

ORDINANCE

Amended Sec. 6- Storm Water Control Policy-2-13-06

Amended Sec. 20-Facility Maintenance Responsibility-2-13-06

AN ORDINANCE ESTABLISHING STORM DRAINAGE CONTROL

WHEREAS, the Town Council of the Town of Warren, Indiana, recognize the need for an Ordinance regulating storm water discharge created by new development; and

WHEREAS, it is in the best interests of the citizens of the Town of Warren, Indiana to establish design standards and guidelines to properly plan for and manage storm water discharge which will enable the Town of Warren, Indiana officials to protect citizen health, safety, personal property, and general welfare.

NOW, THEREFORE, BE IT ORDAINED, by the Town Council of the Town of Warren, Indiana, as follows:

STORM DRAINAGE CONTROL

GENERAL PROVISIONS

SECTION	1	Purpose
	2	Authority
	3	Conflicting Ordinances
	4	Compliance with other Ordinances
	5	Definitions
	6	Storm Water Control Policy
	7	Permits for Construction in the Floodway
	8	Prior Approvals
	9	Site Excavation prior to Plan Approval

DESIGN STANDARDS

SECTION	10	Storm Water Plan Submittal Requirements
	11	Determination of Runoff Quantities
	12	Amount of Runoff to be Accommodated by Various Parts of Drainage Facility
	13	Storm Sewer Design Standards
	14	Workmanship and Materials
	15	Open Channel Design Standards
	16	Construction and Materials

DETENTION REOUIREMENTS

SECTION	20	Storm Water Detention
	21	Waivers

PROJECT COMPLETION

	30	Certifications Required
	31	Changes in Plan
	32	Other Requirements

ENFORCEMENT

	90	Disclaimer of Liability
	91	Violations
	92	Appeals
	93	Penalties
	94	Repealer

A General Ordinance Establishing

Storm Drainage Control

GENERAL PROVISIONS

SECTION 1 Purpose:

It is recognized that smaller streams and drainage channels serving the Town of Warren, Indiana may not have sufficient capacity to receive and convey storm water runoff, resulting when land use changes from open or agricultural use to a more urbanized use. It is further recognized that deposits of sediment from developments during and after construction can reduce capacities of storm sewers and drainage systems and result in damages to receiving lakes and streams.

Therefore, it shall be the policy of the Town of Warren, Indiana that the storage and controlled release of storm water runoff shall be required of all new development, redevelopment and other new construction in the Town which requires Subdivision Plat Approval under Section 1050 of the Town of Warren Zoning Ordinance, or which requires Subdivision Plat approval under the Town of Warren Subdivision Code.

Because topography and the availability and adequacy of outlets for storm runoff vary with almost every site, the requirements for storm drainage tend to be an individual matter for any project. It is recommended that each proposed project be discussed with the County Surveyor's office at the earliest practical time in the planning stage.

SECTION 2 Authority:

- A. The Town of Warren Plan Commission has exclusive control over the approval of storm water drainage plans required by this Ordinance.
- B. The County Surveyor is hereby authorized and directed to administer and enforce all of the provisions of this Ordinance.
- C. This Ordinance shall apply to all areas within the jurisdiction of the Town of Warren Plan Commission.

SECTION 3 Conflicting Ordinances:

The provisions of this Ordinance shall be deemed as additional requirements to minimum standards required by other ordinances of the Town. In the case of conflicting requirements, the most restrictive shall apply

SECTION 4 Compliance with Other Ordinance:

In addition to the requirements of this Ordinance, compliance with the requirements set forth in other applicable ordinances with respect to submission and approval of primary and secondary subdivision plats, development plans, building and improvement location permits, construction inspections, appeals, and similar matters, and compliance with applicable State of Indiana statutes and regulations, shall be required.

SECTION 5 Definitions:

For the purpose of this Ordinance, the following definitions shall apply:

- a. Board - The Drainage Board of Huntington County, Huntington Indiana.
- b. Capacity of a Storm Drainage Facility - The maximum flow that can be conveyed or stored by a storm drainage facility without causing damage to public or private property.
- c. Channel - A natural or artificial watercourse which periodically or continuously contains moving water, or which forms a connecting link between two bodies of water. It has a defined bed and banks, which serve to confine the water.
- d. Commission – Town of Warren Plan Commission
- e. Compensatory Storage - An artificial volume of storage within a floodplain used to balance the loss of natural flood storage capacity when artificial fill or structures are placed within the floodplain.
- f. Contiguous - Adjoining or in actual contact with.
- g. Culvert - A closed conduit used for the passage of surface drainage water under a roadway, railroad, canal, or other impediment.
- h. Department - The Huntington Countywide Department of Community Development.
- i. Detention Basin - A facility constructed or modified to restrict the flow of storm water to a prescribed maximum rate, and to detain concurrently the excess waters that accumulates behind the outlet.
- j. Detention Storage - The temporary detaining or storage of storm water in storage basins, on rooftops, in streets, parking lots, school yards, parks, open spaces, or other areas under predetermined and controlled conditions, with the rate of drainage there from regulated by appropriately installed devices.

- k. Development - The construction, reconstruction, conversion, structural alteration, relocation or enlargement of any buildings; or any clearing, grading or other movement of land.
- l. Drainage Area - The area from which water is carried off by a drainage system; a watershed or catchment area.
- m. Drop Manhole - A manhole having a vertical drop pipe connecting the inlet pipe to the outlet pipe. The vertical drop pipe shall be located immediately outside the manhole.
- n. Dry Bottom Detention Basin - A basin designed to be completely dewatered after having provided its planned detention of runoff during a storm event.
- o. Duration - The time period of a rainfall event.
- p. Erosion - Wearing away of the land by running water, waves, temperature changes, ice or wind.
- q. Flood Elevation - the elevation at all locations delineating the maximum level of high waters for a flood of given return period and rainfall duration.
- r. Flood or Flood Waters - The water of any watercourse which is above the banks of the watercourse. It also means the water of any lake, which is above and outside the banks thereof.
- s. Flood Hazard Area - Any flood plain, floodway, floodway fringe, or any combination thereof which is subject to inundation by the regulatory flood; or any flood plain as delineated by Zone A on a Flood Hazard Boundary Map.
- t. Flood Plain - The area adjoining the river or stream, which has been or may hereafter be covered by floodwaters.
- u. Flood Protection Grade - The elevation of the lowest floor of a building. If a basement is included, the basement floor is considered the lowest floor.
- v. Floodway - See Regulatory Floodway.
- w. Floodway Fringe - That portion of the flood plain lying outside the floodway, which is inundated by the regulatory flood.
- x. Footing Drain - A drainpipe installed around the exterior of a basement wall foundation to relieve water pressure caused by high groundwater elevation.

