ORDINANCE NO. 2025-11

DRAINAGE MANAGEMENT ORDINANCE

Passed and adopted by the Warrick County Board of Commissioners this 11th day of August, 2025

WARRICK COUNTY
BOARD OF COMMISSIONERS

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Michael Dietsch, Auditor

DRAINAGE MANAGEMENT ORDINANCE
for
WARRICK COUNTY, INDIANA

Prepared for the

Warrick County Drainage Board

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No 2025-11

AN ORDINANCE ESTABLISHING A DRAINAGE MANAGEMENT POLICY FOR WARRICK COUNTY, INDIANA

WHEREAS, Warrick County is concerned about the adverse effects of stormwater to adjoining properties, such as flooding, erosion, and other damages, and, indeed, to all property owners within the watershed that contains Warrick County;

WHEREAS, IC 36-9-28.5-3 requires that all municipalities establish a stormwater management policy;

NOW THEREFORE BE IT ORDAINED by the Board of Commissioners of Warrick County that:

ARTICLE 1: STATUTORY AUTHORITY

A. The Indiana Legislature granted the power of local government units per IC 36-7-4 to control land use within their jurisdictions to accomplish the following.

ARTICLE 2: STATEMENT OF PURPOSE

A. The Ordinance regulates proposed developments by a mixture of requirements, performance, and design standards. The purpose of the drainage standards outlined in this ordinance is to establish reasonable rules and regulations for development in Warrick County to:

1. Reduce harm due to periodic flooding, including loss of life and property and threats, and inconveniences to public health and welfare; and

2. Assure that new development does not increase flood or drainage hazards, or create unstable conditions susceptible to erosion; and

3. Create the least financial burden on the taxpayers for flood control projects, repairs to flood-damaged public facilities and utilities, and flood rescue and relief operations; and

4 Protect, conserve, and promote the orderly development of land and water resources; and

5. Protect buildings and improvements from flood damage to the greatest extent possible; and

6. Conserve the natural hydrologic, hydraulic, water quality, and other beneficial functions of watercourses, floodplains, and wetlands; and

7. Prevent disruption of the economy and governmental services due to stormwater and flood drainage; and

8. Maintain eligibility for Warrick County in the National Flood Insurance Program by meeting or exceeding its requirements and thus making federally subsidized flood insurance available at reduced premiums.

ARTICLE 3: CONFLICTING ORDINANCES

A. The provisions outlined in these ordinances shall be deemed as additional to the minimum standards required by other municipal, state, and federal ordinances, laws, regulations, and statutes. In the case of conflicting requirements, the most restrictive requirement shall apply.

ARTICLE 4: COMPLIANCE WITH OTHER ORDINANCES

A. In addition to the requirements outlined in these ordinances, compliance with the requirements outlined in other applicable ordinances adopted by Warrick County and state and federal regulations shall be met.

ARTICLE 5: DEFINITIONS

ABS – Acrylonitrile Butadiene Styrene

Applicant – The person, persons, partnership, corporation, or other private, duly authorized representative or agent, including their heirs and assigns, who applies to the Drainage Board for Drainage Plan approval.

Baffle – A structure, fabricated with water-resistant materials, that directs water, impedes water flows, and forces the water to flow around it.

Base Flood Elevation – The elevation delineates the flooding level from the one hundred (100) year flood.

Berm – A mound of soil added to the surface of a property to create a level space, shelf, or raised barrier separating areas vertically.

Building – See Structure.

Board – Warrick County Drainage Board.

Capacity of a Storm Drainage Facility – The maximum flow rate that can be conveyed or stored by a storm drainage facility.

Catch Basin – A structure with a grate that collects runoff in non-curbed paved areas or in grassed areas.

Catchment Area – See Watershed.

CFS – Cubic Feet per Second

Channel – A natural or man-made watercourse that periodically or continuously conveys water. It has a bed and a bank that confines the water.

CMP – Corrugated Metal Pipe

Contiguous – Adjoining or in actual contact with.

County Commissioners – Board of County Commissioners of Warrick County, Indiana..

County Surveyor – The Warrick County Surveyor.

Culvert – A closed conduit with at least one end open used to pass surface drainage water under an impediment.

Curb Inlet – A structure with a grate and opening that collects runoff from curbed paved areas.

Curb Spill-Outs – See Curb Turnout.

Curb Turnout – An opening in the curb that allows runoff to be discharged off the pavement and into a roadside ditch or drainage structure.

Design Storm Event – The rainfall event that is under consideration.

Developer – See Applicant.

Development: any man-made change to improved or unimproved real estate, including, but not limited to:

1. Construction, reconstruction, or redevelopment.
2. Placement of a building or any addition to a building;
3. Installing a manufactured home on a site
4. Preparing a site for a manufactured home or a recreational vehicle;
5. Utility installations;
6. Wall or fence erection;
7. Road construction;
8. Parking lot construction;
9. Residential or commercial subdivision development.

Detention Facility (also known as pond, lake, basin, tanks, chambers, or parking lot) – An above or below-ground facility with a positive outlet constructed to restrict the flow rate of stormwater to a specified maximum rate, while detaining the excess stormwater that accumulates.

Drainage – See runoff.

Drainage Area (also known as watershed or catchment area) – See Watershed.

Drainage Board – Warrick County Drainage Board.

Drainage Board of Commissioners – Warrick County Drainage Board.

Drainage Direction – The natural or artificial direction in which runoff flows.

Drainage Ditch – A depression in the land created to channel water. (Typically formed around low-lying areas, roadside or field proximately to a water body or created to channel water from a more distant water source for plant irrigation.)

Drainage Easement – An easement appurtenant or attached to a tract or parcel of land allowing the owner of adjacent tracts, other persons, or the public to install drainage facilities and/or to discharge stormwater onto or through the tract or parcel of land subject to the drainage easement.

Drainage Facilities—Drainage structures, basins, bridges, pipes, culverts, ditches, channels, and any other man-made items used in either storing and/or conveying drainage.

Drainage Plan – A set of documents containing a Technical Report, Letter of Certification, Calculations, and Drawings.

Drainage Structure – A structure designed to collect, direct, or divert drainage, such as a manhole, curb inlet, yard inlet, catch basin, or outfall structure.

Dry Bottom Detention or Dry Bottom Retention Facility – A facility designed to completely drain after providing temporary water storage during and after a storm event.

Duration – The time period of a rainfall event.

Easement – Authorization or grant by a property owner to specific persons or the public to use the land for specified purposes.

Emergency Spillway – A waterway in or near a detention or retention facility to escape excess water.

Emergency Weir – The top of the curb at curb inlets for the escape of excess water.

Engineer – The Warrick County Highway Engineer, the Executive Director of the Warrick County Stormwater Department or his duly appointed representative(s).

Existing – See Pre-Developed Condition.

Flood – A general and temporary condition of partial or complete inundation of normally dry land areas from the overall, unusual, and rapid accumulation, or the runoff of surface waters from any source.

Floodplain – The channel proper and the adjoining areas, including wetland, lake, or watercourse, which have been or hereafter may be inundated by the regulatory flood. The floodplain includes both the floodway and the floodway fringe.

Floodway – The channel of any river, stream, creek, or ditch, and those portions of the floodplain adjoining the channel which are reasonably required to convey the one hundred (100) year flood flow without increasing the water surface elevation of the one hundred (100) year flood by more than the regulatory limit. The Indiana Department of Natural Resources has jurisdiction over floodways whose watersheds are greater than one square mile. The Local Floodplain Administrator has jurisdiction over floodways whose watersheds are less than one square mile.

Floodway Fringe – The portion of the floodplain outside the floodway.

Flood Protection Grade (i.e., FPG) – The base flood elevation (i.e., the one hundred (100) year flood elevation) plus two feet.

Flow Line – The lowest point in a ditch, swale, creek, stream, river, or any water body that conveys water.

Footing Drain – A drain pipe installed around the exterior of a basement wall foundation or crawl space to relieve water pressure caused by groundwater.

Freeboard- The vertical distance between a surface or water level and the top of whatever contains or restrains it. Freeboard is a safety feature that provides storage capacity and prevents spills.

Grade – The inclination or slope of a channel, canal, pipe, culvert, etc., or natural ground surface, usually expressed in percent of the vertical rise (or fall) divided by the horizontal distance.

HERPICC Manual – See the latest version of the LTAP Drainage Manual.

Illegal Connection – Any pipe, open channel, drain, or conveyance, whether on the surface or subsurface, which allows an illicit discharge to enter the stormwater system including but not limited to any conveyances that allow any non-stormwater discharge including, but not limited to, sewage, process wastewater, and wash water to enter the storm drain system, regardless of whether such pipe, open channel, drain or conveyance has been previously allowed, permitted, or approved by an authorized enforcement agency.

Illicit Discharge – Any discharge to a municipal or county separate storm sewer system (stormwater drainage system) not composed entirely of stormwater runoff (except for discharges allowed under an NPDES permit or non-polluting flows). These non-stormwater discharges occur due to illegal dumping or illegal connections to the stormwater drainage system.

Impervious Area – A relatively hard surface area that does not readily absorb water. Impervious areas include pavement, parking lots, driveways, roofs, and other hard surfaces that do not absorb water. An impervious area is one in which the runoff coefficient is 0.90 or higher.

INDOT – Indiana Department of Transportation

Infiltration – The seepage of water into the sub-surface ground.

Inlet Pipe – A pipe that conveys water to a detention or retention facility.

LTAP Drainage Manual – The latest revised Stormwater Drainage Manual, within reason, with the goal of creating good drainage, as prepared by Purdue Research Foundation and the Indiana Local Technical Assistance Program. [To obtain a copy of this manual, call the Indiana Local Technical Assistance Program (LTAP) at 765-494-2164.]

Legal Drain – An open or tiled ditch, or combination of the two, which are subject to the jurisdiction and control of the Warrick County Drainage Board.

Letter of Credit – A legally binding instrument, such as an Irrevocable Letter of Credit or cashier's check, from a duly chartered financial institution providing surety satisfactory to the Drainage Board that all proposed Drainage Facilities specified in the Drainage Plan will be constructed by the standards of this Ordinance.

Local Floodplain Administrator – The Executive Director of the Warrick County Area Plan Commission.

Manhole – A drainage structure with a solid cover, through which a person may enter to access an underground storm sewer or enclosed drainage structure.

MS4 (Municipal Separate Storm Sewer System) - A conveyance or system of conveyances, including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, manmade channels, or storm drains, that is:

(1) owned or operated by a federal, state, city, town, county, district, association, or other public body (created by or per state law) having jurisdiction over stormwater, including special districts under state law such as a sewer district, flood control district, or drainage district, or similar entity, or a designated and approved management agency under Section 208 of the Clean Water Act (33 U.S.C. 1288) that discharges into water of the state; or privately owned stormwater utility, hospital, university, or college having jurisdiction over stormwater that discharges into waters of the state;

(2) designed or used for collecting or conveying stormwater;

(3) not a combined sewer; and

(4) not part of a publicly owned treatment works (POTW) as defined at 40 CFR 122.2.

Normal Pool Elevation – See Permanent Pool Elevation.

Off-Site – All right-of-way and all property that is not where the development is to be constructed.

On-Site – The property where the proposed development is to be constructed.

Open Channel Conveyance—Drainage facilities that are open to the atmosphere, such as ditches, canals, swales, and channels. Technically, open channel conveyance occurs when the liquid stream is not completely enclosed by solid boundaries. For purposes related to this ordinance, an open channel will be considered a drainage conveyance facility that is not closed.

Ordinance – This ordinance and all subsequent additions or amendments thereto.

Orifice – See Restrictor.

Outfall – A point where collected and concentrated surface water is discharged into an open drainage feature. These drainage features include ditches, channels, swales, streams, rivers, ponds, lakes, or other open bodies of water. In most cases, an outfall will consist of a pipe discharging runoff from a detention facility or storm sewer system.

Outfall Control Structure – A structure that may include a restrictor designed to control the discharge from a detention facility to meet the desired performance specifications.

Outlet Pipe – A pipe that conveys water from a detention facility.

Peak Flow Rate – The rate of flow of water at a given point resulting from a particular storm event.

Permanent Pool Elevation – The permanent pool elevation of a basin must be at or above the elevation of the outlet pipe and or downstream BMR. The permanent pool should not be lower than 6 inches below the seasonal high-water table. The permanent pool elevation of a basin must be not less than 6' deep.

Pipe – A closed containment of geometric shape with open ends used to convey liquids. See Culverts or Storm Sewers.

Pipe Collar – A device secured to the outside wall of a pipe, specifically designed to prevent water from flowing along the pipe within the exterior of the pipe trench.

Pre-Developed Condition – The site conditions that exist on a site before the commencement of a land development project and at the time that plans for the land development of a site are approved by the Warrick County Area Planning Commission. Where phased development or plan approval occurs (preliminary grading, roads, utilities, etc.), the existing conditions before the first item is approved or permitted shall establish pre-development conditions.

