormwater Management Plan which:

.01 will yield quantities of surface water runoff from the development site at rates which are the same or less than before development occurred as specified by Section 604 of this Resolution.

.02 will not result in increasing current potentials for flooding of watercourses that are at lower elevations off-site.

.03 has been approved and permitted under Section 605 of this resolution.

.3 No changes subject to regulation under this Resolution shall be made in the existing natural surface composition or subsurface configuration of any land proposed for development or redevelopment within Warren County for land use developments specified under Section 603.1 and approved of a Stormwater Management Plan required according to Section 605 enabling final approval of a proposed development and / or subdivision development shall not be given unless:

.01 a determination is made according to Section 605.3 of this Resolution by the Regional Planning Commission of Warren County and appropriately authorized approving agents that implementation of the stormwater management would not cause runoff and erosion impact that would be harmful or damaging to the existing quality of lands and waters at lower elevations off-site.

.4 Within watersheds regulated under NPDES Phase 2 permits by the Ohio Environmental Protection Agency (OEPA), the Warren County Engineer may require that the stormwater management plan prepared for a subject project include a design that meets any stormwater quality guidelines that may be established by the OEPA.

SECTION 604 STORMWATER RUNOFF CONTROL PLANNING STANDARDS.

.1 To control pollution of public waters by soil sediment from accelerated stream channel erosion and to control flood plain erosion caused by accelerated stormwater runoff from development areas, the increased peak rates and volume of runoff shall be controlled such that:

.01 the peak rate of runoff from the critical storm and all more frequent storms occurring on the development area does not exceed the peak rate of runoff from a one year frequency storm (of 24 hour duration) occurring on the same area under pre-development conditions.

.02 storms of less frequent occurrence than the critical storm, up to the one hundred-year storm, have peak runoff rates no greater than the peak runoff rates from equivalent size storms under pre-development conditions.

.03 the critical storms for a specific development area is determined as follows:

a. Determined by appropriate hydrologic methods the total volumes of runoff from a one-year frequency, 24-hour storm occurring on the development area before and after development.

b. From the volume determined in (a), determine the percentage increase in volume of runoff due to development, and using this percentage, select the 24-hour critical storm from this table.

If the percentage of increase in volume of runoff is:

Equal to or Greater than	and less than	The critical storm for peak rate Control will be
_	10	1 year
10	20	2 year
20	50	5 year
50	100	10 year
100	250	25 year
250	500	50 year
500	-	100 year

c. In general, it shall be assumed that the runoff curve numbers (CN) for the predevelopment condition do not exceed those of "Open Space in fair condition". (i. e. A=49, B=69, C=79, D=84) Post development runoff curve numbers (CN) shall be taken from hydrologic soil group D for all subdivisions with lot sizes of ½ acre and less. For lots greater than ½ acre and less than 3 acres allow ¼ acre of Type D soils per lot when calculating the weighted CN for post development. This allowance is to address soil disturbances and compaction during construction.

.04 A recommended method which may be used to determine changes in rates and volumes of runoff is presented in the United States Department of Agriculture, Natural Resources Conservation Service, Engineering Division,, Urban Hydrology for Small Watersheds, Technical Release No. 55 (TR-55)June, 1986. WinTR-55 (July 1, 2002) is also available.

SECTION 605 - STORMWATER MANAGEMENT PLANNING PROCEDURES

.1 REQUIRED INFORMATION

.01 any person seeking approval of subdivision or land development proposals for land use types listed in Section 603 shall

a. provide mapped information about the location and vicinity of the area proposed for development.
b. furnish three types of information and maps about the proposed land development and site location.

(1) A predevelopment conditions assessment.
(2) A post development conditions assessment; and
(3) A stormwater management plan.

c. shall have the right to request the Regional Planning commission of Warren County and the Warren County Engineer to hold pre-submission conferences and site inspections, as necessary, for assistance in submitting the required site planning information.

.2 PREDEVELOPMENT CONDITIONS ASSESSMENT

.01 The assessment requires quantification in tabular or other approved form of inventory map information by site drainage area and subdrainage areas in order to determine and display the current volume and rate of runoff from the proposed development area, and shall be prepared according to methods prescribed in the SCS text cited in Section 604.1 (04) of this Resolution or others which yield equivalent information about rates and volumes of surface runoff. Information from the assessment is used to evaluate impacts expected to result during and from development of a proposed plan.