- y. Grade - The inclination or slope of a channel, canal, conduit, etc., or natural ground surface usually expressed in terms of the percentage the vertical rise (or fall) bears to the corresponding horizontal distance.
- z. Impact Areas - Areas defined and mapped by the Board which is unlikely to be easily drained because of one or more factors including but not limited to any of the following: soil type, topography, land where there is not adequate outlet, a floodway or floodplain, land within 75 feet of each bank of any regulated drain or within 75 feet from the centerline of any regulated tile ditch.
- aa. Impervious - A term applied to material through which water cannot pass, or through which water passes with difficulty.
- bb. Inlet- An opening into a storm sewer system for the entrance of surface storm water runoff, more completely described as a storm sewer inlet.
- cc. Junction Chamber - A converging section of conduit, usually large enough for a person to enter, used to facilitate the flow from one or more conduits into a main conduit.
- dd. Lateral Storm Sewer - A sewer that has inlets connected to it but has no other storm sewer connected.
- ee. Manhole - Storm sewer structure through which a person may enter to gain access to an underground storm sewer or enclosed structure.
- ff. Major Drainage System - Drainage system carrying runoff from an area of one or more square miles.
- gg. Minor Drainage Systems - Drainage systems having an area of less than one square mile.
- hh. Off-Site - Everything not on site.
- ii. On-Site - located within the controlled area where runoff originates.
- jj. Outfall - The point or location where storm runoff discharges from a sewer or drain. Also applies to the outfall sewer or channel, which carries the storm runoff to the point of outfall.
- kk. Peak Flow - The maximum rate of flow of water at a given point in a channel or conduit resulting from a particular storm or flood.
- 11. Radius of Curvature - Length of radius of a circle used to define a curve.

- mm. Rainfall Intensity - The cumulative depth of rainfall occurring over a given duration, normally expressed in inches per hour.
- nn. Reach - Any length of river, channel or storm sewer.
- oo. Regulated Area - All of the land under the jurisdiction of the Town of Warren Plan Commission.
- pp. Regulatory Flood - That flood having a peak discharge which can be equaled or exceeded on the average of once in a one hundred (100) year period, as calculated by a method and procedure which is acceptable to the Board. If a permit from the National Resources Commission for construction in the floodway is required (see Section VI), then the regulatory flood peak discharge should be calculated by a method acceptable to the Board and the Natural Resources Commission. This regulatory flood is equivalent to a flood having a probability of occurrence of the one percent (1 %) in any given year.
- qq. Regulatory Floodway - The channel of a river or stream and those portions of the floodplains adjoining the channel which are reasonably required to carry and discharge the peak flow of the regulatory flood of any river or stream.
- rr. Release Rate - The amount of storm water release from a storm water control facility per unit of time.
- ss. Return Period - The average interval of time within which a given rainfall event will be equaled or exceeded once. A flood having a return period of 100 years has a one percent probability of being equaled or exceeded in any one year.
- tt. Runoff Coefficient - A decimal fraction relating the amount of rain which appears as runoff and reaches the storm drainage system to the total amount of rain falling. A coefficient of 0.5 implies that 50 percent of the rain falling on a given surface appears as storm water runoff.
- uu. Sediment - Material of soil and rock origin, transported, carried or deposited by water.
- vv. Siphon - A closed conduit or portion of which lies above the hydraulic grade line, resulting in a pressure less than atmospheric and requiring a vacuum within the conduit to start flow. A siphon utilizes atmospheric pressure to effect or increase the flow of water through a conduit. An inverted siphon is used to carry storm water flow under an obstruction such as a sanitary sewer.
- ww. Spillway - A waterway in or about a hydraulic structure, for the escape of excess water.

- xx. Stilling Basin - A basin used to slow water down or dissipate its energy.
- yy. Storage Duration - The length of time that water may be stored in any storm —water control facility, computed from the time water first begins to be stored.
- zz. Storm Sewer - A closed conduit for conveying collected storm water.
- aaa. Storm Water Drainage System - All means, natural or man-made, used for conducting storm water to, through or from a drainage area to any of the following: conduits and appurtenant features, canals, channels, ditches, streams, culverts, streets and pumping stations.
- bbb. Storm Water Runoff - The water derived from rains falling within a tributary basin, flowing over the surface of the ground or collected in channels or conduits.
- ccc. Tributary - Contributing storm water from upstream land areas.
- ddd. Urbanization - The development, change or improvement of any parcel of land consisting of one or more lots for residential, commercial, industrial, institutional, recreational or public utility purposes.
- eee. Watercourse - Any river, stream, creek, brook, branch, natural or man-made drainage way in or into which storm water runoff of floodwaters flow either regularly or intermittently.
- fff. Watershed - See Drainage Area.
- ggg. Wet Bottom Detention Basin (Retention Basin) - A basin designed to retain a permanent pool of water after having provided its planned detention of runoff during a storm event.

Section 6: Storm Water Control Policy

It is recognized that the smaller streams and drainage channels serving Town of Warren may not have sufficient capacity to receive and convey storm water runoff resulting from continued urbanization. Accordingly, the storage and controlled release rate of excess storm water runoff shall be required for any development, redevelopment and new construction located within Town of Warren which requires Development Plan approval under Section 1050 of the Town of Warren Zoning Ordinance, or which requires Subdivision Plat approval under the Town of Warren Subdivision Code.

The release rate of storm water from development, redevelopments, and new construction may not exceed the storm water runoff from the land area in its present state of development. The developer must submit to the Town, detailed computations of runoff before and after development, redevelopment or new construction which demonstrate that runoff will not be increased.

These computations must show that the control devices will limit the discharge to a rate such that the release rate from the site is no greater than the 2-year predeveloped rate for 0-10 year return interval storms and the 10-year predeveloped rate for 11-100 year return interval storms. That is, all storms up to and including the 10-year return period storm must be detained at a release rate below the predeveloped peak 2-year return period storm water runoff rate. The release rate for developments and redevelopments for the 11-100 year return period storms shall not exceed the predeveloped peak 10-year return period rate. Note: The allowable release rates may be reduced from these levels if downstream restrictions exist.

Computations for areas up to and including two-hundred (200) acres may be based on the Rational Method; typical runoff coefficients are listed herein. For areas larger than two-hundred (200) acres, hydrography techniques and/or computer drainage modeling methods may be used. Hydrograph techniques and computer modeling methods used to determine storm water runoff shall be proven methods subject to approval of the County

SECTION 7 Permits for Construction in the Floodway

Chapter 318 of the Acts of 1945, as amended, Sections 17 and 19, require the Natural Resources Commission approval of any construction in a floodway, and of any works for flood control. This includes bridges, dams, levees, dikes, floodwalls, wharves, piers, dolphins, booms, weirs, bulkheads, jetties, groins, excavations, fills or deposits of any kind, utility lines, or any other building, structure, or obstruction. Also, any ditch work (new construction, deepening or modification) within one half mile of a public freshwater lake of 10 acres or more in area.

The approval of the Natural Resources Commission, in writing, must be obtained before beginning construction.

All applications should be made on the standard application form provided by the Natural Resources Commission and should be accompanied by plans, profiles, specifications, and other data necessary for the Natural Resources Commission to determine the effect of the proposed construction upon the floodway and on flood control in the state.

Applications made to and approval granted by the Natural Resources Commission does not in any way relieve the owner of the necessity of securing easements or other property rights, and permits and/or approvals from affected property owners and local, state, and federal agencies.

The engineering staff of the Division of Water is available to discuss and offer suggestions regarding requirements in the design of structures in floodways. High water marks have been set on many of the streams in the state, and information is available from the Division of Water on actual and/or potential flooding. Information regarding benchmarks set to Mean Sea Level Datum, General Adjustment of 1929, is available from the Division of Water, Surveying and Mapping Section.

Applications are considered by the Commission at regular meetings usually held each month. After the application and plans have been approved by the Commission, a certificate of approval is forwarded to the applicant.

A fee is charged by the Commission for approvals under the Flood Control Act. Unless stated otherwise in the approval, construction is considered to be a permanent development, and no renewals of the approval are necessary, except in the cases where temporary approvals are granted for temporary construction. The right is reserved to require additional data where necessary.

SECTION 8 Prior Approvals:

Any subdivision plat or development plan which has had its drainage plan approved by the County prior to the effective date of this Ordinance shall be exempt from all of the requirements of this Ordinance.