Post-Developed Condition – The site conditions that may reasonably be expected or anticipated to exist after the land development activity is completed on a site.

Proposed – See Post-Developed Condition.

PVC – Polyvinyl Chloride

Rainfall Intensity – The cumulative depth of rainfall occurring over a given duration, usually expressed in inches per hour.

Record Drawings – As-Built Drawings – Engineering design drawings that have been revised to reflect all changes to the design drawings that occurred during construction.

RCP – Reinforced Concrete Pipe

Release Rate – The amount of stormwater released from a detention or retention facility per unit of time.

Regulatory Flood (also known as the Base Flood or the one-hundred (100) year flood + intensity calculations) – The flood having a one percent probability of being equaled or exceeded in any given year, as shown on the Federal Insurance Rate Maps (FIRMs) or as approved by the Local Floodplain Administrator.

Regulated Drain (also known as a Legal Drain) – A drain or ditch maintained by the County Surveyor and the Drainage Board per Indiana Drainage Code, IC 36-9-27.

Restrictor – A device to restrict the flow of water discharging from a detention facility.

Retention Facility (also known as a pond, lake, basin, perforated pipe, chamber, or facility) – An above or below-ground facility to retain runoff that has no positive outlet. Runoff is removed only by infiltration through a porous bottom or by evaporation.

Return Period – The average interval of time within which a given rainfall event will be equaled or exceeded once. For example, a storm event having a return period of one hundred (100) years has a one

percent (1/100) probability of being equaled or exceeded in any year. The occurrence of a 100-year storm event does not change the chance of another one hundred (100) year storm event occurring the next day.

Runoff (also known as stormwater runoff) – The portion of rainwater that does not infiltrate the ground within the land development.

Runoff Coefficient – A decimal fraction relating the amount of rain that appears as runoff and reaches the storm sewer system to the amount of rain falling. A coefficient of 0.5 implies that fifty (50) percent of rain falling on a given surface appears as runoff.

Slope – The gradient in feet per foot or expressed as a percent (see Grade).

Storm Sewers – Pipes, closed conduits, or any other manufactured or fabricated product with a geometrical shape designed to convey runoff. Storm sewers have both ends connected to drainage structures. See Culverts.

Stormwater – See Runoff.

Storm Water Pollution Prevention Plan (SWPPP) - A plan developed to minimize the impact of stormwater pollutants resulting from construction activities, also known as the Construction Stormwater General Permit.

Stormwater Runoff – See Runoff.

Stormwater Drainage Facility – All means, natural or man-made, including conduits and appurtenant features, canals, channels, ditches, streams, culverts, and pipes, used for conveying stormwater.

Stub out – A short length of pipe for future connection.

Swale – A drainage ditch with relatively flat side slopes.

Trash Rack – A device or equipment that prevents trash and debris from discharging from a drainage facility.

Tributary – Any watercourse that flows into a larger watercourse.

Watercourse – Any river, stream, brook, ditch, creek, or natural or man-made drainage system where stormwater or floodwaters flow.

Watershed – A geographic area from which water drains to a specific concentration point at the furthest downstream (i.e., the lowest elevation) point.

WCSWCD – Warrick County Soil & Water Conservation District.

Wet Bottom Detention Facility – A basin designed to permanently retain a pool of water after temporarily detaining runoff during a storm event.

Yard Inlet/Area Drain – A structure with a grate that collects runoff in grassed areas.

ARTICLE 6: DRAINAGE CONTROL POLICY

A. It is recognized that some natural watercourses and existing storm sewers within Warrick County may not have sufficient capacity to receive and convey runoff resulting from development. Accordingly, either the temporary storage and controlled release rate of runoff, or the retention of runoff, shall be required for any development whenever a development increases the total impervious area by at least ten thousand (10,000) square feet, and a Drainage Plan shall be prepared and approved for all such developments. For lots that are located within subdivisions where a detention or retention facility was constructed, that is considered an increase in impervious area of ten thousand (10,000) square feet for said lot, submission of documentation demonstrating that detention and/or retention for the excess runoff from said lot shall be submitted. If, in the opinion of the County Surveyor, the documentation is satisfactory, a Drainage Plan will not be required.

B. Developments that result in a total impervious area of more than 5,000 square feet, but less than 10,000 square feet, regardless of net increase or decrease of impervious areas (such as reconstruction, new construction, replacement, redevelopment, combination, expansion, etc.) may require the review and approval of the County Surveyor. The County Surveyor may review the existing site conditions, and he/she may request a sketch, plan, and/or drawing of the proposed site conditions from the developer.

C. It is understood that during certain storm events, discharging unretained peak runoff flow from a development into a receiving watercourse, before the peak runoff flow in that receiving water flows by the development, might reduce downstream or upstream impacts. However, it is not possible to guarantee that the discharge of unretained peak flow from a development will occur before the peak flow of the receiving watercourse during all storm events. In fact, under most conditions and most common storm events, detaining the peak runoff flow will reduce downstream and/or upstream impacts. Therefore, all developments, unless those exempt by this ordinance, shall detain or retain the peak runoff flow generated from a fifty (50) year storm event under the developed conditions while discharging a release rate that may not exceed the peak runoff flow generated from a five (5) year storm event under the pre-developed condition. Except with the exemptions stated in this ordinance, the Applicant must either submit a Drainage Plan to the Warrick County Drainage Board to demonstrate that this requirement will be met, or technically demonstrate that during the 1-year, 2-year, 5-year, 10-year, 25-year, and the 50-year storm event, releasing unretained runoff flow will not result in negative impacts downstream or upstream of the site.

D. The Drainage Plan must clearly show that the post-developed runoff for the fifty (50) year storm event discharged off the site does not exceed the pre-developed peak runoff rate for the five (5) year storm event.

E. Drainage calculations for developments where the watershed under consideration is less than two hundred (200) acres may be determined by the Rational Method (Q = CIA) per the latest version of the LTAP Drainage Manual, except that the rainfall intensity (I) shall be determined from the Rainfall Intensity Table in Appendix F. Note that a minimum time of concentration shall be ten (10) minutes. Drainage calculations for developments where the watershed under consideration is more than two hundred (200) acres may be determined by the Soil Conservation Service Curve Number Method, per the latest version of the LTAP Drainage Manual.

ARTICLE 7: THE DRAINAGE BOARD'S RIGHTS TO DISCRETIONARY DECISIONS

A. Because topography, soil types, field conditions, and the availability and adequacy of outlets for stormwater runoff vary with almost every site, the requirements for drainage management tend to be a unique matter for each project; therefore, the Drainage Board retains the right to make discretionary decisions on an individual basis.

B. The Drainage Board shall authorize and empower certain technical advisors, including the Warrick County Surveyor and his assigns, as well as the Warrick County Highway Engineer and his assigns. The Drainage Board shall empower the technical advisors as follows:

1. To review the submitted drainage plans.

2. Make recommendations to the Drainage Board concerning such reviews, and make other reports when ordered by the Board.

3. To make periodic inspections before, during, and after completion of a development project, and to report findings to the Drainage Board.

4. To act on behalf of the Drainage Board when so authorized, or by ordinance.

C. The Drainage Board encourages and advises anyone with an interest in a development project to contact the technical advisors named above as soon as possible during the planning stage of the project.

ARTICLE 8: DRAINAGE PLAN APPROVAL REQUIRED BEFORE CONSTRUCTION

A. Construction for development projects, unless exempt from this ordinance, shall not commence without prior approval of the Drainage Plan from the Drainage Board. However, the Applicant must be aware that before construction commences, all applicable municipal, state, and federal permits must be secured, including MS4 required SWPPP applications.

ARTICLE 9: RECORD OF BOARD DECISIONS

A. Decisions by the Drainage Board concerning this ordinance shall be made only during regular or special meetings of the Drainage Board.

B. Records of actions taken by the Drainage Board concerning this ordinance shall be recorded in the appropriate edition of the minutes of each Drainage Board meeting.

ARTICLE 10: SPECIAL OR EMERGENCY DECISIONS

A. In special or emergency circumstances where actions must be taken quickly to enforce this ordinance's purposes, policies, or other requirements, the Drainage Board or the duly authorized representatives may make decisions or take actions outside of Board meetings.

B. Special or emergency decisions and actions of the Drainage Board and/or their authorized

representatives shall be recorded in the appropriate edition of each Drainage Board meeting.

ARTICLE 11: DRAINAGE PLAN DESCRIPTION

A Drainage Plan shall include Drawings (including the Drawings Checklist), a Technical Report, and a Letter of Certification (including the Certification Form).

A. DRAWINGS

1. The Drawings shall include all plans, profiles, details, notes, and specifications to construct the development. All applicable items listed in the Drawings Checklist in the Appendices shall be shown. The Drawings Checklist shall be filled out and submitted with the Drawings. The Applicant may mark N/A for any inapplicable items.

2. The Drawings shall portray design concepts in a common format. This format must present all the information necessary for persons trained in engineering to review the plans and those skilled in construction work to build the project according to the design engineer's intent. Supporting documentation for the site improvement plans must also be presented in an orderly and concise format that can be systematically reviewed and understood by others. A good format is also essential for easy access to information for future reference.

3. Plan sheets, profile sheets, or combined plan and profile sheets, specifications, and detail sheets shall be on 24" x 36" sheet sizes.

4. The Drawings shall include a project information/cover sheet with the following:
   (a) Title of development or project name (including Applicant's name)
   (b) Table of contents (if more than three pages).
   (c) Vicinity map.
   (d) Name and telephone number of utility field contacts
   (e) One-call telephone number.
   (f) Name and telephone number of the Developer's project surveyor.
   (g) Name and telephone number of the owner/agent.
   (h) Name and telephone number of the Developer.
   (i) Name and telephone number of the Developer's engineering firm preparing plans.
   (j) Legal description (or reference to deed).

5. Existing features shall be shown on the Drawings with dashed lines, and/or are half-toned (screened), to distinguish existing features from proposed improvements clearly

6. The vertical datum shall be based on the current flood maps. The Drawings shall show the location, description, and elevation for at least two (2) permanent benchmarks. Permanent means that the benchmark will not be disturbed or damaged during the construction of the development.

7. An Overall Site Plan shall be included if the site must be divided into more than three (3) plan sheets. The overall plan shall include, at least, a north arrow and graphic scale, the entire property to be developed, existing and proposed rights-of-way with street names,

and the location of the detailed site plan sheets, indexed to the detailed site plan sheets. The scale of the overall plan shall be 1"= 40', 1" = 50', 1" = 60', 1" = 100', 1" = 200', 1" = 300", 1" = 400', 1" = 500', or 1" = 600', unless otherwise approved by the County Surveyor.

8. Each Drawing shall be stamped, signed, and dated by a professional civil engineer or a professional land surveyor regularly engaged in stormwater drainage design, and registered to practice in the State of Indiana.

9. Site plans shall have a north arrow, graphic scale, match lines showing the matched sheet number, and project phasing, if known at the time of the Drainage Plan's submission.

10. Detail sheets shall provide sufficient information to construct complex elements of the plan. Details may be provided on plan and profile sheets if space allows. The location and label for each section or other details shall be provided.

11. Each drawing, except for the title sheet, shall have a title block that lists, at minimum, the development title, the name, address, and phone number of the firm or individual preparing the plan, a revision block, page (of pages) numbering, and sheet title.

12. All natural and proposed drainage collection, conveyance, and detention/retention systems with structure numbers shall be shown on one overall site plan showing the entire property, even if only a portion of the property is to be developed.

13. General, Drainage, and Structural Notes that apply to the plan shall be provided on the plans.

14. The Drawings consist of all the plans, profiles, details, notes, and specifications necessary to construct roads, grading, and the drainage system. Detailed Site Plan scales shall be in legible scales and show the entire development and off-site work. Details for clarification, including those for intersections and existing driveways, should be displayed on a larger scale.

15. The Drawings shall include, at least, the following existing features:

    (a) If able, the existing ground surface topography within the site and extending beyond the property line for at least ten (10) feet. Existing and proposed topography contours shall be shown at one-foot intervals for the entire area to be developed unless the County Surveyor approves another contour interval.

    (b) If able, the existing surface water discharge points. Ground surface elevations for a reasonable "area" around points of discharge shall extend at least twenty (20) feet downstream of all discharge points.

    (c) Existing hydrologic features. Provide spot elevations, in addition to contour lines to aid in delineating the boundaries and depth of all existing floodplains, wetlands, channels, swales, streams, storm drainage systems, roads (low spots), bogs, depressions, springs, seeps, swales, ditches, pipes, groundwater, and seasonal standing water.

(d) Other existing natural features. Provide spot elevations to delineate perimeter and variations, including existing vegetation and trees, as needed.

(e) Flow arrows to indicate the direction of existing surface flow on all public and private property and for all existing conveyance systems.

(f) Floodplains, as shown on Flood Insurance Rate Maps (FIRMs) with the FIRM panel noted, along with the regulatory base flood elevation and the regulatory flood zone. If the Local Floodplain Administrator requires the floodplain to be determined by the Applicant, that floodplain with base elevations shall be shown.