.02 the assessment shall:

a. Delineate drainage units, which comprise the area proposed for development.

b. Indicate the hydraulic length of slope per individual drainage unit and the soil type(s) present.

c. Indicate within the legend the average percent slope and runoff curve number (CN) per individual subdrainage unit for a 24 hour storm of a 1,2,5,10,25,50 and 100 year frequency.

.3 DEVELOPMENT PLAN EVALUATION

.01 The evaluation of the proposed site development plan is to provide mapped and tabularized information about the changes in rates and volumes of runoff and erosion, which are expected to result from its implementation and shall be prepared according to methods prescribed in the SCS texts cited in Section 604 and Sections 604.1 (.02) 604.1 (.03) of this Resolution. The Regional Planning Commission of Warren County and agent(s) shall use this evaluation information to determine whether an additional Runoff Control and Sediment Abatement Plan is needed.

.02 The development plan evaluation map shall:

a. depict all permanently proposed structural improvements and installations to be made on the development site, inclusive of buildings, retaining walls, sidewalks, streets, parking lots, driveways and storm drainage impoundment’s, channels and outlets.

b. graphically differentiate the area to be developed from the area to be left undisturbed.

c. Depict all grade changes and areas to be excavated or used for stockpiling on-site during development and provide the timing for their occurrence within an attached schedule of overall construction activities.Be accompanied by a hydrograph for 24 hour storm of the critical frequency to be controlled as determined according to Section 604.1 (.03) and all calculations made pertinent to evaluating the effects of the proposed development plan upon current runoff and erosion conditions of the site.

.4 STORMWATER MANAGEMENT PLAN CONTENT REQUIREMENTS

.01 A stormwater management plan shall identify how increases in surface water runoff induced by development is to be controlled to within the standards of Section 604.1 of this Resolution.

.02 All proposed controls are to be designed in accordance with methods and techniques set forth in the SCS texts cited in Section 604 of this Resolution or others approved by the Planning Commission and appropriately authorized approving agent (s).

.03 A stormwater management plan shall be comprised of, but not limited to, the following information:

a. A map rendered on the appropriate scale which indicates the number, types, dimensions and locations of all stormwater runoff control structures or devices to be utilized either temporarily or permanently on a development site.

b. All pertinent computations made to arrive at the final dimensions of each control device shall be presented along with plan and section view drawings of the same rendered at an appropriate design scale to be agreed upon between the applicant and the approving agent (s).

c. Schedules detailing the timing and cost for the installation and maintenance of each structure or device.

.5 STORMWATER MANAGEMENT PLAN SUBMISSION, REVIEW AND APPROVAL

.01 Submission of a stormwater management plan to the Regional Planning Commission of Warren County and the appropriately authorized approving agent(s) completes ALL site development planning information and impact control planning responsibilities required of an applicant under provisions of this Resolution and initiates final site development plan approval proceedings which are necessary to enable approval of the proposed subdivisions and/or development.

.02 Review of the stormwater management plan required of the applicant shall:

a. be made by the Regional Planning Commission or Warren County and the appropriately authorized approving agent(s) including Warren County Engineer and a representative of the local Soil and Water Conservation District, provided the applicant has prepared and submitted all necessary information according to Section 605.4 of this Resolution.

b. be completed within a period of three (3) weeks before the plan is approved or disapproved by the Regional Planning Commission of Warren County at a regularly scheduled meeting.

.03 The Regional Planning Commission of Warren County and the appropriately authorized approving agent(s) shall upon completing its review of the stormwater management plan either:

a. approve the plan as submitted by the applicant provided it is in compliance with provisions of this Resolution and initial site plan review recommendations, or

b. disapprove the plan until the applicant makes revisions which comply with provisions of this Resolution.

.04 Revisions to a disapproved stormwater management plan shall be prepared and submitted by an applicant to the Regional Planning Commission of Warren county the appropriately authorized approving agent(s) for review and approval according to the same procedures specified by provisions within the above paragraphs of this Section.

.05 Action by the Regional Planning Commission of Warren County and appropriately authorized approving agent(s) approving or disapproving a stormwater management plan is a final order for purpose of judicial review.