SECTION 9 Site Excavation Prior to Plan Approval

If a development is proposed for a property wherein development wherein development plan approval is required, no site excavation work shall begin prior to said development plan being approved. Site excavation work includes, but is not limited to, tree removal, site grading, filling, dredging, pond excavation, driveway placement, installation of utility lines, or building pad preparation.

DESIGN STANDARDS

SECTION 10 Storm Water Plan Submittal Requiirements:

- A. The following information and data provided by an Indiana licensed professional engineer, architect or land surveyor engaged in storm drainage design shall be submitted to the Town at the time of application for development plan review or subdivision plat review:
 - (1) The extent and area of each watershed affecting the design of detention facilities as shown on USGS Quadrangle Maps or other detailed maps as required by the Commission.
 - (2) A topographic map of the site to be developed and such adjoining land whose topography may affect the layout or drainage of the development. Contour interval shall be one foot when slopes are less that four percent and shall be two feet when the slope exceeds for percent. Topographic map shall also included:
 - a. Locations, cross sections and profiles of existing streams and floodplains, and new channels to be constructed.
 - b. Locations of regulated drains, farm drains, inlets and outfalls, if any of record.

- c. Storm, sanitary, and combined sewers and outfalls, if any of record.
 - d. Septic tank systems and outlets, if any of record.
- (3) The preliminary layout and design of proposed storm sewers, the outfall and outlet locations and approximate elevations, the receiving stream or channel and its 100 year return period water elevation.
 - (4) The location and design of the proposed street system, especially including depressed pavements used to convey or temporarily store overflow from the heavier rainstorms, and the outlets for such overflow.
 - (5) The materials, elevations, waterways openings, and the basis for design of proposed culverts and bridges.
 - (6) Existing detention ponds and basins to be maintained, enlarged, or otherwise altered and new ponds or basins to be built and the basis to their design.
 - (7) The estimated depth and amount of storage required in the new ponds or basins.
 - (8) The estimated location and percentage of impervious surfaces existing and expected to be constructed when the development is completed.
 - (9) All hydrologic and hydraulic computation should be included in the submittal. These calculations should include runoff curve numbers or runoff coefficients; runoff calculations; stage-discharge relationships; times of concentration; and storage volume.
 - (10) Soil erosion and sediment control plan.
- B. One or more typical cross sections must be provided showing all existing and proposed channels or other open drainage facilities carried to a point above the 100 year high water elevation; showing the elevation of the existing land and the proposed changes thereto, together with the high water elevations expected from the 100 year storm under the controlled conditions called for by this Ordinance, and showing the relationship of structures, streets, and other facilities.
- C. Five (5) copies of the storm water plan shall be submitted with the development plan or subdivision plat application.

SECTION 11 Determination of Runoff Quantities:

Runoff quantities shall be computed for the area of the parcel under development plus the area of the watershed flowing into the parcel under development. The quantity of runoff, which is generated as the result of a given rainfall intensity may be calculated as follows:

- A. For areas up to and including 200 acres, the Rational Method may be used, In the Rational Method, the peak rate of runoff, Q , in cubic feet per second is computed as:

$$Q=CIA$$

where: C = runoff coefficient, representing the characteristics of the drainage area and defined as the ratio of runoff to rainfall. I = average intensity of rainfall in inches per hour for a duration equal to the time of concentration (tc) for a selected rainfall frequency. A = tributary drainage area in acres. Guidance to selection of the runoff coefficient "C" is provided by Table 1 and Table 1A, which show values for different types of surface and local soil characteristics. The composite "C" value used for a given drainage are with various surface types shall be the weighted average value for the total area calculated from a breakdown of individual areas having different surface types.

Table 2 provided runoff coefficients and inlet times for different land use classifications. In the instance of undeveloped land situated in an upstream area, a coefficient or coefficients shall be used for this area in its present or existing state of development.

TABLE 1
Urban Runoff Coefficients

Type of Surface	Runoff Coefficient "C"
Asphalt	0.82
Concrete	0.85
Roof	0.85
Lawns (Sandy)	
Flat (0-2% Slope)	0.07
Rolling (2-7% Slope)	0.12
Steep (greater than 7%)	0.17
Lawns (Clay)	
Flat (0-2% Slope)	0.16
Rolling (2-7% Slope)	0.21
Steep (greater than 7%)	0.30

The coefficients of this tabulation are applicable to storms of 5 to 10 year frequencies. Coefficients for less frequent higher intensity storms shall be modified as follows:

<u>Return Period (yrs)</u>	<u>Multiply "C" by</u>
25	1.1
50	1.2
100	1.25

TABLE 1A

Rural Runoff Coefficients

<u>Type of Surface</u>	<u>Runoff Coefficient "C"</u>
Woodland (Sandy)	
Flat (0-5% Slope)	0.10
Rolling (5-10% Slope)	0.25
Steep (greater than 10%)	0.30
Woodland (Clay)	
Flat	0.30
Rolling	0.35
Steep	0.50
Pasture (Sandy)	
Flat	0.10
Rolling	0.16
Steep	0.22
Pasture (Clay)	
Flat	0.30
Rolling	0.36
Steep	0.42
Cultivated (Sandy)	
Flat	0.30
Rolling	0.40
Steep	0.52
Cultivated (Clay)	
Flat	0.52
Rolling	0.60
Steep	0.72

The coefficients of this tabulation are applicable to storms of 5 to 10 year frequencies. Coefficients for less frequent higher intensity storms shall be modified as follows:

<u>Return Period (yrs)</u>	<u>Multiply "C" by</u>
25	1.1
50	1.2
100	1.25

TABLE 2

Runoff Coefficients "C" By Land Use And Typical Inlet Times

LAND USE	Runoff Coefficients			Inlet Time (minutes)
	Flat	Rolling	Steep	
Commercial (CBD)	0.75	0.83	0.91	5
<i>Commercial(Neighborhood)</i>		0.5	0.60	0.66
Industrial	0.63	0.70	0.77	5-10
Garden Apartments	0.54	0.60	0.66	5-10
Churches	0.54	0.60	0.66	5-10-
Schools	0.31	0.35	0.39	10-15
Semi Detached Residential	0.45	0.50	0.55	10-15
Detached Residential	0.40	0.45	0.50	10-15
Quarter Acre Lots	0.36	0.45	0.44	10-15
Half Acre Lots	0.31	0.35	0.39	10-15
Parkland	0.18	0.20	0.22	To Be Computed

1. Flat terrain 0-2% slopes.
2. Rolling terrain 2-7% slopes.
3. Steep terrain greater than 7% slopes.

4. Interpolation, extrapolation and adjustment for local conditions shall be based on engineering experience and judgment.
5. The coefficients of this tabulation are applicable to storms of 5 to 20 year frequencies. Coefficients for less frequent higher intensity storms shall be modified as follows:

Return Period	Multiply "C" by
25	1.1
50	1.2
100	1.25

Rainfall intensity shall be determined from the rainfall frequency curves shown in Figure 1 or from data shown in Table 5A. The time on concentration (t_c) to be used shall be the sum of the inlet time and flow time in the drainage facility from the most remote part of the drainage area to the point under consideration. The flow time in the storm sewers may be estimated by the distance in feet divided by velocity of flow in feet per second. The velocity shall be determined by the Manning Formula.

Inlet time is the combined time required for the runoff to reach the inlet of the storm sewer. It included overland flow time and flow time through established surface drainage channels such as swales, ditches and sheet flow across such areas as lawns, fields, and other graded surfaces. It may be computed by using Figure 2.