(g) Floodways, as shown on Flood Insurance Rate Maps (FIRMs), as approved by the Indiana Department of Natural Resources (in cases where the watershed is greater than one square mile but not shown on the FIRM panel), or as designated or as required by the Local Floodplain Administrator (in cases where the watershed is less than one square mile).

(h) Wetlands shall be identified by the National Wetland Inventory Map.

(i) Location and limits of all existing property boundaries.

(j) If able, the location of all existing structures, including the locations of all structures on abutting properties within twenty (20) feet of the proposed site. Maps, plans, and/or aerial photography may be used if verified by observation.

(k) If able, the dimensions of existing easements within the property to be developed and within twenty (20) feet of the property to be developed.

(l) If able, the dimensions of existing property lines and lot lines within the property to be developed and within twenty (20) feet of the property to be developed.

(m) Location and limits of all existing roads and rights-of-way within the property to be developed and adjoining the property to be developed. This includes the opposite side of the road and curb drives/sidewalk entrances from the property to be developed.

(n) Location of all existing sanitary sewers and water mains (including appurtenances) within the property to be developed and, if possible, within ten (10) feet from the property to be developed.

(o) Location of all existing utilities within the property to be developed and, if possible, within ten (10) feet from the property to be developed.

(p) Location of all drainage facilities within the property to be developed and, if possible, within ten (10) feet from the property to be developed.

(q) Location of all existing utility poles and fences within the property to be developed and, if possible, within ten (10) feet from the property to be developed.

(r) Location and limits of existing pavement, including type of pavement (i.e., asphalt,

concrete, etc.) within the property to be developed and, if possible, within ten (10) feet from the property to be developed.

(s) Location and limits of all existing common open space within the property to be developed and, if possible, within ten (10) feet from the property to be developed.

(t) Location and limits of all existing public dedications within the property to be developed and, if possible, within ten (10) feet from the property to be developed.

(u) Existing features to be removed shall be clearly labeled as "To Be Removed".

16. The Drawings shall include the following proposed features:

(a) Proposed property lines, right-of-way lines, and widths for proposed roads and intersecting roads.

(b) Proposed roadway features such as centerline, edge of pavement and shoulder, ditch lines, curbs, and/or sidewalks. In addition, points of access to abutting properties and roadway continuations shall be shown within the property to be developed and within twenty (20) feet of the property to be developed, if able.

(c) Proposed topography contours shall be shown at one (1) foot intervals and selected spot elevations within all right-of-way and drainage easements, as needed. For the remainder of the development, proposed topography contours shall be shown at one (1) foot intervals with proposed drainage directions.

(d) The location of all proposed utilities, as well as known future utilities installed by others, that are within right-of-way and drainage easements shall be shown to the extent that these will be affected by the proposed project.

(e) The proposed right-of-way and easements are sufficiently dimensioned to clearly show the locations of all proposed dedicated land.

(f) Proposed pavement, including type of pavement (i.e., asphalt, concrete, gravel, etc.).

(g) Proposed drainage structures, including all surface drainage structures, are generally sequentially numbered starting from the furthest downstream structure.

(h) Slope, length, diameter, and material for all proposed pipes, culverts, and stub-outs. The storm sewer information shall be shown in a table format.

(i) All proposed drainage facilities.

(j) Approximate location of proposed downspout sub-drains or footing drains for all lots intending to connect to the storm drainage system, with prior County approval only. All stub-outs shall be located to allow gravity flow from the lowest corner of the lot to the connecting drainage structure. Stub-outs shall be terminated with fabricated caps.

(k) Proposed stub-out locations for any future pipe connections. Stub-outs shall be terminated with fabricated caps. For all pipes not RCP, the cap shall be fabricated from the same material as the pipe to be stubbed. For RCP stubs, a fabricated cap such as Foreman Night Cap by Advanced Products & Systems from Lafayette, Louisiana, or a similar product shall be used.

(l) Proposed drainage easements, tracts, access easements, streets, with dimensions and type of restriction and/or use.

(m) Location, identification, and dimensions of all proposed buildings (if known), property lines, streets, alleys, and easements.

(n) Sections and details of all retaining walls, if applicable.

(o) Profile of all storm sewers showing proposed and existing ground profiles at 50-foot stations and significant ground breaks and topographic features. The storm sewer profile shall have the same stationing shown on the site plan. The profile shall be read from left to right, with lower stationing on the left. The profile shall have a grid of numbered lines, providing a continuous plot of vertical positioning against horizontal.

(p) Invert elevations of all pipes and culverts, as well as the inside bottom and rim elevations of all drainage structures. This information can be shown on the plan or in a table.

(q) Show locations where pipes that are proposed to have one (1) foot or less of cover from the finished grade (measured vertically from the top of the pipe to the finished grade, not from the top of the pipe to the road centerline finished grade elevations).

(r) Show the profile on the same sheet aligned underneath the plan view whenever possible.

(s) Clearly label all profiles with respective street names and plan sheet reference numbers if drawn on separate sheets.

(t) Locate match points with existing pavements and show elevations.

(u) Locate, in plan and profile, all existing (if a gravity line, base the location and elevation on the data collected at the upstream and downstream structure, and if a non-gravity line, make an assumption and note it), proposed, and future (if known) utilities where they cross proposed storm sewers, including the elevations of the top and bottom of pipes where they cross.

(v) Maintenance Statement recommending maintenance tasks and frequency for all drainage facilities.

17. Proposed Retention/Detention and Infiltration Facilities.

(a) Scaled drawing of each retention/detention or infiltration facility.

(b) Maximum design water elevation for the fifty (50) year storm event.

(c) Normal pool elevation.

(d) Elevations and dimensions of all berm widths.

(e) At least two cross-sections through a facility. One cross-section must include the outflow restrictor.

(f) Detail, section, and plan view of restrictor/outfall control structure, including restrictor.

(g) Pipe collar, if necessary.

(h) All inlet and outlet pipes' location, elevation, and orientation detail.

(i) Construction and material requirements for retention/detention facility construction.

(j) Location, elevations, and detail of emergency overflows and spillways.

(k) Rock protection/energy dissipation requirements and details.

(l) Invert elevations of all pipes, grates, inlets, tanks, and vaults of the retention/detention facility, plus spot elevations at the bottom of dry bottom detention facilities. This information can be in a table form.

(m) Provide the location of the access route if required.

(n) Minimum Freeboard amounts.

(o) Maintenance Statement recommending maintenance tasks and frequency for all drainage facilities.

(p) Details of all energy dissipaters, including splash pads.

(q) Size, type, slope, and length of pipes entering or exiting the retention/detention facility, when applicable. This information can be presented in a table form.

(r) Details shall be drawn at one of the following scales: ½" = 1', 1/4' = 1', 1/8" = 1", 1"=1', 1"=2', 1"= 3', 1"=4', 1"=5', 1"= 6', 1"=10', or 1"=20', when applicable.

19. Structural Plan Details

Any structurally designed drainage facility (e.g., bridge crossing, reinforced concrete footings, walls, or vaults) shall include plan sheets necessary to provide complete working drawings showing dimensions, steel placement, and specifications for construction. Structures may require a design prepared and stamped by a professional civil engineer regularly engaged in structural design, and registered to practice in the State of Indiana.

A. LETTER OF CERTIFICATION

1. The Letter of Certification shall be prepared by a professional engineer registered in the State of Indiana, stating that the Drainage Plan was prepared following the criteria of the requirements of the Drainage Board. This letter shall also contain the estimated cost of the drainage facilities, as specified in the Drainage Plan. In addition, a Certification Form shall be filled out and signed. A sample Certification Form can be found in Appendix D.

B. TECHNICAL REPORT

1. The Technical Report shall be typed or computer-generated on 8 ½" X 11" paper and be bound or placed in a three-hole binder. The Drainage Report shall include the following sections:

(a) Title Page
(b) Table of Contents
(c) Project Overview
(d) Existing Conditions Summary
(e) Off-Site Analysis
(f) Conveyance Systems Analysis and Design
(g) Retention/Detention Analysis and Design
(h) Special Reports and Studies
(i) Letter of Credit (or Bond) Cost Estimate
(j) Maintenance and Operations Manual
(k) Appendices

2. The Title Page shall show the project name, Applicant, address if known of the development, and submission date of the Drainage Report. The Title Page shall be stamped by a professional civil engineer or professional land surveyor regularly engaged in stormwater drainage design, and registered to practice in the State of Indiana

3. The Project Overview shall identify and discuss the site's location, topography, and size. It shall also include general descriptions of the site's pre-developed conditions, the existing drainage system (including drainage to and from the adjacent property), the proposed development, and the proposed drainage system. The Project Overview shall also include a map showing the general location of the site, all roads that border the site, and significant geographic features and sensitive areas.

4. The Existing Conditions Summary shall include a description of the site topography, including basins, watershed areas, drainage facilities, flooding, and

backwater. This section shall estimate the runoff peak flow rate for the 5-year storm event generated by the existing site and shall discuss the capacity of the existing drainage facilities, existing drainage problems, if known (i.e., scouring, sedimentation, bank sloughing, flooding, etc.), and location of discharge points, indicating if the discharge points are point locations and/or areas of overland flow. This section shall include a discussion of the assumptions and site parameters used to analyze the existing site hydrology. Watersheds with areas identified in acres, surface conditions with appropriate runoff coefficients or curve numbers (if any), times of concentration, and travel times shall be included. Watershed areas within the site or contributing runoff towards the site, drainage facilities with invert elevations, and direction of overland drainage shall be shown on a topographical map showing one (1) foot interval ground contours at a scale suitable to show these plan elements sufficiently. Each watershed area shall be labeled individually, with flow calculations for each watershed area. Information required under this section, shown on the plans, may be referenced. Information may be presented in table form.

5. The Off-Site Analysis shall discuss the capacity of the existing drainage facilities, existing drainage problems, if known (i.e., scouring, sedimentation, bank sloughing, flooding, etc.), and the location of discharge points.

6. The Conveyance Systems Analysis and Design section shall present a detailed analysis of the proposed conveyance system. The analysis, which should be checked and verified, should be presented in a clear, concise manner that can be easily followed. All drainage structures and storm sewers shall be clearly labeled and correspond directly to the construction drawings. This section shall include a discussion regarding the sizing of the elements of the conveyance system. Documentation supporting the chosen runoff coefficient values and the chosen concentration time for each catchment area shall be included in this section or the Appendices. A Storm Sewer Design Table, shown in Figure 7.2.1 in the latest version of the LTAP Drainage Manual, must be provided when the rational method is used.

7. The Retention/Detention Analysis and Design section shall include a professionally prepared illustration of any retention or detention facilities and their appurtenances. This illustration shall include plan, section, profile, and elevation views. This section shall include the basic measurements of the facilities necessary to calculate the storage volumes available from zero to the maximum head available, orifice/restrictor sizes, head relationships, and outfall structure orientation concerning the retention or detention facility. The section shall include calculations, equations, storage/volume tables, graphs, references, and other necessary documents to clearly show the results and methodology used to determine the storage facility volumes. This section should provide a clear sequence of how the retention or detention facility was determined. Section 6.3 of the latest version of the LTAP Drainage Manual shall be followed for detention/retention; calculations may reference plans.

8. The Special Reports and Studies section shall include a summary of special reports prepared by persons with expertise in the particular area of analysis in cases where site characteristics pose unique and challenging road and drainage design problems. Special Reports and Studies may involve geotechnical/soils, wetlands, floodplains, slope protection/stability, groundwater, erosion & deposition, structural design, geology,

hydrology, hydraulics, water quality, and/or structural fill. If the submitted Drainage Plan does not include a Special Report or Study that would technically address the potential impacts and mitigation implementations associated with a unique feature of the site, the County Surveyor may request a Special Report or Study. A copy of the Special Report or Study shall be included in the Appendices of the Technical Report.

9. The Letter of Credit Cost Estimate section shall include a quantity tabulation and appropriate unit costs for each work item specified in the Drainage Plan. The total cost of the drainage system shall then be specified. Once approved, the total cost of the remaining construction shall be the value of a Letter of Credit. That estimated cost may be specified in the Letter of Certification.

10. The Maintenance and Operations Manual section shall include a maintenance and operations manual for each retention or detention facility specified in the Drainage Plan. The manual should be simply written and briefly describe the retention or detention facility, what it is, and how it works. In addition, the manual shall provide an outline of recommended maintenance tasks with the recommended frequency at which each task should be performed, and an estimate of the recommended life expectancy of the major drainage structures.

11. Appendices shall include copies of reference material (if a reference is made in the Drainage Report, and the reference is less than 10 pages, a copy of the reference will be placed in the appendices), maps, plans, Special Reports, or Studies, drawings (if there are several construction drawings, the drawings may be submitted as a bound and stapled separate set, although it is preferable for all of the drawings to be in the appendices).