.06 Notwithstanding anything to the contrary in this Section 5, any applicant for a site development permit for a subdivision (1) shall submit its initial application (605.3) together with the preliminary plat submissions required by Section 301 of the Subdivision Regulations for Warren County, Ohio and (2) shall submit its stormwater management plan (605.5) together with either the preliminary or final plat submissions required by Section 301 of the Subdivision Regulations for Warren County, Ohio, and all such submissions shall be reviewed pursuant to the subdivision regulations.

.6 OFF SITE STORMWATER MANAGEMENT

.01 Exceptions to requiring permanent control of increased runoff on the development site in all cases shall be considered by the Regional Planning Commission of Warren County and the appropriately authorized approving agent(s) provided the applicant can prove that:

a. Performance objectives and standards of this Resolution for runoff control can be best achieved by installations of off-site abatement control facilities.

Runoff from the development site can be conveyed to off-site control facilities in a manner and by means, which satisfies or surpasses performance objectives of this Resolution.

SECTION 606 COMPLIANCE RESPONSIBILITY

.1 PERFORMANCE LIABILITY

No provisions of this Resolution shall limit, increase or otherwise affect the liabilities of the developer nor impose any liability upon this jurisdiction not otherwise imposed by law.

.2 OPERATIONS AND MANAGEMENT

.01 During site development, a developer is responsible for:

a. carrying out all provisions as approved in plan and required by this Resolution.

.3 ENFORCEMENT

ENFORCEMENT

.01 The Warren County Engineer may, upon identification to the owner or person in charge, enter any land upon obtaining agreement with the owner, tenant or manager of the land in order to determine whether there is compliance with this resolution. If the Warren County Engineer is unable to obtain such an agreement, he may apply for and a judge of the court of common pleas for the County where the land is located may issue an appropriate inspection warrant as necessary to achieve the purposes of this resolution.

.02 If the Warren County Engineer determines that a violation of the rules adopted under this section exists he may issue an immediate stop work order if the violator failed to obtain any federal, state or local permit necessary for sediment and erosion control, earth movement, clearing or cut and fill activity.

.03 In addition, if the Warren County Engineer determines a rule violation exists, regardless of whether or not the violator has obtained the proper permits, he may authorize the issuance of a notice of violation. If, after a period of not less than thirty days has elapsed following the issuance of the notice of violation, the violation continues, he shall issue a second notice of violation.

.04 If after a period of not less than fifteen days has elapsed following the issuance of the second notice of violation, the violation continues, the Warren County Engineer may issue a stop work order after first obtaining the written approval of the prosecuting attorney of the county if, in the opinion of the prosecuting attorney, the violation is egregious.

.05 Once a stop work order is issued, the Warren County Engineer shall request, in writing, the prosecuting attorney of the county to seek ann injunction or other appropriate relief in the court of common pleas to abate excessive ersosion or sedimentation and secure compliance with the rules adopted under this resolution. If the prosecuting attorney seeks an injunction or other appropriate relief, then, in granting relief, the ocurt of common pleas may order the construction of sediment control improvements or implementation of other control measures and may assess a civil fine of not less than one hundred or more than five hundred dollars. Each day of violation of a rule or stop work order issued under this section shall be considered a separate violation subject to a civil fine.

.06 The person to whom a stop work order is issued under this section may appeal the order to the court of common pleas of the ocunty in which it was issued, seeking any equitable or other appropriate relief from that order.

.07 No stop order shall be issued under this section against any public highway, transportation, or drainage improvement or maintenance project undertaken by a government agency or political subdivision in accordance with a statement of its standard sediment control policies that is approved by the board or the chief of the division of soil and water conservation in the department of natural resources.

SECTION 607 OWNERSHIP AND MAINTENANCE

.01 The Regional Planning Commission of Warren County may require the owner and/or the developer to ??????????outlined in Ohio Revised Code, Chapter 6117 of the Ohio Revised Code. The Planning Commission may require of the owner and/or developer any one or all of the following prerequisites:

a. benefit two or more property owners.

b. are designed for cost-effective maintenance.

c. Are determined by the Regional Planning Commission of Warren County or appropriately authorized approving agent(s) to be appropriate additions to this jurisdiction's existing storm drainage systems.

d. Are not better suited for private maintenance by an individual or group of property owner(s), with ultimate responsibility for maintenance in the event of default on the part of the owner(s) remaining jurisdiction.