- B. The runoff rate for areas in excess of 200 acres shall be determined by methods described in Section XIV, subsection F.

SECTION 12 Amount of Runoff to be Accommodated by Various Parts of Drainage Facility:

Various parts of a drainage facility must accommodate runoff water as follows:

- A. The minor drainage system such as inlets, catch basins, Street gutters, swales, sewers and small channels, which collect storm water, must accommodate peak runoff from a 10-year return period storm. Rainfall duration shall be equal to the time of concentration or one hour if the time of concentration is less than one hour. A first quartile storm distribution shall be used for computer modeling. These minimum requirements must be satisfied:
 - (1) The allowable spread of water on Collector Streets is limited to maintaining two clear 10-foot moving lanes of traffic. One lane is to be maintained on Local roads, while Places can have a water-spread equal to one-half of their width.

- (2) Open channels carrying peak flows greater than 30 cubic feet per second shall be capable of accommodating peak runoff for a 50 year return period storm within the drainage easement.
- (3) Culverts shall be capable of accommodating peak runoff from a 50-year return period storm when crossing under a road, which is part of the Indiana Department of Highways rural functional classification system and are classified as principal or minor arterial, major or minor collector roads.

B. Major drainage systems are defined in Section IV, subsection CC and shall be designed in accordance with Indiana Department of Natural Resources Standards as described in Section VI.

SECTION 13 Storm Sewer Design Standards:

All storm sewers, whether private or public, and whether constructed on private or public property shall conform to the design standards and other requirements contained herein.

A. Manning Equation

The hydraulic capacity of storm sewer shall be determined using Manning’s Equations:

$$V = \frac{1.486 P^{2/3} S^{1/2}}{N}$$

V = mean velocity of flow in feet per second

R = the hydraulic radius in feet

S = the slope of the energy grade line in feet per foot

N = roughness coefficient

The hydraulic radius, R, is defined as the cross sectional area of flow divided by the wetted flow surface or wetted perimeter. Typical “n” values and maximum permissible velocities for storm sewer materials are listed in Table 3. Roughness coefficient (n) values for other sewer materials can be found in standard hydraulics texts and references.

B. Minimum Size:

The minimum size of all storm sewers shall be 12 inches. Rate of release for detention storage shall be controlled by an orifice plate or other devices, subject to approval of the County Surveyor, where the 12-inch pipe will not limit rate of release as required.

TABLE 3

Typical Values of Manning's n

Material	Manning's n	
Closed Conduits		
Concrete	0.013	15 f.p.s.
Vitrified Clay	0.013	15 f.p.s.
Brick	0.015	15 f.p.s.
Cast Iron	0.013	15 f.p.s.
Circular Corrugated Metal Pipe, Annular Corrugations, 2 2/3 x 1/2 in.		
Unpaved	0.024	7 f.p.s.
25% Paved	0.021	7 f.p.s.
50% Paved	0.018	7 f.p.s.
100% Paved	0.013	7 f.p.s.
Circular Corrugated Metal Pipe, Helical, 2 2/3 x 1/2 in. Unpaved Corrugations		
12"	0.011	
18"	0.013	
24"	0.015	
36"	0.018	
48"	0.020	
60" or larger	0.021	
Corrugated Polyethylene Smooth Interior Pipe	0.012	15 f.p.s.
Concrete Culverts	0.013	
Open Channels		
Concrete, Trowl Finish	0.013	
Concrete, Broom or Float Finish	0.015	
Gumte	0.018	
Riprap Placed	0.030	
Riprap Dumped	0.035	

Gabion	0.028
New Earth (Uniform, Sodded, Clay)	0.025
Existing Earth (Fairly Uniform, with some weeds)	0.030
Dense Growth of Weeds	0.040
Dense Weeds and Brush	0.040
Swale With Grass	0.035

C. Grade:

Sewer grade shall be such that, in general, a minimum of two feet of cover is maintained over the top of the pipe. Pipe cover less than the minimum may be used only upon approval of the County Surveyor. Uniform slopes shall be maintained between inlets, manholes and inlets to manholes. Final grade shall be set with full consideration of the capacity required, sedimentation problems and other design parameters. Minimum and maximum allowable slopes shall be those capable of producing velocities of two and one-half and 15 feet per second, respectively, when the sewer is flowing full.

D. Alignment:

Storm sewers shall be straight between manholes in so far as possible. Where long radius curves are necessary to conform to Street layout, the minimum radius of curvature shall be no less than 100 feet for sewers 42 inches and larger in diameter. Deflection of pipe sections shall not exceed the maximum deflection recommended by the pipe manufacturer. The deflection shall be uniform and finished installation shall follow a smooth curve.

E. Manholes:

Manholes shall be installed to provide access to continuous underground storm sewers for the purpose of inspection and maintenance. Manholes shall be provided at the following locations:

1. Where two or more storm sewers converge.
2. At the point of beginning or at the end of a curve, and at the point of reverse curvature (PC, PT, PRC).
3. Where pipe size changes.
4. Where an abrupt change in alignment occurs.
5. Where a change in grade occurs.
6. At suitable intervals in straight sections of sewer.

The maximum distance between storm sewer manholes shall be as follows:

Size of Pipe (inches)	Maximum of Distance (feet)
12 thru 42	400
48 and larger	600

F. Inlets:

Inlets or drainage structures shall be utilized to collect surface water through grated openings and convey it to storm sewers, channels or culverts. Inlet design and spacing shall be in accordance with Section 7-400 of the Indiana Department of Highways Road Design Manual Volume 1 or other approved design procedure. The inlet grate opening provided must be adequate to pass the design 10-year flow with 50% of the sag inlet areas clogged. An overflow channel from sag inlets to the overflow channel or basin shall be provided at sag inlets, so that the maximum depth of water that might be ponded in the street sag shall not exceed 7 inches.

SECTION 14 Workmanship and Materials:

A. Workmanship:

The specifications for the construction of storm sewers shall not be less stringent than those set forth in the latest edition of the Indiana Department of Highways' "Standard Specifications"; additionally, ductile iron pipe shall be laid in accordance with American Water Works Association (AWWA) C-600 and clay pipe shall be laid in accordance with American Society of Testing Materials (ASTM) C-12.

B. Materials:

Storm sewer manholes and inlets shall be constructed of masonry, cast in place concrete or precast reinforced concrete. Material and construction shall conform to Indiana Department of Highways' "Standard Specifications", Section 720.

Pipe and fittings used in storm sewer construction shall be extra strength clay pipe (ASTM C700), ductile iron pipe (AWWA C-1), or concrete pipe (ASTM C-76). Other pipe and fittings not specified herein may be used only when specifically authorized by the Commission. Pipe joints shall be flexible and watertight and shall conform to the requirements of Section 715.02 Materials, of the latest edition of the Indiana Department of Highways' "Standard Specifications".

C. Special Hydraulic Structures:

Special hydraulic structures required to control the flow of water in storm runoff drainage systems include junction chambers, drop manholes, inverted siphons, stilling basins, and other special structures. The use of these structures shall be limited to those locations justified by prudent planning and by careful and thorough hydraulic engineering analysis.

SECTION 15 Open Channel Design Standards:

All open channels, whether private or public, and whether constructed on private or public land, shall conform to the design standards and other design requirements contained herein.

A. Manning Equation:

The waterway for channels shall be determined using Manning's Equation.

$$Q = AV = A \frac{1.486 R^{2/3} S^{1/2}}{N}$$

Where: A = Waterway area of channel in square feet

Q = Discharge in cubic feet per second (cfs)

V, R, S & n are explained in Paragraph XA.