ARTICLE 12: DRAINAGE PLAN REVIEW PROCEDURES (see the Flowcharts in Appendix A)

A. All requests for Drainage Plan approval for commercial projects shall be made by the Applicant to the Warrick County Drainage Board through the County Surveyor's office. The Applicant shall submit four (4) copies of the Drainage Plan, including four (4) blacklines of the Drawings, to the office of the County Surveyor for review at least 28 days before the Drainage Board meeting in which the Drainage Plan is to be presented and discussed. See Appendix A-1.

B. All requests for Drainage Plan approval for subdivisions shall be made by the Applicant to the Warrick County Area Plan Commission. The Applicant shall submit four (4) copies of the Drainage Plan, including four (4) blacklines of the Drawings to be included in the primary plat application. See Appendix A-2.

C. After reviewing the Drainage Plan, the County Surveyor will respond to the Applicant in writing with a copy sent to the Engineer. If the Drainage Plan is determined to be sufficient by the County Surveyor, the County Surveyor will include it in the agenda for the next scheduled Drainage Board meeting, assuming that the agenda is not full and there is ample time for it to be placed on the agenda. If the Drainage Plan is insufficient, the County Surveyor will return a marked-up Drainage Plan checklist indicating the areas of deficiency, and he/she shall return a marked-up Technical Report and/or Drawing(s). The Applicant will then revise the Drainage Plan to address the deficiencies. The Applicant shall submit four (4) complete, sufficient Drainage Plans, including four (4) blacklines of the Drawings, to the County Surveyor at least seven days before the Drainage Board meeting in which the Drainage Plan is to be presented

and discussed. If the County Surveyor returned a marked-up Technical Report and/or Drawing(s) to the Applicant, the Applicant shall return the marked-up Technical Report or Drawing(s) with the revised Drainage Plan. Note that any changes in the Drainage Plan that were not required to address an identified deficiency must be noted.

D. Once the County Surveyor has four (4) copies of a sufficient Drainage Plan, at least seven days before the Drainage Board meeting in which the Drainage Plan is to be presented and discussed, he/she will include it in the agenda for the next scheduled Drainage Board meeting, assuming that the agenda is not full and there is ample time, and he/she will present the Drainage Plan to the Drainage Board for its consideration. The Applicant or his/her representative should attend that Drainage Board meeting.

E. If the Drainage Plan is approved by the Drainage Board, the Board will send one copy to the Applicant with a written notice of approval.

F. Within 14 days of the date of Drainage Plan approval, the Applicant shall submit an electronic version of the approved drawings in Portable Document Format (PDF) that is acceptable to the County Surveyor.

ARTICLE 13: DRAINAGE PLAN APPROVAL

A. The Drainage Board shall approve any drainage plan that complies with the requirements of this ordinance and with the conditions and requirements applied by the Drainage Board. A drainage Plan becomes effective when the Drainage Board approves it.

B. The Applicant must initiate construction within thirty-six (36) months from the date that the Applicant receives the approved Drainage Plan approval from the Drainage Board. If construction has not commenced within thirty-six (36) months, the Drainage Plan approval shall be void, and the Drainage Plan must be resubmitted and reviewed. The Applicant may request the Drainage Board, in writing and through the County Surveyor, to extend the Drainage Plan approval.

C. If the drainage work specified in the Drainage Plan has not been completed within five (5) years from the date the secondary plat was approved, the Drainage Plan must be resubmitted and reviewed. The Applicant may request the Drainage Board, in writing and through the County Surveyor, to extend the Drainage Plan approval.

ARTICLE 14: DRAINAGE APPROVAL BEFORE RECORDING PLAT

Drainage Plan approval shall be obtained before the consideration by the Warrick County Area Plan Commission of the plat and before the recording of the plat for development.

ARTICLE 15: VARIANCES

Variances may be requested on rare occasions when a proposed development justifies varying from these ordinances. The Warrick County Drainage Board may grant variances. Any variances must be based on a demonstration that such variances are in the public interest and that the objectives of safety, function, appearance, environmental protection, and maintainability, based on sound engineering judgment, are fully met. All variances must be

approved before the Drainage Plan is approved.

ARTICLE 16: FLOODPLAIN MANAGEMENT ORDINANCE

The Warrick County Floodplain Management Ordinance contains specific requirements that apply to this ordinance. Each Development shall be reviewed for compliance with the same.

ARTICLE 17: EASEMENTS

A. All facilities conveying or detaining/retaining stormwater runoff (except for those specified in this section), including, but not limited to; pipes, storm sewers, conduits, culverts, catch basins, manholes, headwalls, ditches, channels, swales, ponds, basins, and outfall structures shall be located within an easement. Downspouts from buildings, footings, and yard inlets from private property do not have to be located within easements.

B. Drainage easements shall be dedicated to stormwater facilities only. Other structures, such as utility pipelines, may cross drainage easements at no less than forty-five (45) degrees, but preferably at an angle of ninety (90) degrees. There shall be a minimum twelve (12) inch vertical clearance between storm sewers and other utilities that cross, except as specified in Sections below.

C. Utilities, other than drainage facilities, that cross a drainage easement shall have a minimum of thirty-six (36) inches of cover unless otherwise approved by the Drainage Board.

D. All County Regulated Drains have seventy-five (75) foot wide right-of-entry easements, as measured from the top of the banks, except where a variance has reduced the right-of-entry easements. Other structures, such as utility, may cross a Regulated Drain easement, upon application, the payment of a $300 fee, and the approval of the Drainage Board at an angle no less than forty-five (45) degrees, but preferably at an angle of ninety (90) degrees. There shall be a minimum of sixty (60) inches of cover for utilities below the bottom of the drain that crosses a Regulated Drain easement, unless otherwise approved by the Drainage Board.

E: Easements for open channels based upon typical sections provided in the drainage plans shall be a minimum of 10 feet wide. Additional easement widths are as follows:

1. For channels less than 2 feet in depth, the distance is measured from the top of the bank to the top of the bank plus 1.5 feet along both banks.

2. For channels less than 4-feet depth but greater than 2-feet depth, the distance is measured from the top of the bank to the top of the bank plus 2.0 feet along both banks.

3. For channels greater than 4-feet depth, the distance measured from top of bank to top of bank plus 10 feet minimum along one side for access purposes.

Easements for existing natural channels shall be as follows:

1. Natural channels with side slopes of 3:1 or less shall have a minimum easement width equal to the distance measured from top of bank to top of bank plus 10 feet minimum along one side for access purposes.

2. Natural channels with side slopes greater than 3:1 shall have a minimum easement width equal to the distance measured from top of bank to top of bank plus 12 feet minimum along one side for access purposes.

All easements reserved for pipes shall be at least twelve (12) feet in width.

Pipe Diameter	Feet of Cover	Minimum Easement Width
24" or Less	Up to 4' Cover	12'
Greater than 24"	Up to 4' Cover	12' + Diameter of Pipe
24" or Less	Greater than 4' Cover	[(Total cover – 4') x 2] + 12'
Greater than 24"	Greater than 4' Cover	[(Total cover – 4') x 2] + (12' + Diameter of Pipe)

If special circumstances exist, the Warrick County Engineer and/or Warrick County Surveyor may require additional easement widths.

G. After the construction specified in the Drainage Plan has been accepted, no improvements within the easement shall be performed, including but not limited to, installing fences or poles, constructing sheds or buildings, planting trees or shrubs, regrading, excavating, placing fill, or anything else that may impede the flow of water in the easement without the expressed written approval from the County Surveyor.

H. Drainage and Sanitary Sewer Easements (DSSE) shall be dedicated to stormwater facilities and sanitary sewer facilities that run parallel and 8' apart (measured from centers).

ARTICLE 18: AMOUNT OF RUNOFF TO BE ACCOMMODATED BY VARIOUS PARTS OF THE DRAINAGE SYSTEM

A. All drainage facilities shall be designed for a minimum peak flow runoff generated from the fifty (50) year storm event.

B. Detention Facilities shall release a maximum flow rate equal to the runoff generated from a 5-year storm event under the pre-developed condition, while detaining at a minimum the excess runoff generated from a 50-year storm event under the developed conditions.

C. Retention Facilities shall retain at a minimum the runoff generated from a 50-year storm event under the developed conditions.

ARTICLE 19: 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, $Q = (A) \times (V) = (A) \times (1.486 / n) \times (R^{2/3}) \times (S^{1/2})$, where

Q = Discharge in cubic feet per second

A = Waterway area of the pipe in square feet
V = the mean velocity of flow in feet per second
R = the hydraulic radius in feet (cross-sectional area / wetted perimeter)
S = the slope of the energy grade line in feet per foot
n = the roughness coefficient, where

PIPE (n values)

RCP	0.013
Concrete Box Culverts	0.013
PVC or HDPE (smooth-wall pipe)	0.010
CMP	0.021
Steel (smooth-wall pipe)	0.011
Ductile Iron	0.011

For roughness coefficients for pipes or ditches, other than those specified above, refer to Table 4.2.1 or the equivalent in the latest version of the LTAP Drainage Manual.

B. Minimum Pipe Capacity

All storm sewers shall be designed to be a maximum of 90% full when conveying at a minimum the peak flow of a fifty (50) year storm event, except for basin discharge pipes, which can be designed to convey 100% of their capacity.

C. Minimum Pipe Size

The minimum size of all storm sewers shall be twelve (12) inches in diameter. Where a twelve (12) inch diameter pipe will not limit the required release rate, a stainless-steel orifice plate or similar device shall control the release rate for detention facilities.

D. Minimum Cover

The storm sewer grade shall be such that, generally, a minimum of one (1) foot of cover shall be maintained over the top of the pipe, unless pipe manufacturer literature recommends a greater minimum cover.

E. Slopes

Uniform slopes shall be maintained between drainage structures. Minimum and maximum slopes shall produce velocities between two (2) and fifteen (15) feet per second when the pipe is flowing full.

F. Horizontal Alignment

Storm sewers shall be straight between drainage structures, except in the case of box culverts which may have bends with access manholes.

G. Location of Drainage Structures

1. Drainage Structures shall be installed to provide access to storm sewers for inspection and maintenance.

2. Except for box culverts, drainage structures shall be installed at the following locations:

   (a) Where two or more storm sewers converge with a minimum diameter of twelve (12) inches.
   (b) Where pipe sizes change.
   (c) Where a change of vertical alignment occurs.
   (d) Where a change of horizontal alignment occurs.
   (e) Where a change in pipe slope occurs.

3. For box culverts, access manholes shall be installed at the following locations:

   (a) Where two or more box culverts converge.
   (b) Where box culvert sizes change.
   (c) Where a change of vertical alignment occurs.
   (d) Where a change of horizontal alignment occurs.
   (e) Where a change in slope occurs.

4. The maximum distance between surface drainage structures shall be six hundred (600) feet. The maximum distance between structures shall be three hundred (300) feet for access.

5. Manhole covers shall not be installed at the following locations:

   (a) Within a curb and/or gutter.

H. Curb Inlets

Curb Inlets shall collect surface water on curbed and paved areas through grated openings. Curb inlets shall be designed according to the latest version of the LTAP Drainage Manual. Curb inlet openings shall be adequate to pass a runoff from a fifty (50) year storm event with a maximum gutter flow depth of four (4) inches in sag areas. An emergency weir with an overflow channel or similar drainage facility shall be installed adjacent to curb inlets in sags so that the maximum depth of water that is ponded in a street sag during a fifty (50) year storm event, assuming the inlet is plugged, shall not exceed ten (10) inches, as measured at a point from, and perpendicular to, the front of the grate. The maximum distance between curb inlets shall be six hundred (600) feet.

I. Area Drains and Yard Inlets

Area drains and yard inlets shall be utilized to collect surface water on paved, non-curbed surfaces through grated openings. Area drains and yard inlet openings shall be adequate to pass a runoff from a fifty (50) year storm event.

J. Minimum Road Elevation

The minimum road elevations shall be such so that all manhole rims and curb inlets/front of the grate shall be above the one hundred (100) year flood elevation.

K. Curb Turnouts

Curb turnouts shall not be allowed to be part of a Drainage Plan unless specifically approved by the County Surveyor and County Engineer.

L. Construction and Materials

The specifications for the construction of storm sewer drainage structures shall not be less than those outlined in the latest edition of the Indiana Department of Transportation (INDOT) Standard Specifications or as modified by the County Surveyor or County Engineer. Pipe trench details are shown in the Appendices. The most current manufacturer's installation recommendations shall be followed. All workmanship in implementing the Drainage Plan shall be of high quality and reflect compliance with this ordinance's requirements and with all applicable local, state, and federal laws and regulations, as well as common industry standards.