.02 Permanent runoff control installations which are to be privately owned and maintained by an individual or group of property owner(s) shall be:

a. designed and constructed by the developer with easements sufficient to allow adequate access for inspections and corrective actions, if necessary, by the Warren County Engineer's Office.

b. regularly inspected by the Warren County Engineer's Office to ensure privately owned installations are being properly maintained and, if not, shall be repaired by them at the expense of the responsible owner(s).

c. maintained as installed by the developer according to the approved design and not be altered unless approved by the Warren County Engineer. This covenant shall be enforceable by injunction procedures by the grantors, their heirs, assignees and Warren County.

APPENDIX A

Rainfall Intensity (Inches/Hour)

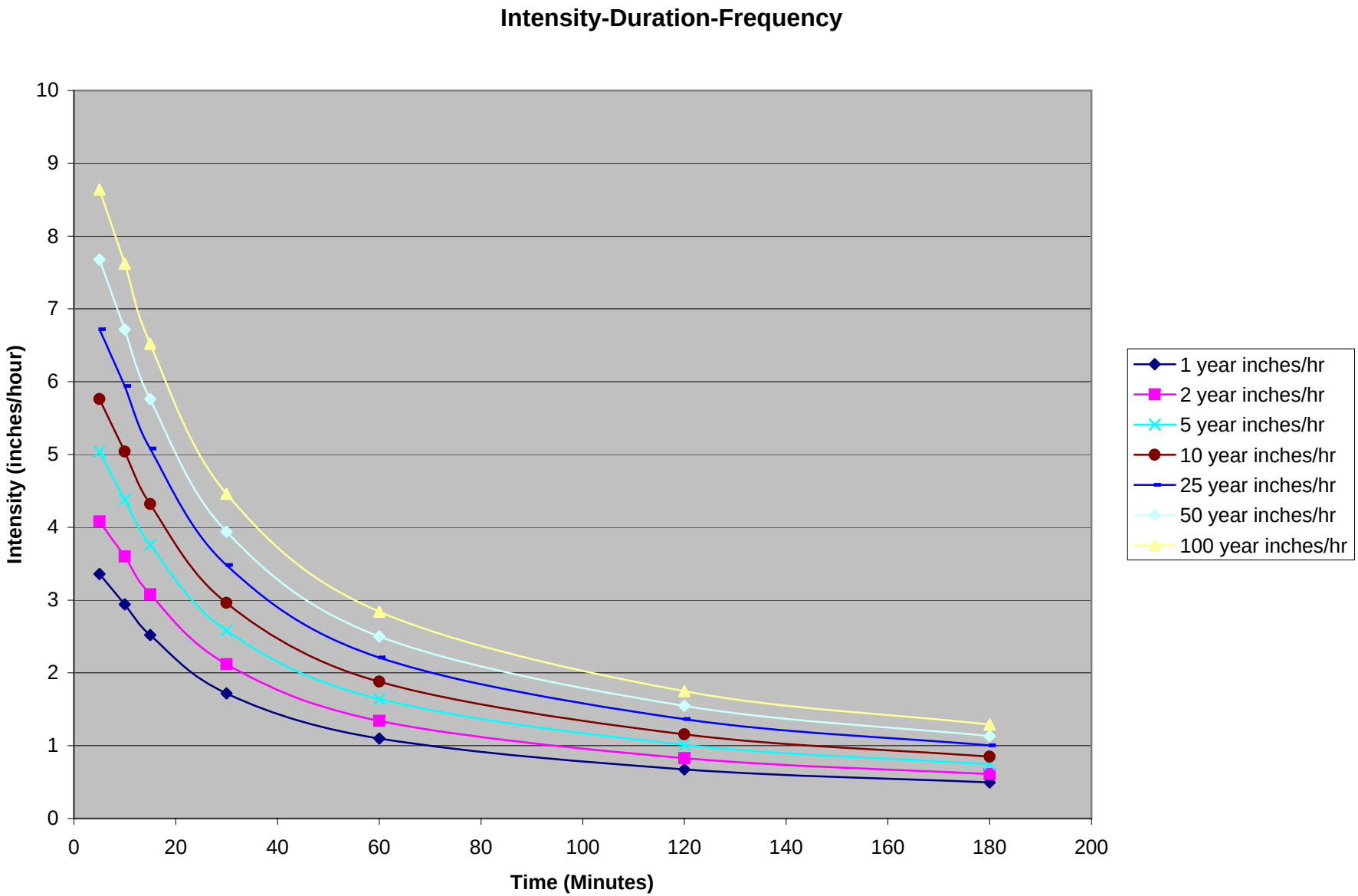
Time (Minutes)	Hours	1-Year Inches/Hour	2-Year Inches/Hour	5-Year Inches/Hour	10-Year Inches/Hour	25-Year Inches/Hour	50-year Inches/Hour	100-Year Inches/Hour
5		3.36	4.08	5.04	5.76	6.72	7.68	8.84
10		2.94	3.60	4.38	5.04	5.94	6.72	7.62
15		2.52	3.08	3.76	4.32	5.08	5.76	6.52
30		1.72	2.12	2.58	2.96	3.48	3.94	4.46
60	1	1.10	1.34	1.64	1.88	2.21	2.50	2.84
120	2	0.68	0.83	1.01	1.16	1.37	1.55	1.75
180	3	0.50	0.61	0.74	0.85	1.00	1.13	1.29
360	6	0.29	0.36	0.44	0.50	0.59	0.67	0.76
720	12	0.17	0.21	0.25	0.29	0.34	0.39	0.44
1080	18	0.12	0.15	0.18	0.21	0.25	0.28	0.32
1440	24	0.10	0.12	0.15	0.17	0.20	0.22	0.25