B. Channel Cross-Section and Grade

The required channel cross-section and grade are determined by the design capacity, the material in which the channel is to be constructed, and the requirements for maintenance. A minimum depth may be required to provide adequate outlets for subsurface drains, tributary ditches, or streams. The channel grade shall be such that the velocity in the channel is high enough to prevent siltation but low enough to prevent erosion. Velocities less than 1.5 feet per second should be avoided because siltation will take place and ultimately reduce the channel cross section. The maximum permissible velocities in vegetal-lined channels are shown in Table 4. Developments through which the channel is to be constructed must be considered in design of the channel section.

C. Side Slopes:

Earthen channel side slopes shall be no steeper than 2 to 1. Flatter slopes may be required to prevent erosion and for ease of maintenance. Where channels will be lined, side slopes shall be no steeper than 1-1/2 to 1 with adequate provisions made for weep holes. Side slopes steeper than 1-1/2 to 1 may be used for lined channels provided that the side lining and structural retaining wall are designed and constructed with provisions for live and dead load surcharge.

TABLE 4

Maximum Permissible Velocities in Vegetal - Lined Channels

	Cover	Permissible Velocity (1)	
		Slope range (2) (percent)	Erosion Resistant Easily Eroded Soils (ft. per sec.) (ft. per sec.)
Bermudagrass	0-5	8	6
	5-10	7	5
	Over 10	6	4
Bahia			
Buffalograss			
Kentucky bluegrass		0-5	7 5
Smooth brome		5-10	6 4
Blue grama over 10		5	3
Grass mixtures		(2) 0-5	5 4
Reed canarygrass		5-10	4 3
Lespedize sericea			
Weeping lovegrass		(3)	
Yellow Bluestem		0-5	3.4 2.5
Redtop			
Alfalfa			
		Red fescue	
Common lespedeza (4) (5)			
Sudangrass(4) 0-5		3.5	2.5

-
- (1) Use velocities exceeding 5 feet per second only where good converse and proper maintenance can be obtained.
 - (2) Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
 - (3) Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with stone, concrete, or highly resistant vegetative center section.

- (4) Annuals--use on mild slopes or as temporary protection until permanent converse are established.
- (5) Use on slopes steeper than 5 percent is not recommended.

D. Channel Stability

- (1) Characteristics of a stable channel are:
 - (a) It neither aggrades nor degrades beyond tolerable limits.
 - (b) The channel banks do not erode to the extent that the channel cross section is changed appreciably.
 - (c) Excessive sediment bars do not develop.
 - (d) Excessive erosion does not occur around culverts, bridges or elsewhere.
 - (e) Gullies do not form or enlarge due to the entry of uncontrolled surface flow to the channel.

Channel stability shall be determined for an aged condition and the velocity shall be based n the design flow or the bank full flow, whichever is greater, using “n” values for various channel linings as shown in Table 3. In no case is it necessary to check channel stability for discharge greater than that from a 100-year return period storm.

- (3) Channel stability must be checked for conditions immediately after construction. For this stability analysis, the velocity shall be calculated for the expected flow from a ten-year return period storm on the watershed, or the bank full flow, whichever is smaller. The “n” value for newly constructed channels in fine-grained soils and sands may be determined in accordance with the National Engineering Handbook 5, Supplement B, Soil Conservation Service and shall not exceed 0.025. The allowable velocity in the newly constructed channel may be increased by a maximum of 20 percent to reflect the effects of vegetation to be established under the following conditions:
 - (a) The soil and site in which the channel is to be constructed are suitable for rapid establishment and support of erosion controlling vegetation.
 - (b) Species of erosion controlling vegetation adapted to the area, and proven methods of establishment are shown.
 - (c) The channel design includes detailed plans for establishment of vegetation on the channel side slopes.

E. Drainage of Waterways:

Vegetated waterways that are subject to low flows of long duration or where wet conditions prevail shall be drained with a tile system or by other means such as paved gutters. Tile lines may be outletted through a drop structure at the end of the waterway or through a standard tile outlet.

F. Establishment of New Regulated Drain:

When the Board determines it is necessary to establish a new Regulated Drain, each developer must provide the necessary information and meet the requirements of the 1965 Indiana Drainage Code, as amended, for the establishment of a new Regulated Drain. The Board shall determine the necessary easements for adequate maintenance of any new Regulated Drain.

G. Appurtenant Structures:

The design of channels will provide all structures required for the proper functioning of the channel and the laterals thereto and travel ways for operation and maintenance. Recessed inlets and structures needed for entry of surface and subsurface flow into channels without significant erosion or degradation shall be included in the design of channel improvements. The design is also to provide the necessary flood gates, water level control devices, and any other appurtenance affecting the functioning of the channels and the attainment of the purpose for which they are built.

The effect of channel improvements on existing culverts, bridges, buried cables, pipelines and inlet structures for surface and subsurface drainage on the channel being improved and laterals thereto shall be evaluated to determine the need for modification or replacement. Culverts and bridges which are modified or added as part of channel improvement projects shall meet reasonable standards for the type of structure, and shall have a minimum capacity equal to the design discharge or governmental agency design requirements, whichever is greater.

H. Disposition of Spoil:

Spoil material resulting from clearing, grubbing and channel excavation shall be disposed in such a manner which will:

- (1) Minimize over bank wash.
- (2) Provide for the free flow of water between the channel and floodplain unless the valley routing and water surface profile are based on continuous dikes being installed.
- (3) Not hinder the development of travel ways for maintenance.

- (4) Leave the right-of-way in the best condition feasible, consistent with the project purposes, for productive use by the owner.
- (5) Improve the aesthetic appearance of the site to the extent feasible. . J
- (6) Be approved by the IDNR or US Army Corps of Engineers (whichever is applicable) if deposited in the floodway.

SECTION 16 Construction and Materials:

A. Construction:

Specifications shall be in keeping with the current standards of engineering practice and shall describe the requirements for proper installation of the project to achieve its intended purpose.

B. Materials:

Materials acceptable for use as channel lining are:

1. Grass
2. Revetment Riprap
3. Concrete
4. Hand-laid Riprap
5. Precast Cement Concrete Riprap
6. Grouted Riprap
7. Gabions

Other lining materials shall receive specific approval of the County Surveyor. Materials shall comply with the latest edition of the Indiana Department of Highways' "Standards Specification".

SECTION 20 Storm Water Detention:

The following shall govern the design of any improvement with respect to the detention of storm water runoff.

A. Acceptable Detention Methods:

The increased storm water runoff resulting from a proposed development shall be detained on-site by the provisions of appropriate wet or dry bottom reservoirs, by storage on flat roofs, parking lots, streets, lawns, or other acceptable techniques. Measures which retard the rate of J overland flow and the velocity in runoff channels shall also be used to control the runoff rate partially. Detention basins shall be sized to store excess flows from storms with a one hundred (100) year return period. Control devices shall limit the discharge to a rate no greater than that prescribed by this Ordinance (see Sections 20~E] and 20

B. Design Storm:

Design of storm water detention facilities shall be based on a return period of once in 100 years. The storage volume and outflow rate shall be sufficient to handle storm water runoff from a critical duration storm, as defined in sections 20(E) and 20(F). Rainfall depth -duration-frequency relations and intensity-duration-frequency relations shall be those given in Tables 5 and 5A.

C. Allowable Release Rate:

The allowable release rate of storm water originating from a proposed development shall not exceed the amount specified in Section 6 - **Storm Water Control Policy**, and as described in Sections 20(E) and 20(F).