ARTICLE 20: OPEN CHANNEL DESIGN STANDARDS

All open channels, 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, $Q = (A) \times (V) = (A) \times (1.486 / n) \times (R^{2/3}) \times (S^{1/2})$, where

Q = Discharge in cubic feet per second
A = Waterway area of the pipe in square feet
V = the mean velocity of flow in feet per second
R = the hydraulic radius in feet (cross-sectional area / wetted perimeter)
S = the slope of the energy grade line in feet per foot
n = the roughness coefficient, where

Ditch (i.e., open channel) n values	
Concrete (trowel finish)	0.013
Concrete (broom or float finish)	0.015
Guite	0.018
Rip-Rap, placed	0.030
Rip-Rap, dumped	0.035
Gabions	0.028

For roughness coefficients for pipes or ditches other than those specified above, refer to Table 4.2.1 or an equalizing table in the latest version of the LTAP Drainage Manual.

B. Cross Section and Grade

The required channel cross-section and grade are determined by the design capacity, the

material lining the channel, and the maintenance requirements. 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 avoid erosion and to maintain channel stability. Velocities less than 1.5 feet per second should be avoided because siltation will occur, reducing the channel capacity.

C. Side Slopes

Earthen channel side slopes shall be no steeper than 3 horizontal to 1 vertical. 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 for weepholes. Side slopes steeper than 1-1/2 to 1 may be used for lined channels, provided the sidelining is designed and constructed as a structural retaining wall.

D. Channel Stability

1. Characteristics of a stable channel are:

(a) It neither aggravates 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, storm drains, channel outfalls, or elsewhere.

(e) Gullies do not form or enlarge due to the entry of uncontrolled flow into the channel.

E. Low Flow Channels

Low-flow channels shall be installed in wide bottom channels. The bottom width of a grass-lined channel shall not exceed fifteen (15) feet unless a concrete low-flow channel is provided to prevent flowline meandering.

F. V-shaped channels shall not be allowed.

G. Drainage of Waterways

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

I. Appurtenant Structures

The effect of channel improvements on existing culverts, bridges, buried cables, pipelines, and

inlet structures for surface and subsurface drainage to the channel being improved and the channel laterals shall be evaluated to determine the need for modification or replacement. Culverts and bridges that 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.

J. Disposition of Spoil

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

1. Minimize overbank wash.

2. Provide for the free water flow between the channel and floodplain unless the valley routing and water surface profile are based on continuous dikes being installed.

3. Do not hinder the development of maintenance travel ways.

4. Leave the right-of-way or right-of-entry in the best condition feasible, consistent with the project purposes, for productive use by the owner.

K. Construction and Materials

1. The specifications for the construction of storm sewer open channels shall not be less than those outlined in the latest edition of the Indiana Department of Transportation (INDOT) Standard Specifications.

2. The most current manufacturer's installation recommendations shall be followed.

3. Acceptable materials for channel lining shall be Grass, Riprap, Concrete, Grouted Riprap, or Gabions. Other lining materials shall require specific approval from the County Surveyor and shall comply with the latest edition of the INDOT "Standard Specifications."

ARTICLE 21: DETENTION/RETENTION DESIGN STANDARDS

The following shall govern the design of any improvement concerning the detention/retention of stormwater runoff.

A. Acceptable Detention/Retention Methods

As the ordinance requires, runoff from a proposed development shall be detained on-site by appropriate detention or retention facilities. As these standards explain, detention facilities shall be sized to store excess flows. In the case of detention facilities, control devices shall limit the discharge to a rate no greater than that prescribed in this ordinance. All stormwater pipes carrying runoff water into a detention facility shall be installed and maintained in a manner that does not hold standing water. The permanent pool elevation of a detention facility shall not be changed without the Drainage Board's approval.

B. Design Storm

The design of stormwater detention facilities shall be based on a return period of once every 50 years. The storage volume and outflow rate shall be sufficient to accommodate the stormwater runoff from such a storm.

C. Allowable Release Rate

1. The allowable release rate of stormwater originating from a proposed development shall not exceed the amount specified in Article 6 – Stormwater Control Policy.

2. In the event the natural downstream channel or storm sewer system is inadequate to convey 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.

3. An allowance, equivalent to the reduction in flow rate provided, shall be made for upstream detention when the Warrick Drainage Board has previously approved such upstream detention and release rate, and evidence of the upstream detention facility's as-built condition and operation can be demonstrated to the Drainage Board.

D. Emergency Overflow Spillway

1. An emergency overflow spillway shall be provided to release runoff that exceeds the maximum detention volume, or all runoff, should the normal discharge devices for the detention facility become totally or partially inoperative.

2. As a safety factor, a minimum freeboard of one-half foot above the calculated maximum of the design storm detention high water level to the elevation of the emergency overflow spillway is required.

3. The emergency overflow spillway shall be designed so that it operates openly, and automatically, does not require manual attention, and will pass all of the unretained runoff from storms with intensities of the fifty (50) year storm event while maintaining a minimum vertical height of six (6) inches from the water surface flowing over the spillway to the lowest ground elevation in the earthwork surrounding the spillway.

4. The runoff flowing over the spillway shall be directed to watercourses and shall not be directed to cause damage.

E. Determination of Storage Volume – Rational Method

For areas of two hundred (200) acres or less, the Rational Method shall be used to determine

the required stormwater storage volume. The procedure for calculating the storage of stormwater needed using the Rational Method is included in Section 6.2.1 of the latest version of the LTAP Drainage Manual. The facility must be designed to store the largest volume, which is calculated for storm durations of up to 24 hours.

F. Determination of Storage Volume – Other Methods

For tributary drainage areas larger than 200 acres, computerized runoff hydrographs and routing techniques shall be used. Various standard methods may be used, as long as the source of the method is documented. The facility must store the largest volume, which is calculated for storm durations of up to 24 hours.

G. General Detention or Retention Basin Design Requirements

1. Basins shall be constructed to temporarily detain the stormwater runoff that 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 permitted in other on-site facilities, shall be sufficient to control excess runoff from the design storm.

2. The following design principles shall be followed:

(a) The maximum volume of water stored and subsequently released at the design release rate shall not result in a storage duration over 48 hours unless additional storms occur.

(b) The inside top of a bank for stormwater detention or retention facilities shall be separated by at least twenty (20) feet from any occupied building or structure. The Lowest Adjacent Grade (including walkout basement floor elevations) shall be set at least twelve (12) inches above the lowest point at the top of the Detention or Retention Basin bank.

(c) The maximum depth of water to be stored in a dry-bottom detention or retention facility during the design storm event shall not exceed four (4) feet, and the maximum depth of water to be stored above the normal pool level in a wet bottom detention or retention facility shall not exceed four (4) feet during the design storm event.

3. All excavated excess spoil may be spread for aesthetic and recreational features.

4. All detention and retention basins with grassed, earthen side slopes shall have side slopes no steeper than four horizontal units of measurement to one vertical unit of the same measurement (4:1) to the base of dry-bottom basins and the permanent pool elevation of wet-bottom basins.

5. All detention and retention basins with rip-rap armored side slopes shall have side slopes no steeper than two horizontal units of measurement to one vertical unit of the same measurement (2:1) at any point in the side slope. The rip-rap shall extend below the minimum depth of the permanent pool elevation by at least two (2) feet below the permanent pool elevation. The minimum depth of rip-rap armament shall be twelve (12)

inches in all areas. Structural retaining walls shall be constructed on side slopes steeper than two horizontal units of measurement to one vertical unit of the same measurement (2:1).

6. For retention basins with non-armored earthen side slopes, the submerged side slopes shall have side slopes no steeper than four horizontal units of measurement to one vertical unit of the same measurement (4:1) from the permanent pool elevation to a level that is two (2) vertical feet below the permanent pool elevation.

7. Safety screens having a maximum opening of six (6) inches shall be provided for any pipe or opening discharging from a detention facility to prevent children or large animals from crawling into the structures.

8. Danger signs shall be mounted on signposts at appropriate locations to warn of deep water or possible flooding during storm periods..

9. Outlet control structures shall be designed to operate as simply as possible and require minimal maintenance and/or attention for proper operation. Regardless of the primary outlet device, this structure shall include a grate or similar device set at the emergency overflow elevation for the fifty (50) year storm.

10. Grass or suitable vegetative cover shall be provided on all side slopes where rip-rap is not used. Grass should be cut regularly at approximately monthly intervals during the growing season or as required.

11. Debris and trash removal and other necessary maintenance shall be performed regularly to assure continued operation in conformance to design. Trash racks, fabricated from and secured by stainless steel, aluminum, or any other water-resistant material, shall be installed to prevent trash from discharging from the detention/retention facility.

12. Inlet pipes shall discharge runoff into the basins as reasonably far as practically possible from the outlet control structure to provide the maximum time for sediments to settle. If inlet pipes cannot be located reasonably far from the outlet control structure, permanent baffles constructed of water-resistant materials shall be installed to provide a longer time for sediments to settle.

H. Parking Lot Storage

Paved parking lots may be designed to provide temporary detention storage of runoff on all or a portion of their surface. Outlets shall be designed to slowly empty the stored water. Depths of storage shall be limited to a maximum depth of six (6) inches to prevent damage to parked vehicles, so that access to parked vehicles is not restricted. Parking lot storage should, in general, be confined to those areas of the parking lot that are furthest from the areas being served by the parking lot.

I. Dry Bottom Basin Design Requirements

Detention basins that 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, including 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, such as recreational facilities, aesthetic qualities (open spaces) or other types of use. Such detention basin shall be regularly mowed and maintained free of excess brush and vegetation.

J. Wet Bottom Basin Design Requirements

Where part of a detention basin 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 minimum water depth at any point of six (6) feet, 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. Ponds require periodic maintenance to control weed and larval growth. They must also be designed to easily remove sediment accumulated during operation periods.

5. Aeration facilities may be installed to enhance and maintain pond water quality in wet-bottom basins. The type and size of the aeration facilities shall be determined either by the manufacturer of the aeration facilities or by the engineer. Design calculations and written recommendations by the manufacturer to substantiate the effectiveness of these aeration facilities may be submitted.

6. If the local fire department requires it, a dry hydrant shall be installed. The dry hydrant shall meet the department's specifications and requirements.

K. Trash Racks

1. The trash racks shall be fabricated or manufactured from stainless steel, aluminum, or any other durable water- and weather-resistant material. For outlets greater than six inches in any dimension, the trash rack shall have openings no wider than six (6) inches in any dimension. For outlets six inches or less in any dimension, the trash rack shall have openings no wider than the greatest dimension of the outlet in any dimension.

2 The trash racks shall be securely fastened to the outlet control structure or similar

structure with stainless steel, aluminum, or any other durable, water—and weather-resistant material.

3. The trash rack must be large enough that partial clogging will not adversely restrict the outflow. It shall be fabricated so that it will pass the designed outflow rate even if as many as 25% of the openings are clogged. The trash rack shall be placed at a suitable distance from the outlet to avoid interference with the outlet's hydraulic efficiency.

4. The trash rack shall be installed so that debris can be removed from it while standing from the top of the outlet control drainage facility and using only manual tools and/or equipment.

L. Restrictors

1. Restrictors shall be an opening with a closed perimeter, usually sharp-edged, and of geometric shape in the form of a plate, wall, or partition, through which water may flow at a restricted flow rate. For example, a stainless-steel plate with an opening secured within the inside of a pipe to reduce the cross-sectional area to restrict the flow, or an opening in a concrete wall of an outlet control structure to restrict the amount of flow discharging from a detention facility.

2. Restrictors shall be fabricated or manufactured from stainless steel, aluminum, or any other durable, water—and weather-resistant material. They shall be securely fastened to the outlet control structure or similar structure with stainless steel, aluminum, or any other durable, water—and weather-resistant material.

3. The minimum dimension in any direction of the restrictor shall be twelve (12) inches. If hydraulic calculations show that the restrictor must be less than twelve (12) inches in any dimension, a special device shall be designed. This device may consist of a perforated riser, vertical slotted pipe, inlet-controlled perforated pipe, internally-controlled perforated pipe, hooded orifice or riser that draws water at least one (1) foot below the permanent pool elevation (for retention basins only), negatively sloped pipe that draws water at least one (1) foot below the permanent pool elevation (for retention basins only), or any other specialty device that has been designed to meet the hydraulic requirements while minimizing clogging.

M Pipe Collars

The County Surveyor may require pipe collars in the trench for the outlet pipe to prevent water from flowing from the detention facility. Fabricated or manufactured devices shall be stainless steel, aluminum, concrete, bentonite, ABS (i.e., *Ripley's Dam*), or any other water/weather-resistant material. The pipe collar shall span the trench's entire width and create a watertight seal against the pipe.

N Paved Ditch

If the slope of the pond bottom in a detention basin is less than one percent, a paved ditch shall

be constructed by constructing a concrete ribbon (minimum 4000 psi and 5%—6% air entrainment) with a minimum thickness of six (6) inches of reinforced concrete and a minimum width of sixteen (16) inches. The minimum slope shall be 0.2%.

O. To minimize the wetness of the pond bottom that might harbor insects, if a paved ditch is required, the pond bottom between the toe of the side slopes and the paved ditch shall be graded to a minimum slope of one percent.