Data Taken From: "Rainfall Frequency Atlas of the Midwest" "Bulletin 71)

Total Rainfall (Inches)

Time (Minutes)	Hours	1-year Total Inches	2-Year Total Inches	5-Year Total Inches	10-Year Total Inches	25-Year Total Inches	50-Year Total Inches	100-Year Total Inches
5		0.28	0.34	0.42	0.48	0.56	0.64	0.72
10		0.49	0.60	0.73	0.84	0.99	1.12	1.27
15		0.63	0.77	0.94	1.08	1.27	1.44	1.63
30		0.86	1.06	1.29	1.48	1.74	1.97	2.23
60	1	1.10	1.34	1.64	1.88	2.21	2.50	2.84
120	2	1.35	1.66	2.02	2.31	2.73	3.09	3.50
180	3	1.49	1.83	2.23	2.55	3.01	3.40	3.87
360	6	1.75	2.14	2.62	2.99	3.52	3.99	4.53
720	12	2.03	2.49	3.04	3.47	4.09	4.63	5.25
1080	18	2.19	2.69	3.28	3.75	4.42	5.00	5.68
1440	24	2.33	2.86	3.49	3.99	4.70	5.32	6.04

Data Taken From: "Rainfall Frequency Atlas of the Midwest" "Bulletin 71)


Intensity-Duration-Frequency
Intensity (inches/hour)
Time (Minutes)
0
1
2
3
4
5
6
7
8
9
10
0
20
40
60
80
100
120
140
160
180
200
1 year inches/hr
2 year inches/hr
5 year inches/hr
10 year inches/hr
25 year inches/hr
50 year inches/hr
100 year inches/hr

ROCK CHANNEL PROTECTION AT CULVERT AND STORM SEWER OUTLETS

1107-1
METRIC UNITS
REFERENCE SECTION
1107.2

NOTES

Rock size (150,300, 500 mm) indicates the square opening on which 85% of the material, by weight, will be retained.

The width of protection shall be the width of the headwall, with 1.2 m being the minimum.

(Where a stream bed will withstand the calculated velocity without erosion, no rock channel protection will be required.)

LEGEND		ROCK TYPE
①	1.25 m of 500 mm rock	A
②	1.0 m of 500 mm rock	A
③	0.75 m of 300 mm rock	B
④	0.50 m of 150 mm rock	C

APPENDIX B

HYDROLOGIC STUDIES INCORPORATED INTO THESE REGULATIONS:

1) "Bear Run Watershed Hydrologic Study" by Fuller, Mossbarger, Scott & May Engineers, Inc., January, 2002