In the event the natural downstream channel or storm sewer system is inadequate to accommodate the release rate provided above, then the allowable release rate shall be reduced to that rate permitted by the capacity of the receiving downstream channel or storm sewer system and additional detention as determined by the County Surveyor shall be required to store that portion of the runoff exceeding the capacity of the receiving sewers or waterways.

If more than one detention basin is involved in the development of the area upstream of the limiting restriction, the allowable release rate from any one detention basin shall be in direct proportion to the ratio of its drainage area to the drainage area of the entire watershed upstream of the restriction.

TABLE 5

RAINFALL DEPTHS FOR VARIOUS RETURN
PERIODS AND STORM DURATIONS

Duration	Depth (Inches)					
	Return				Period (Years)	
	2	5	10	25	50	100
5 mm.	0.42	0.52	0.59	0.68	0.75	0.82
10 mm.	0.64	0.79	0.91	1.04	1.15	1.25
15mm.	0.80	0.99	1.13	1.29	1.43	1.55
20mm.	0.95	1.17	1.34	1.53	1.70	1.85
30mm.	1.11	1.37	1.57	1.79	1.98	2.16
40mm.	1.23	1.52	1.74	1.99	2.20	2.40
50 mm.	1.33	1.64	1.87	2.14	2.36	2.58
60mm.	1.40	1.73	1.97	2.26	2.49	2.72
1.5 hrs.	1.70	2.09	2.39	2.72	3.03	3.30
2 hrs.	1.71	2.11	2.41	2.76	3.05	3.33
3 hrs.	1.84	2.27	2.6	2.97	3.29	3.59
4 hrs.	2.06	2.54	2.90	3.31	3.67	4.00
5 hrs.	2.16	2.66	3.04	3.48	3.85	4.20

RAINFALL DEPTHS FOR VARIOUS RETURN
PERIODS AND STORM DURATIONS

Duration	Depth (Inches)					
	Return				Period (Years)	
	2	5	10	25	50	100
6 hrs.	2.22	2.74	3.13	3.58	3.96	4.32
7 hrs.	2.31	2.85	3.26	3.72	4.12	4.49
8 hrs.	2.35	2.90	3.32	3.79	4.20	4.58
9 hrs.	2.42	2.99	3.41	3.90	4.32	4.71
10 hrs.	2.49	3.07	3.51	4.01	4.44	4.84
12 hrs.	2.58	3.18	3.63	4.15	4.59	5.01
14 hrs.	2.66	3.29	3.76	4.30	4.75	5.18
16 hrs.	2.75	3.40	3.68	4.44	4.91	5.39

18 hrs.	2.82	3.48	3.98	4.55	5.03	5.49
20 hrs.	2.89	3.56	4.07	4.65	5.15	5.62
24 hrs.	3.00	3.70	4.23	4.83	5.35	5.83

TABLE 5A

RAINFALL INTENSITIES FOR VARIOUS RETURN PERIODS AND STORM DURATIONS

Duration	Intensity (Inches/Hour)					
	Return Period (Years)					
	2	5	10	25	50	100
5 mm.	5.04	6.24	7.08	8.16	9.00	9.84
10 mm.	3.84	7.74	5.46	6.24	6.90	7.50
15 min.	3.20	3.96	4.52	5.16	5.72	6.20
20 min.	2.85	3.51	4.02	4.59	5.10	5.55
30 min.	2.22	2.74	3.12	3.58	3.96	4.32
40 min.	1.85	2.28	2.61	2.99	3.30	3.60
50mm.	1.60	1.97	2.24	2.57	2.83	3.10
60mm.	1.40	1.73	1.97	2.25	2.49	2.72
1.5 hrs.	1.13	1.39	1.59	1.82	2.02	2.20
2 hrs.	0.86	1.06	1.21	1.38	1.53	1.67
3 hrs.	0.61	0.76	0.87	0.99	1.10	1.20
4 hrs.	0.52	0.64	0.73	0.83	0.92	1.00
5 hrs.	0.43	0.53	0.61	0.70	0.77	0.84
6 hrs.	0.37	0.46	0.52	0.60	0.66	0.72
7 hrs.	0.33	0.41	0.47	0.53	0.59	0.64
8 hrs.	0.29	0.36	0.42	0.47	0.53	0.57
9 hrs.	0.27	0.33	0.38	0.43	0.48	0.52
10 hrs.	0.25	0.31	0.35	0.40	0.44	0.48
12 hrs.	0.22	0.27	0.30	0.35	0.38	0.42
14 hrs.	0.19	0.24	0.27	0.31	0.34	0.37
16 hrs.	0.17	0.21	0.24	0.28	0.31	0.34
18 hrs.	0.16	0.19	0.22	0.25	0.25	0.31
20 hrs.	0.14	0.18	0.20	0.23	0.26	0.28
24 hrs.	0.13	0.15	0.18	0.20	0.22	0.24

--

D. Drainage System Overflow Design:

Drainage systems shall have adequate capacity to convey the storm water runoff from all upstream tributary areas through the development under consideration for a storm of 100 year design return period calculated on the basis of the upstream land in its present state of development. An allowance, equivalent to the reduction in flow rate provided, shall be made for upstream detention when such upstream detention and release rate have previously been approved by the City or County and evidence of its construction can be shown.

E. Determination of Storage Volume - Rational Method:

For areas of two hundred (200) acres or less, the Rational Method may be used to determine the required volume of storm water storage. The following eleven step procedure may be used to determine the required volume of storage. Other design methods may also be used, subject to approval of the County Surveyor, and as described in Section 20(F).

Steps Procedure

1. Determine total drainage area in acres "A".
2. Determine composite runoff coefficient "Cu" based on existing land use (undeveloped).
3. Determine time of concentration "tc" in minutes based on existing conditions.
4. Determine rainfall intensity "Iu" in inches per hour, based on time of concentration and using Figure 1 or from data given in Table 5A for the ten (10) year return period.
5. Compute runoff based on existing land use (undeveloped), and ten (10) year return period:

$$Q_u = C_u I_u A$$

6. Determine composite runoff coefficient "Cd" based on developed conditions and a one hundred (100) year return period.
7. Determine the one hundred (100) year return period rainfall intensity "Id" for various storm durations "td" up through the time of concentration for the developed area using Table 5A.
8. Determine developed inflow rates "Qd" for various storm durations "td", measured in hours.

$$Q_d = C_d I_d A$$

9. Compute a storage rate “Std” for various storm durations “td” up through the time of concentration of the developed area.

$$\text{Std} = Q_d - Q_u$$

10. Compute required storage volume “SR” in acre-feet for each storm duration “td”. This assumes a triangular hydrograph of duration (2*td) hours with the peak flow of Std at td hours.

$$\text{SR} = \text{Std} (d/12)$$

11. Select the largest storage volume computed in step 10 for detention basin design.

F. Determination of Storage Volume - Other Methods

Methods other than the rational method for determining runoff and routing of storm water may be used to determine the storage volume required to control storm water runoff. The procedures or methods used must receive the prior approval of the County Surveyor. The ILLUDAS, TR – 20 and TR - 55 models are approved by the Commission for appropriate just in analysis of the runoff and routing of storm water. The use of these models or other approved procedures can be defined in a seven step procedure to determine the required storage volume of the detention basin.