P. Sub-surface Detention or Retention Design Requirements

1. Subsurface storage units may be accommodated using tanks, chambers, vaults, pipes, stones, voids, or any other fabricated or manufactured container, but such storage units shall not be located in the County right-of-way.

2. The minimum diameter for a pipe, and the minimum vertical height or horizontal span for any other type of detention or retention storage unit shall be thirty (30) inches, unless otherwise approved by the County Surveyor.

3. Materials, including material limitations, on all detention or retention units shall be per the latest edition of the INDOT Standard Specifications.

4. In areas where seasonal groundwater may induce flotation, buoyancy tendencies must be balanced by either adding ballast, placing heavier backfill materials like concrete, installing hold-down straps and concrete anchors, increasing the total weight of the units, or providing sub-surface drains to lower the groundwater table permanently.

5. The maximum depth to the invert of any sub-surface detention or retention units shall be twelve (12) feet. Spacing between access openings shall not exceed two hundred (200) feet. All access openings shall be readily accessible to maintenance vehicles. Openings shall have a twenty-four (24) inch diameter with a sealed cover.

Q. Water Quality

1. Water Quality during and after construction of the development shall be specifically addressed through the Construction/Stormwater Pollution Prevention Plan, as required for the development of sites that disturb an area that is equal to or greater than one acre in size. Vegetated filter strips, vegetated swales, infiltration trenches, infiltration basins, detention or retention facilities, constructed or restored wetlands, filtration systems, and oil-grit separators can improve water quality.

2. For the development of sites that disturb an area that is less than one acre in size, water quality shall still be considered in the development's overall design.

R. Off-site Drainage Provisions

When allowable runoff is released in an area susceptible to flooding, the developer may be required to construct appropriate storm drains through such an 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

Drainage Board unless the Applicant technically proves that the development will not cause or increase downstream flooding.

S. Infiltration Systems

The design of infiltration systems shall follow section 6.3.5 or its equivalent of the latest version of the LTAP Drainage Manual.

T. Construction and Materials

The specifications for the construction of detention and retention facilities shall be at least those outlined in the latest edition of the Indiana Department of Transportation (INDOT) Standard Specifications.

U. Inspections

All public and privately owned detention or retention facilities may be inspected by representatives of the County, at any time.

ARTICLE 22: PRIVATE DRAINAGE FACILITIES

Sump pumps installed to receive and discharge groundwater and other stormwater shall be directed to the storm surface system where possible, or discharged into a designated storm sewer channel, but never allowed to discharge or pool in public roadways or storm inlet structures. Sump pumps installed to receive and discharge floor drain flow or sanitary sewage must be connected to the sewer system or an approved septic system. A sump pump shall be used for one function only, either the discharge of stormwater/groundwater or the discharge of floor drain/sanitary sewage

All downspouts or roof drains shall discharge onto the ground or be directed to the storm surface drainage structures. No downspouts or roof drains shall be connected to the sanitary sewer system.

A. Footing drains shall discharge onto the ground or be directed to storm surface drainage structures, where possible, or be discharged into a designated storm sewer surface channel. No footing drains or drainage tile shall be connected to the sanitary sewer system.

B. Basement floor drains shall not be connected to the storm system.

ARTICLE 23: EROSION CONTROL

If a construction project disturbs one (1) acre or more of land, the site owner must apply for a Construction Stormwater General Permit from the Warrick County MS4.

ARTICLE 24: PIPE CONNECTIONS

No unauthorized connections to stormwater pipes are allowed.

ARTICLE 25: STORMWATER DISCHARGE

Runoff from developments shall discharge into the existing stormwater drainage facility.

ARTICLE 26: INSPECTION OF STORM SEWER SYSTEM INSTALLATION

A. Photo documentation of pipe installation showing bedding and backfill per the manufacturer's standards. If special circumstances exist, the Warrick County Engineer and/or Warrick County Surveyor may require deflection testing of flexible pipe per the next section.

B. All storm sewer construction of flexible pipe, including pipe manufactured from Polyvinyl Chloride (PVC), High-Density Polyethylene (HDPE), and Corrugated metal Pipe (CMP), shall be inspected or tested for deflection per the following:

(a) Pipes that cannot be inspected and measured for deflection with video cameras, visual inspection, or manual measurement to the satisfaction of the County Engineer or the Warrick County Surveyor to determine less than five percent (5%) deflection shall be tested using a mandrel.

(b) The mandrel shall be pulled by hand without mechanical assistance, and the mandrel test shall be a "go/no-go" procedure.

(c) The mandrel shall be approved by the County Engineer or the Warrick County Engineer or their authorized representative before its use to certify that the mandrel is rigid, non-adjustable, has an odd number of legs not less than nine (9), and has a length not less than its nominal diameter.

(d) The diameter of the mandrel at any point shall not be less than the allowed percentage of deflection of the certified actual mean inside diameter of the tested pipe.

(e) The mandrel shall be fabricated of metal, fitted with pulling rings at each end, stamped or engraved on some segment other than a runner with the nominal pipe size and the mandrel's outside diameter.

(f) For any vertical or horizontal deflection test, pipe failure shall be defined as a five percent (5%) or greater deflection of the tested pipe's internal diameter.

(g) The Project Site Owner/Operator shall perform or cause to be performed all required deflection tests no sooner than thirty (30) days after the final backfill, per the manufacturer's specifications, has been placed over the pipe to be tested.

(h) Pipe inspection and test methods, procedures, and equipment, whether conducted or employed for mandrel testing under special circumstances or other video inspections necessary to comply with this section, shall be subject to the County Engineer's or the Warrick County Surveyor's approval and all tests and inspections must be conducted in the presence of the County Engineer or his or her authorized representative.

(i) The pipe inspection and test results must be reviewed and certified by the

County Engineer or authorized representative before the storm sewer facilities' final acceptance or release and applicable portion improvements.

(j) All flexible pipes failing the deflection test within the warranty period shall be replaced or caused to be replaced by the project site owner or operator at no cost to the County.

ARTICLE 27: LETTER OF CREDIT

A. For major subdivisions, a separate Letter of Credit for the stormwater system will not be required because the Letter of Credit for approval of the major subdivisions, as defined in the Warrick County, Indiana Subdivision Control Ordinance, includes the stormwater system

ARTICLE 28: RECORD DRAWINGS

A. After completion of the project, but before final approval and/or acceptance by the County, two blackline sets of the Drawings and by email, USB drive or drop-box containing an electronic version of the record drawings in PDF that is acceptable to the County Surveyor shall be submitted to the Drainage Board through the office of the County Surveyor. The blacklines shall be stamped, signed, and dated by a professional civil engineer or professional land surveyor regularly engaged in stormwater drainage design, and registered to practice in the State of Indiana.

B. Certified "Record Drawings"

(a) After completion of the project, and before final approval and/or acceptance can be made, two professionally prepared and certified sets of "Record Drawings" shall be submitted to the county surveyor and the county engineer for review. The plans shall also be submitted electronically in PDF format, which does not allow edits. If the Drainage Plan is constructed essentially as designed or with only minor variations within acceptable Engineering Practice, a Certification Statement may be submitted on the approved County Certification for 803.

(b) These plans shall include all pertinent data relevant to the completed stormwater drainage system and shall include:

1. Pipe size, length, and material;

2. All rim and invert elevations of all drainage structures;

3.Spot elevations on all drainage swales and ditches. Elevations shall be provided on the flow line at 100-foot intervals, or at each property line (whichever is less). Upon request of the County Engineer or County Surveyor, the top of the bank shall also be shown on the "as-built" plans.

4.Correctly located limits and alignment of all drainage facilities, intended to remain in place, in correlation to platted easements and rights-of-way;

5.Data and calculations showing all basin storage volumes and storage elevations as-built with a statement that the volumes contained within any retention or detention facility meet of exceed the required design storage volumes;

6.An engineer's certified statement on the "Record Drawings" plans that the completed stormwater drainage system complies with the final drainage plan approved by the Board, or clearly depicts, describes, and explains deviations from the approved final drainage plan.

(c) The County Surveyor will store "Record Drawings" with the drainage plan. The County surveyor shall store one copy of the "as-built" plans with the approved drainage plan.

(d) The County Engineer will store "Record Drawings" with Street Plans. The county engineer shall store one copy of the "as-built" or Record Drawings" plans with the approved street plans.

Drainage Certification

The completed stormwater drainage system complies with
the final drainage plans approved by the Warrick County
Drainage Board on _____ except as noted on the Record Drawings.

_____

ARTICLE 29: MODIFICATIONS TO APPROVED DRAINAGE PLAN

A. Modifications During Construction:

1. Any major modification (or modifications) to an approved Drainage Plan shall be filed with the Drainage Board before implementing the major modification(s). The word "major" shall be determined by the County Surveyor. If the Drainage Board approves the modification(s), it will become part of the approved Drainage Plan. If the Drainage Board does not approve it, the Applicant must revise the modification(s) and resubmit them to the Drainage Board for approval. If the major modification(s) have been implemented and then not approved by the Drainage Board, the major modification(s) will either have to be removed or modified to satisfy this ordinance.

2. Any minor modification (or modifications) to an approved Drainage Plan shall be filed with the Drainage Board before implementing the minor modification(s). The word "minor" shall be determined by the County Surveyor. The County Surveyor may approve the minor modification(s), not approve the minor modification(s), or request the Drainage Board to consider the minor modification(s). If the minor modification(s) have been implemented and then not approved by the County Surveyor or by the Drainage Board, the minor modification(s) will either have to be removed or modified to satisfy this ordinance.

B. Modifications After Project Completion and Acceptance:

1. Any modification (or modifications) to any part of the approved Drainage Plan shall require a new approval of the Drainage Plan from the Drainage Board. If the

modification(s) are major, as determined by the County Surveyor, a new Drainage Plan conforming to this ordinance shall be submitted to the Drainage Board for approval.

ARTICLE 30: MAINTENANCE

A. General Maintenance.

1. Before Project Completion and Acceptance, maintenance of proposed (as shown on the approved Drainage Plan) drainage facilities within existing and proposed County right-of-way shall be the Applicant's responsibility. Before Project Completion and Acceptance, the county shall be responsible for maintaining existing drainage facilities that receive stormwater from the development and are within the existing county right-of-way. However, if the County Surveyor determines that the sole reason for performing maintenance on existing drainage facilities is due to the implementation of the approved Drainage Plan (such as sedimentation, damage, and construction debris), the Applicant shall be responsible for the maintenance. After Project Completion and Acceptance, maintenance of existing and proposed (as shown on the approved Drainage Plan) drainage facilities, which are within existing and accepted County right-of-way and drainage easements (which were shown to be proposed in the Drainage Plan), shall be the responsibility of the County, excluding retention/Detention facilities

B. Assignment of maintenance of drainage easements and drainage facilities.

1. The County shall perform structural and non-structural maintenance of drainage facilities within the right-of-way.

2. The property owner of the said easement shall perform non-structural maintenance of the land with drainage easements. See Appendix C's DECLARATION OF COVENANTS, INSPECTION/MAINTENANCE OF DRAINAGE FACILITY.

3. The County shall perform Structural maintenance of drainage facilities within drainage easements, excluding retention/detention facilities. See Appendix C's DECLARATION OF COVENANTS, INSPECTION/MAINTENANCE OF DRAINAGE FACILITY.

4. Structural and non-structural maintenance of the land and drainage facilities not within drainage easements shall be performed by the property owner of the said land.

C. Types of Maintenance.

1. Non-structural maintenance shall include: mowing grass, removing trash, controlling weeds, and maintaining the designed cover over the storm sewers.

2. Structural maintenance shall include: keeping all parts of the stormwater drainage system operating as designed and constructed, keeping channels, embankments, shorelines, and bottoms of waterways and basins free of all erosion and sedimentation; maintaining the drainage facilities which lie on his or her property following the conditions described in the accepted Drainage Plan on file in the County Surveyor's Office, and in compliance with this Ordinance; preventing all

persons or parties from causing any unauthorized alternations, obstructions, or detrimental actions from occurring to any part of the stormwater drainage facility and drainage easement.

D. Drainage Facility Repair Account.

1. A Drainage Facility Repair Account established for each development will pay for the costs of structural maintenance of the drainage facilities shown on the record plans for this Subdivision, which are either within County right-of-way or are outside of the County right-of-way and but within drainage easements, as shown on the plat of this subdivision.

2. The Drainage Facility Repair Account shall be created and maintained by the Warrick County Auditor as follows:

(a) The County Auditor shall create an account into which the County Treasurer shall deposit the prepaid maintenance money received from the Applicant using this maintenance method and all money collected through fines and liens from properties within subdivisions. This account shall also collect all money received from fines, tax liens, interest payments, and penalties generated by violations of the terms of this Ordinance.

(b) The County Surveyor shall sign a warrant for payment of a claim for materials and/or labor used to repair structural failures of drainage facilities, or to bring a project or a part thereof into compliance with the terms of this chapter all as described in this section of this chapter; but only if the criteria are met:

(c) The Applicant shall submit to the County Treasurer a sum equal to five dollars times the linear feet of stormwater sewers and culverts installed for this development that are twelve inches (12") or greater in nominal diameter ($5.00/linear foot), plus two hundred dollars times the number of drainage structures installed for this development ($200.00/structure.