Step. Procedure

1. Calibrate the hydrologic/hydraulic model that is to be used for prediction of runoff and routing of storm water.
2. For each storm duration listed in Table 5, perform steps three through six.
3. Determine the ten (10) year, undeveloped peak flow. Denote this flow by Q_{u10}.
4. Determine the one hundred (100) year runoff hydrograph (H_{d100}) for developed conditions.
5. Determine the hydrograph that must be stored (H_{s100}) by subtracting a flow up to Q_{u10} from the hydrograph (H_{d100}) found in step 4.
6. Determine the volume of water (V_s) to be stored by calculating the area under the hydrograph H_{s100}.
7. The detention basin must be designed to store the largest volume (V_s) found for any storm duration analyzed in step 6.

G. General Detention Basin Design Requirements:

Basins shall be constructed to detain temporarily the storm water runoff which exceeds the maximum peak flow rate authorized by this Ordinance. The volume of storage provided in these basins, together with such storage as may be authorized in other on-site facilities shall be sufficient to control excess runoff from the one hundred (100) year storm.

The following design principles shall be observed:

- (1) The maximum volume of water stored and subsequently released at the design release rate shall not result in a storage duration in excess of 4~ hours unless additional storms occur within the period.
- (2) The maximum planned depth of storm water stored (without a permanent pool) shall not exceed four feet.
- (3) All storm water detention facilities shall be separated by not less than 50 feet from any building or structure to be occupied.
- (4) All excavated excess spoil may be spread so as to provide for aesthetic and recreational features such as sliding hills, sports fields, etc. Slopes no steeper than 2 horizontal to 1 vertical for safety, erosion control, stability and ease of maintenance shall be permitted.
- (5) Safety screens having a maximum opening of 4 inches shall be provided for any pipe or opening to prevent children or large animals from crawling into the structures.
- (6) Danger signs shall be mounted at appropriate locations to warn of deep water, possible flooding conditions during storm periods and other dangers that exist. Fencing shall be provided if deemed necessary by the Commission.
- (7) Outlet control structures shall be designed to operate as simply as possible and shall require little or no maintenance and/or attention for proper operation. They shall limit discharges into existing or planned down stream channels or conduits so as not to exceed the predetermined maximum authorized peak flow rate.
- (8) Emergency overflow facilities such as a weir or spillway shall be provided for the release of exceptional storm runoffs or in emergency conditions should the normal discharge devices become totally or partially inoperative. The overflow facility shall be of such design that its operation is automatic and does not require manual attention.
- (9) Grass or other suitable vegetative cover shall be provided throughout the entire basin area. Grass should be cut regularly at approximately monthly intervals during the growing season or as required.

- (10) Debris and trash removal and other necessary maintenance shall be performed on a regular basis to assure continued operation in conformance to design.
- (11) A report shall be submitted to the Commission describing (a) the proposed development; (b) the current land use conditions; (c) the method of hydraulic and hydrologic analysis used, including any assumptions or special conditions; (d) the results of the analysis; and (e) the recommended drainage control facilities. Hydraulic and hydrologic calculations, including input and output files, shall be included as appendices to the report.

H. Dry Bottom Basin Design Requirements:

Detention basins which will not contain a permanent pool of water shall comply with the following requirements:

- (1) Provisions shall be incorporated to facilitate complete interior drainage of dry bottom basins, to include the provisions of natural grades to outlet structures, longitudinal and transverse grades to perimeter drainage facilities, paved gutters, or the installation of subsurface drains.
- (2) The detention basin shall, whenever possible, be designed to serve a secondary or multipurpose function. Recreational facilities, aesthetic qualities (open spaces) or other types of use shall be considered in planning the detention facility.

I. Wet Bottom Basin Design Requirements:

Where part of a detention basins will contain a permanent pool of water, all the items required for detention storage shall apply except that the system of drains with a positive gravity outlet required to maintain a dry bottom basin will not be required. A controlled positive outlet will be required to maintain the design water level in the wet bottom basin and provide required detention storage above the design water level. However, the following additional conditions shall apply:

- (1) Basins designed with permanent pools or containing permanent ponds shall have a water area of at least one-half acre. If fish are to be maintained in the pond, a minimum depth of approximately 10 feet shall be maintained over at least 25 percent of the pond area. The remaining pond area shall have no extensive shallow areas, except as required by subsection (3) below.
- (2) In excavated ponds, the underwater side slopes in the pond shall be stable. In the case of valley storage, natural slopes may be considered to be stable.
- (3) A safety ledge four to six feet in width is required and must be installed in all ponds approximately 30 to 36 inches below the permanent water level. In addition, a similar maintenance ledge 12 to 18 inches above the permanent water line shall be provided. The slope between the two ledges shall be stable and of a material such as stone or riprap which will prevent erosion due to wave action.

- (4) A safety ramp exit from the pond is required in all cases and shall have a minimum width of 20 feet and exit slope to 6 horizontal to 1 vertical. The ramp shall be of material that will prevent its deterioration due to vehicle use and/or wave action.
- (5) Periodic maintenance is required in ponds to control weed and larval growth. The pond shall also be designed to provide for the easy removal of sediment which will accumulate during periods of pond operation. A means of maintaining the designed water level of the pond during prolonged periods of dry weather is also required.
- (6) For emergency use, basin cleaning or shoreline maintenance, facilities shall be provided or plans prepared for auxiliary equipment to permit emptying and drainage.
- (7) Facilities to enhance and maintain pond water quality shall be provided, if required to meet applicable water quality standards. Design calculations to substantiate the effectiveness of these aeration facilities shall be submitted with final engineering plans. Agreements for the perpetual operation and maintenance of aeration facilities shall be prepared to the satisfaction of the Commission.

J. Parking Lot Storage:

Paved parking lots may be designed to provide temporary detention storage of storm waters on all or a portion of their surfaces. Outlets will be designed so as to empty the stored waters slowly. Depths of storage must be limited to a maximum depth 6 inches so as to prevent damage to parked vehicles and so that access to parked vehicles is not impaired. Ponding should, in general, be confined to those positions of the parking lots farthest from the area served.

K. Facility Financial Responsibilities:

The construction cost of storm water control systems and facilities as required by this Ordinance shall be accepted as part of the cost of land development. If general public use of the facility can be demonstrated, negotiations for public participation in the cost of such development may be considered.

L. Facility Maintenance Responsibility:

Maintenance of detention/retention facilities during construction and thereafter shall be the responsibility of the land developer/owner. Assignment of responsibility for maintaining facilities serving more than one lot or holding shall be documented by appropriate covenants to property deeds, unless responsibility is formally accepted by a public body, and shall be determined before the final drainage plans are approved.

The undersigned, hereinafter the Grantor, are the owners of the following described real estate, hereinafter referred to as "Real Estate," located in the Town of Warren, Indiana to wit:

(legal description of the tract of land being impressed with maintenance burden)

Before me, the undersigned, a Notary Public, in and for said County and State personally appeared _____ as _____ for _____ and acknowledged the execution of the foregoing Document as and for their voluntary act and deed for the uses and purposes therein contained.

WITNESS my hand and notary seal this _____ day of _____ 20____.

Notary Public
Resident of _____ County

Printed Name of Notary

My Commission Expires:

Presented By:

M. Joint Development of Control Systems:

Storm water control systems may be planned and constructed jointly by two or more developers as long as compliance with this Ordinance is maintained.

N. Installation of Control Systems:

Erosion control systems shall be installed on the perimeter of the site prior to the commencement of any site excavation. Storm water management systems shall be installed, and made operational as designed, prior to the placement of any hard surface, such as a building slab or parking area. Detention/retention basins shall be designed with an additional (six) percent of available capacity to allow for sediment accumulation resulting from development and to permit the pond to function for reasonable periods between cleanings. Basins should be designed to collect sediment and debris in specific locations so that removal costs are kept to a minimum.