E. Inspection.

1. The entire drainage system, including the basins, for all developments requiring a Drainage Plan shall be inspected by the County Surveyor or his representative after construction. A written approval and acceptance of the drainage facilities, including basins and off-site facilities, shall be subject to an inspection conducted by the County Surveyor according to the following procedure:

(a) The County Surveyor's inspection shall be conducted by the following procedure:

(i) The applicant shall give written notice to the County Surveyor that the drainage system for the development is completed.

(ii) The County Surveyor shall inspect, or cause to be inspected, the drainage System, including the basins, and shall issue, within twenty-one (21) days

from the receipt of the owner's/developer's written notice, either a written approval of the facilities or a notice listing any inadequacies in the system.

(iii) Upon correction of inadequacies, if any, written notice of completion again shall be given to the County Surveyor by the owner(s)/developer(s).

(iv) The applicant shall maintain and guarantee the entire storm sewer system, including the basin(s), for one year beginning on the date of the County Surveyor's written approval of the system.

2. Periodic Inspections of Storm Sewer Systems and Basins.

(a) Drainage facilities constructed under the provisions of this Ordinance will be inspected by the County Surveyor or his/her agent on a periodic or as-needed basis.

(b) A permanent record of all inspections shall be kept in the Office of the County Surveyor

(c) The purpose of such periodic inspections shall be to determine compliance or noncompliance with the requirements of this Ordinance and compliance with the conditions of the approved Drainage Plan.

(d) If required by the Drainage Board, a certified inspection report covering physical conditions, operational conditions, compliance with ordinance requirements, and other pertinent data will be filed with the Drainage Board and made available for public viewing.

ARTICLE 31: DISCLAIMER OF LIABILITY

The Drainage Board accepts no responsibility for any impacts due to deviations from the approved Drainage Plan.

ARTICLE 32: CORRECTIVE ACTION

Nothing in this ordinance shall prevent Warrick County, Indiana, from taking lawful action as may be necessary to prevent or remedy any violation. All costs of such action shall accrue to the person or persons responsible.

ARTICLE 33: VIOLATIONS, ENFORCEMENT, AND PENALTIES

Any action or inaction that violates the provisions of this ordinance or the requirements of an approved stormwater management plan or permit may be subject to the enforcement actions outlined in this Section. Any such action or inaction that is continuous over time is deemed a public nuisance and may be abated by injunctive or other equitable relief. Imposing any of the penalties described below shall not prevent such equitable relief.

ARTICLE 34: NOTICE OF VIOLATION

A. If the Warrick County Surveyor determines that an Applicant or other responsible person has failed to comply with the terms and conditions of an approved Drainage Plan or the provisions of this ordinance, it shall issue a written notice of violation to such Applicant or other responsible person. Where a person is engaged in activity covered by this ordinance without having first secured a permit, the notice of violation shall be served on the owner or the person responsible for the activity being conducted on the site.

B. The notice of violation shall contain:

1. The name and address of the owner, the Applicant or the responsible person;

2. The address or other description of the site upon which the violation is occurring;

3. A statement specifying the nature of the violation;

4. A description of the remedial measures necessary to bring the action or inaction into compliance with the permit, the stormwater management plan or this ordinance and the date for the completion of such remedial action;

5. A statement of the penalty or penalties that may be assessed against the person to whom the notice of violation is directed; and,

6. A statement that the determination of violation may be appealed to the Drainage Board by filing a written notice of appeal within thirty (30) days after the notice of violation (except, that in the event the violation constitutes an immediate danger to public health or public safety, a 24-hour notice shall be sufficient).

ARTICLE 35: ILLICIT DISCHARGE AND ILLEGAL CONNECTION

Discharges to the storm sewer system not composed entirely of stormwater runoff contribute to increased non-point source pollution and degradation of receiving water. These non-stormwater discharges occur due to spills, dumping, and improper connections to the municipal/county separate storm sewer system from residential, industrial, commercial, or institutional establishments. These non-stormwater discharges impact waterways not only individually, but geographically dispersed, small volume non-stormwater discharges can have cumulative impacts on receiving waters. These discharges adversely affect public health and safety, drinking water supplies, recreation, fish and other aquatic life, property values, and other uses of lands and waters. These impacts can be minimized through the regulation of spills, dumping, and discharges into the storm sewer system; Warrick County is required to comply with many State and Federal laws, regulations, and permits that require a locality to address the impacts of stormwater runoff quality and nonpoint source pollution due to improper non-stormwater discharges to the (municipal/county) separate storm sewer system. Therefore, Warrick County prohibits such non-stormwater discharges to the storm sewer system and has determined that the regulation of spills, improper dumping, and discharges to the municipal/county separate storm sewer system is in the public interest and will prevent threats to the public health and safety, and the environment.

ARTICLE 36: PENALTIES

In the event the remedial measures described in the notice of violation have not been completed by the date set forth for such completion in the notice of violation, any one or more of the following actions or penalties may be taken or assessed against the person to whom the notice of violation was directed. Before taking any of the following actions or imposing any of the following penalties, the County Surveyor shall first notify the Applicant or other responsible person in writing of the intended action and shall provide a reasonable opportunity, of not less than ten days (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24-hour notice shall be sufficient) to cure such violation. If the Applicant or other responsible person fails to cure such violation after such notice and cure period, the County Surveyor may take any one or more of the following actions or impose any of the following penalties.

1. Stop-work Order -The County Surveyor may issue a stop-work order, which shall be served on the Applicant or other responsible person. The stop-work order shall remain in effect until the remedial measures outlined in the notice of violation have been cured or the violation or violations described therein have otherwise been cured, provided that the stop-work order may be withdrawn or modified to enable the Applicant or other responsible person to take the necessary remedial measures to cure such violation or violations.

2. Withhold Certificate of Occupancy - The Warrick County Building Department may be directed in writing by the County Surveyor to refuse to issue a certificate of occupancy for the building or other improvements constructed or being constructed on the site until the Applicant or other responsible person has taken the remedial measures outlined in the notice of violation or has otherwise cured the violations described therein.

3. Suspension, Revocation or Modification of Permit - The Warrick County Area Plan Commission may be directed in writing by the County Surveyor to suspend, revoke, or modify the permit authorizing the land development project. A suspended, revoked, or modified permit may be reinstated after the Applicant or other responsible person has taken the remedial measures outlined in the notice of violation or has otherwise cured the violations described therein, provided such permit may be reinstated to enable the Applicant or other responsible person to take the necessary remedial measures to cure such violations.

4. Civil Penalties - In the event the Applicant or other responsible person fails to take the remedial measures outlined in the notice of violation or otherwise fails to cure the violations described therein within ten days, or such greater period as the County Surveyor shall deem appropriate (except, that in the event the violation constitutes an immediate danger to public health or public safety, 24 hour notice shall be sufficient) after the County Surveyor has taken one or more of the actions described above, the County Surveyor may impose a penalty not to exceed $1,000 (depending on the severity of the violation) for each day the violation remains unremedied after receipt of the notice of violation.

ARTICLE 37: WHEN EFFECTIVE

This Drainage Ordinance shall become effective after the final passage by the Warrick County Board of Commissioners.

ARTICLE 38: INTERPRETATION

In interpreting and applying the provisions of this ordinance, the ordinance shall be construed to promote the community's health, safety, morals, and general welfare. This ordinance does not intend to interfere with and/or abrogate any easements, covenants, or agreements between parties and/or land owners provided, however, that where the provisions of this ordinance are more restrictive than regulations on the same point, as contained in any other law or Ordinance, or restrictions by deed or subdivision, the provision of this Ordinance shall govern.

ARTICLE 39: VALIDITY

Should any article, section, paragraph, clause, phrase, or other part of this ordinance be declared invalid by a court of competent jurisdiction, such decision shall not affect the validity of the ordinance as a whole, or any other part thereof.

ARTICLE 40: EXEMPT DEVELOPMENTS

A. Any development that has had its Drainage Plan approved by the Drainage Board before the effective date of this ordinance and has not made any unapproved changes to the approved Drainage Plan since the approval date of the Drainage Plan shall be exempt from all of the requirements of this ordinance.

B. Developments that will increase less than 10,000 square feet of impervious area do not require a Drainage Plan.

ARTICLE 41: UPDATES

This drainage ordinance may be updated and revised as recommended by the County Surveyor, with the approval of the Warrick County Board of Commissioners.

APPENDIX

for the

DRAINAGE MANAGEMENT ORDINANCE

for

WARRICK COUNTY, INDIANA

Prepared for the

Warrick County Drainage Board

APPENDIX

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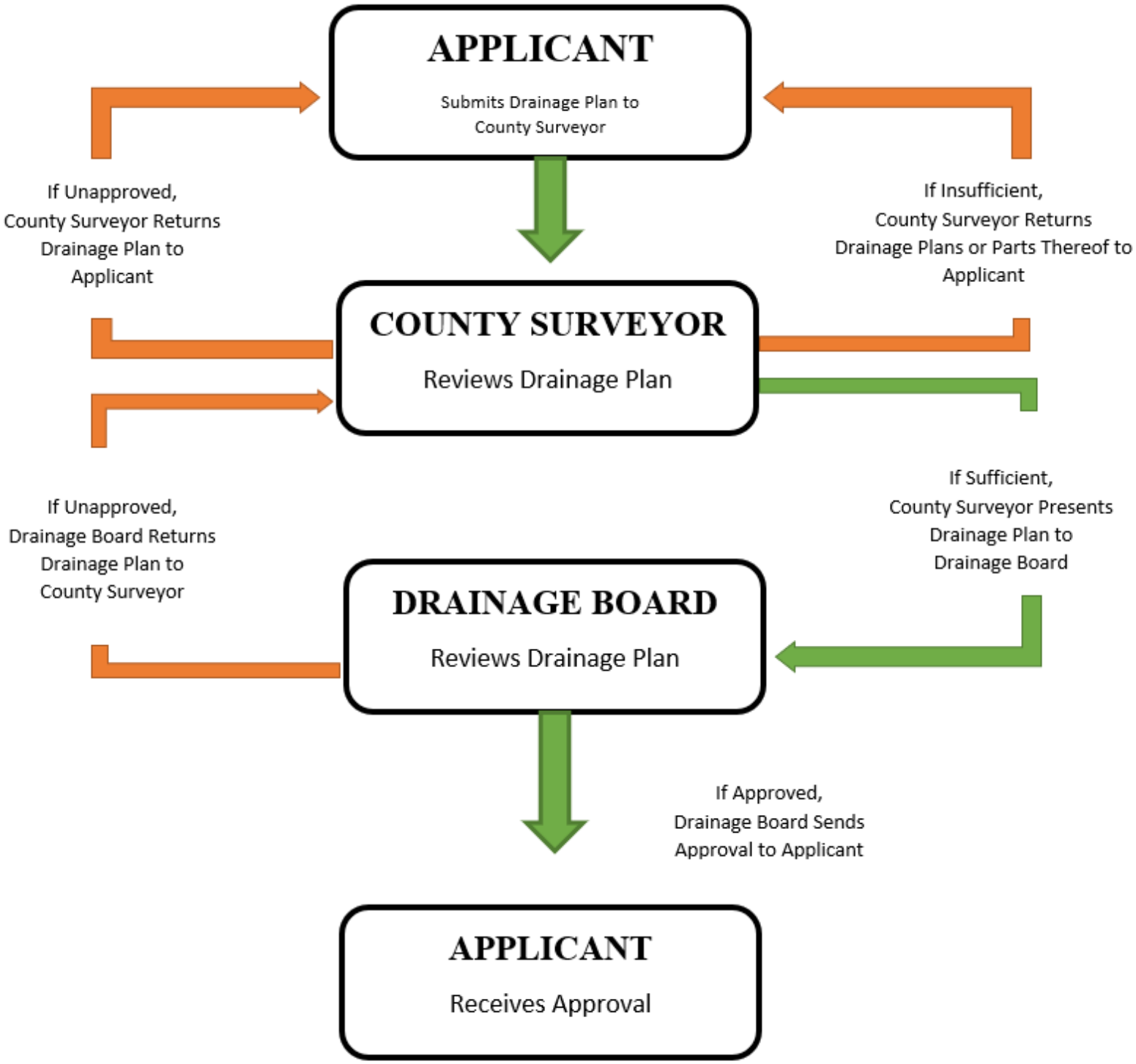
APPENDIX A