O. Detention Facilities in Floodplains:

If detention storage is provided within a floodplain, only the net increase in storage volume above that which naturally existed on the floodplain shall be credited to the development. No credit will be granted for volumes below the elevation of the regulatory flood at the location unless compensatory storage provided.

P Off-Site Drainage Provisions:

When the allowable runoff is released in an area that is susceptible to flooding, the developer

may be required to construct appropriate storm drains through such area to avert increased flood hazard caused by the concentration of allowable runoff at one point instead of the natural overland distribution. The requirement of off-site drains shall be at the discretion of the Commission.

SECTION 21 Waivers

Upon written request from the applicant, the Commission may waive the requirement to submit one or more of the items listed in Section 10. In order for the Commission to waive a requirement, the Commission shall determine in writing that:

- a. the item is not necessary for the Commission to adequately determine the ability of the property to properly control storm water runoff.

PROJECT COMPLETION

SECTION 30 Certifications Required:

After completion of the project and before final approval and acceptance can be made, a professionally prepared and certified "As Built" set of plans shall be submitted to the County Surveyor for review. These plans shall include all pertinent data relevant to the completed storm drainage system and shall include:

- (1) Pipe size and pipe material.
- (2) Invert elevations
- (3) Top rim elevations.
- (4) Lengths of all pipe structures.
- (5) Data and calculations showing detention basin storage volume.
- (6) Certified statement on plans stating the completed storm drainage system substantially complies with approved by the Commission.

All such submitted plans shall be reviewed for compliance within 30 days after submission to the County. If notice of non-compliance is not given within 30 days of submission of the plans, the plans shall be construed as approved and accepted.

SECTION 31 Changes in Plan:

Any revision, significant change or deviation in the detailed plans and specifications after formal approval by the County shall be filed in duplicate with and approved by the Commission prior to implementation of the revision or change. Copies of the revisions or changes, if approved, shall be attached to the original plans and specifications.

SECTION 32 Other Requirements:

A. Sump Pumps:

Sump pumps installed to receive and discharge groundwater or other storm waters shall be connected to the storm sewer where possible or discharged into a designated storm drainage channel. Sump pumps installed to receive and discharge floor drain flow or other sanitary sewage shall be connected to the sanitary sewers. A sump pump shall be used for one function only, either the discharge of storm waters or the discharge of sanitary sewage.

B. Down Spouts:

All down spouts or roof drains shall discharge onto the ground or be connected to the storm sewer. No down spouts or roof drains shall be connected to the sanitary sewers.

C. Footing Drains:

Footing drains shall be connected to storm sewers where possible or designated storm drainage channels. No footing drains or drainage tile shall be connected to the sanitary sewer.

D. Basement Floor Drains:

Basement floor drains shall be connected to the sanitary sewers.

SECTION 90 Disclaimer of Liability:

The degree of protection required by this Ordinance is considered reasonable for regulatory purposes and is based on historical records, engineering and scientific methods of study. Larger storms may occur or storm water runoff depths may be increased by man-made or natural causes. This Ordinance does not imply that land uses permitted will be free from storm water damage. This Ordinance shall not create liability on the part of the Town of Warren or any officer or employee thereof for any damage, which may result from reliance on this Ordinance or on any administrative decision lawfully made there under.

SECTION 91 Violations:

- (A) It shall be a violation of this Ordinance for any person, firm, or corporation, whether as owner, tenant, lessee, occupant, contractor, or subcontractor, to:
1. Occupy any building or structure, which required development plan or subdivision plat approval, when the storm water management system has not been completed in compliance with the approved plans.
 2. Construct a storm water management system in violation of the approved plan.
 3. Commence site excavation prior to development plan approval.
 4. Alter, move, relocate or use any portion of an approved storm water management system without prior approval of the Commission.
 5. Fail to maintain an approved storm water management system in operating condition.

- (B) Upon a violation set forth in Section 91(A), the County Surveyor may impose any one or all of the following remedies:
- (1) A STOP WORK ORDER whereby all work on the site, including any building construction, shall cease at the time of posting.
 - (2) A revocation of a certificate of occupancy or any permit issued under Ordinance 1991-6, Building Code, as amended.
 - (3) Request the County Attorney file an action in the Circuit or Superior Court to enforce this Ordinance and have penalties and fines imposed as provided in Section 93.
 - (4) Any other remedy or penalty provided for herein, or by other applicable law.

SECTION 92 Appeals

- A. Any decision or determination made under this Ordinance by the County Surveyor may be appealed to the Town Council for the Town Roanoke, Indiana. The following procedures shall apply:
1. Appeal shall be filed with the Secretary for the Town Council for the Town of Warren on a form provided by the County within fourteen (14) days of the date of issuance of the decision.
 2. The Town of Warren shall review the appeal request at the next available meeting after the appeal is filed.
 3. Notice of the appeal shall be issued to the County Surveyor and person filing the appeal of the date, time, and meeting place of the Town Council in the Town of Warren when the appeal will be heard.
 4. The Town Council for the Town of Warren may affirm, rescind, or modify the decision of the County Surveyor. Only that item or items to which an appeal is filed shall be heard and decided upon by the Board.
 6. Any owner of land affected by a final order or determination by the Town Council for the Town of Warren, Indiana is entitled to Judicial Review of that order or determination in the Huntington Circuit or Superior Court. The owner must file in the Court a petition:
 - a. Setting out the order or determination complained of; and

- b. Alleging specifically that the order or determination is arbitrary, capricious, unlawful, or not supported by substantial evidence;

and pay any fees required under Indiana Statute.

A Petition for Judicial Review must be filed within twenty (20) days after the decision is rendered by the Town Council for the Town of Warren, Indiana. A copy of the Petition shall be served on the Board within five (5) days after the Petition is filed.

The Review shall be heard by the Court without the intervention of a jury. The Court may not try or determine the cause de novo, but shall consider and determine the cause exclusively upon the record made before the Board and filed with the Court.

If the Court finds from the record before it that:

- a. The person filing the Petition for Review has complied with all procedures required to properly present the matter set forth in the Petition for Review, and has exhausted his administrative remedies; and
- b. The decision or determination of the Board is arbitrary, capricious, or unlawful;

the Court shall order the decision or determination of the Board set aside and shall remand the matter to the Board for further proceedings consistent with the findings and order of the Court. If the Court finds otherwise, the decision of the Board shall be confirmed.

SECTION 93 Penalties:

- A. The following fines, not to exceed the amounts listed, shall be imposed for each violation:

<u>Code Reference</u>	<u>Violation</u>	<u>Civil Penalty</u>	<u>Second Violation</u>	<u>Subsequent Violation</u>
All Ordinance Violations	Storm Water Control Violation	\$500.00	\$1000.00	\$2500.00

- B. The fines and penalties provided for in this Section shall be in addition to all other remedies and penalties provided herein and by law, and except where otherwise provided, everyday any violation continues shall constitute a separate violation.

SECTION 94 Repealer:

All ordinance or parts thereof in conflict with the provisions of this ordinance are repealed.

This ordinance shall become effective after its final passage, approval and publication as required by law.

Approved-by the Town Council of the Town of Warren, Indiana, this 22ND day of
June 1998.

Terry Abbett
Richard Brubaker
Ned M. Simons
Board of County Commissioners
Huntington County
Huntington, Indiana

ATTEST:
Carl Smith
Huntington County Auditor