COMMERCIAL SITE FLOWCHART A-1

SUBDIVISION SITE FLOWCHART A-2

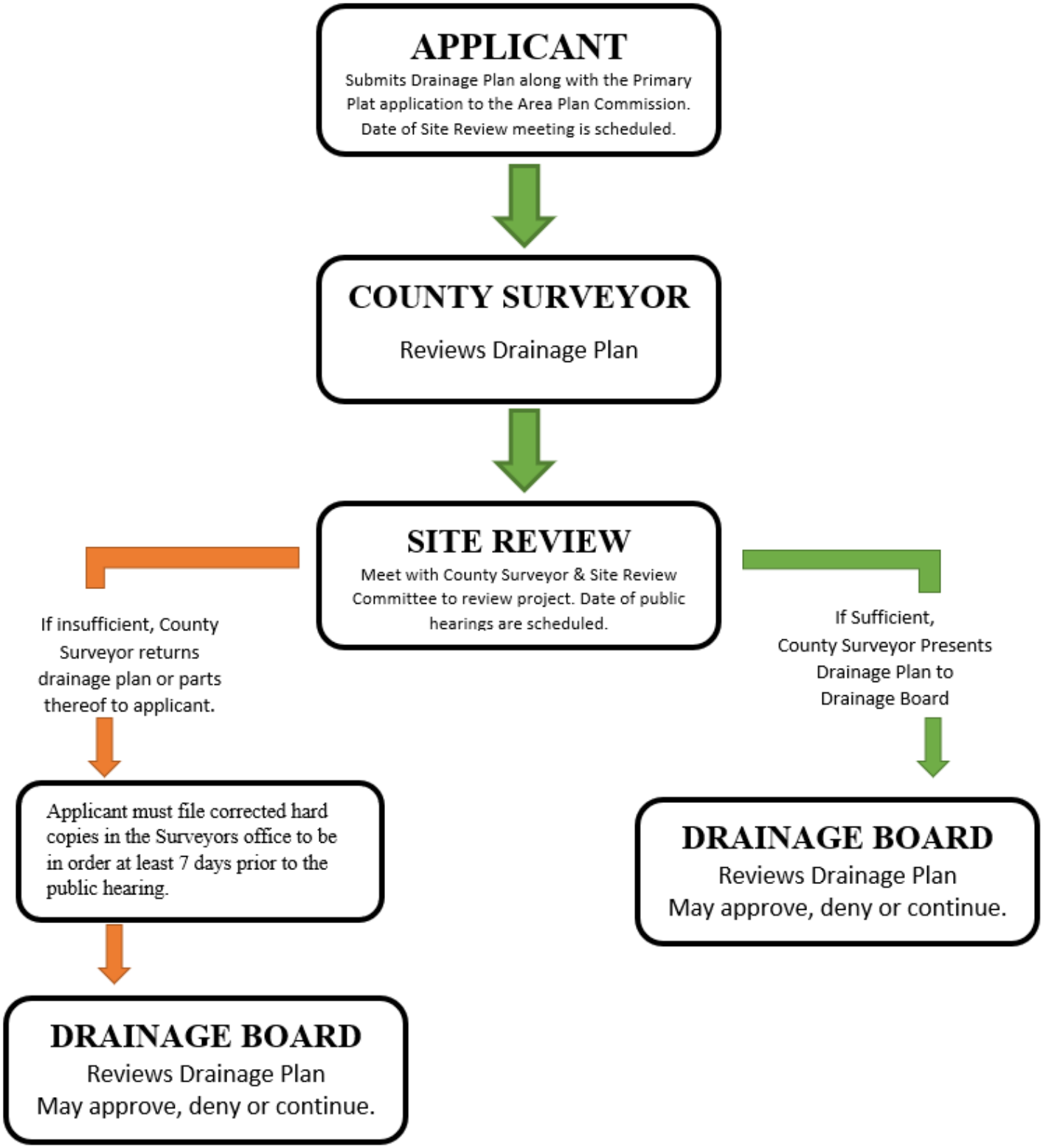
APPENDIX A – COMMERCIAL SITE

FLOWCHART A-1



APPENDIX A – SUBDIVSION SITE

FLOWCHART A-2



APPENDIX B

DRAINAGE PLAN DRAWING CHECKLIST

APPENDIX B

DRAWINGS CHECKLIST

Fill out all lines with a "YES", "NO", or "N/A" for not applicable, or a specific response (only if requested). For "NO" or "N/A" responses, please explain why. Contact the Office of the County Surveyor for an electronic version of this Drawings Checklist.

GENERAL

24" x 36" Sheet Size ____
Each Drawing stamped, signed and dated ____

Vertical Datum (specify) ____
Two, at least, Permanent Benchmarks ____

N.A.D 1983 ____

COVER SHEET

Title of development or project name ____
Table of contents (if more than three pages) ____
Vicinity map (at scale, showing north arrow) ____
Name and telephone number of utility field contacts ____
One-Call telephone number ____
Name and telephone number of surveyor ____
Name and telephone number of owner/agent ____
Name and telephone number of Applicant ____
Name and telephone number of engineering firm preparing plans ____
Legal description or reference on the Deed ____

SITE PLANS

EXISTING FEATURES

Existing features shall be shown as dashed lines, and/or
Are half-toned ____

If more than 3 site plans, provide overall site plan
Horizontal scale of overall site plan (specify) ____

Title Block ____

North Arrow ____

Horizontal Scale (specify) ____

Match Lines ____

Notes ____

Existing legend ____

Existing ground contours with labels ____

Existing surface water discharge points ____

Existing hydrologic features ____

Other existing natural features ____

Surface flow arrows (sheet flow) ____

Surface flow arrows (all existing conveyance systems) ____

Floodplains ____

Mapped Floodways ____

Wetlands per National Wetland Inventory Map ____

Location and limits of all existing property boundaries ____

Location and limits of all existing structures ____

Dimensions of existing easements within the property ____

Dimensions of existing property lines and lot lines ____

Location and limits of all existing roads and right-of-way ____

Location of all existing sanitary sewers and eater mains ____

Location of all existing located utilities ____

Location of all drainage facilities ____

Location of all existing utility poles and fences ____

Location and limits of all existing common open space ____

Location and limits of all existing public dedications ____

Existing features to be removed ____

PROPOSED IMPROVEMENTS

Proposed legend ____

Proposed property lines and right-of-way lines ____

Widths for proposed road and intersecting roads ____

Points of access to abutting properties and roadways ____

Proposed ground contours with labels ____

Location of all proposed utilities ____

Proposed utility poles, if designed ____

All proposed roads within twenty (20) feet of the property to be developed ____

All proposed lot lines, easements, and buildings of adjacent subdivisions that are within twenty (20) feet of the property to be developed ____

Proposed right-of-ways and easements ____

Proposed pavement ____

Proposed drainage structures ____

Slope, length, diameter, material, rim elevations and invert elevations for all proposed pipes, culverts, and stub outs. All proposed drainage facilities. ____

Approximate location of proposed downspout sub-drains or footing drains for all lots intending to connect to the storm drainage system (if known) ____

Proposed stub out locations for future pipe connections ____

Proposed drainage easements, tracts, access easements,

and building setback lines, with dimensions and type of restriction and/or use ____

Location, identification, and dimensions of all proposed buildings (if known) ____

Location, identification, and dimensions of all proposed property lines, streets, alleys, and easements ____

Sections and details of all retaining walls, if applicable ____

Storm sewer profile
Identify areas where cover of pipe is less than one (1) foot
If plan and profile are drawn on separate sheets, clearly label all profiles with plan sheet reference numbers
Note all existing and proposed utilities where they cross proposed storm sewers, including top and bottom of pipes where they cross. ____

Proposed retention/detention and Infiltration Facilities ____

Scaled drawing of each retention/detention or infiltration facility ____

Maximum design water elevations ____

Normal pool elevation ____

Minimum bottom elevation of facility ____

Dimension of all berm widths ____

At least two (2) cross-sections through facility ____

Pipe collar ____

Location and orientation of all inlet and outlet pipes ____

Rock protection/energy dissipation requirements and details ____

Invert elevations of all pipes, grates, inlets, tanks, vaults, and spot elevations of bottoms of retention/detention facilities ____

Location of path way ____

Plan and section view of all energy dissipaters ____

Size, type, slope, and length of pipes entering or exiting the retention/detention facility. ____

Statement of Maintenance ____

DETAILS

Details ____
Scale (specify) ____

STRUCTURE PLANS

Structure details ____

APPENCIX C

DECLARATION OF COVENANTS
INSPECTION/MAINTENANCE OF DRAINAGE FACILITY

APPENDIX C

Parcel ID#: _____

DECLARATION OF COVENANTS
INSPECTION/MAINTENANCE OR DRAINAGE FACILITY

THIS DECLARATION, made this ____ day of _____, 20 _____ between _____, hereinafter referred to as the "Covenantor(s)" of the following property:_____
_____
_____and Warrick County, Indiana, hereinafter referred to as the "County".

WITNESSETH:

The covenant, with full authority to execute deeds, mortgages, other covenants, and all rights, titles and interest in the property described above, does herby covenant with the County as follows:

1. The covenant must maintain the Drainage Easement(s) depicted in attached Exhibit A by providing trash removal and grass cutting on the property described in Exhibit A and performing other nonstructural maintenance, described in Article 31 of the Warrick County Drainage Management Ordinance.

2. The County must provide routine inspection and structural maintenance for the Drainage Facility(ies) as needed to ensure that the Drainage Facility(ies) remain(s) in proper working condition in accordance with approved design standards. The County will undertake all reasonable measures to return the Drainage Easement Area(s) to its original condition whenever the County undertakes repairs and maintenance in accordance with this Covenant.

3. The Covenantor must provide and maintain perpetual access from public rights-of-way to the Drainage Facility(ies) for the County, its agents, and its contractors.

4. The Covenantor must grant the County, its agents, and its contractors a right of entry to the Facility(ies) for the purpose of inspecting, operating, monitoring, installing, constructing; reconstructing, modifying, altering or repairing the Facility(ies).

5. Except in the case of an emergency, the County will provide not less than seven (7) days prior notice to the Covenantor before performing any structural maintenance or repair of the Facility(ies) in accordance with this Covenant. The county will also notify the Covenantor after completing the maintenance or repair work specified in the notice.

6. If, after reasonable notice by the County, the Covenantor fails to maintain the Drainage Easement(s) in accordance with this Covenant, the County may perform any nonstructural maintenance needed to correct a condition that impacts the effectiveness of routine structural maintenance and collect any cost incurred as a result from each owner of the Drainage Facility(ies) and in the same manner as real property taxes are collected. In addition, the County may seek reimbursement under any other method legally available to collect debts owed to the County.

7. The Covenantor agrees to indemnify and save the County harmless from any and all claims for direct damages to persons or property arising from maintenance of the Drainage Easement(s) in accordance with this Covenant. The County agrees to indemnity and save the Covenantor harmless from any and all claims for direct damages to persons or property caused by an act or omission of the County during the routine inspection and structural maintenance of the Drainage Facility(ies). The County's liability shall be subject to and limited by the provision, type of liability, notice requirements, and maximum amounts established. Either party's obligation under this paragraph is subject to and contingent upon the other party providing it with notice of any and all claims upon which the part will rely for indemnification. A party's failure to provide timely notice of any claim shall cause this indemnification to be void and of no further force or effect as to the even for which the party seeks protection under this indemnification.

8. The covenants contained herein shall run with the land and shall bind the County, the Covenantor and the Covenantor's successors and assigns, and shall bind all present and subsequent owners of property served by the Drainage Facility(ies).

9. This Covenant shall be recorded in the land records of Warrick County, Indiana.

10. This Covenant runs to the benefit of the County and may not be released or modified except by written consent of the County.

IN WITNESS WHEREOF, the Covenantor and the County have executed this Declaration of Covenants on the date first above written.

ATTEST:	FOR THE COVENATOR(S)
_____	_____
Signature	Signature
_____	_____
Printed Name	Printed Name
	_____
	Title
	WARRICK COUNTY, INDIANA
_____	_____
Signature	Signature
_____	_____
Printed Name	Printed Name
	County Commissioner

STATE OF _____
COUNTY OF _____ : ss

I hereby certify that on this _____ day of _____, 20___, before the subscriber, a Notary Public of the State of _____, and for the County of_____, personally appeared _____, known to me (or satisfactorily proven) to be the person(s) described in the foregoing instrument, who did acknowledge that (he)(she)(they), having been properly authorized, executed the same in the capacity therein stated and for the purposes therein contained.

IN TESTIMONY WHEREOF, I have affixed my hand and official seal.

_____
NOTARY PUBLIC

My Commission Expires _____

STATE OF _____
COUNTY OF _____ : ss

I hereby certify that on this _____ day of _____, 20___, before the subscriber, a Notary Public of the State of _____, and for the County of _____, personally appeared _____, County Commissioner, known to me (or satisfactorily proven) to be the person described in the foregoing instrument, who did acknowledge that (he)(she), having been properly authorized, executed the same on behalf of Warrick County, Indiana in the capacity therein stated and for the purposes therein contained.

IN TESTIMONY WHEREOF, I have affixed my hand and official seal.

_____
NOTARY PUBLIC

My Commission Expires _____

INFORMATION FOR RECORDING:
Parcel ID No. _____
Street Address of Parcel: _____

Name and Address of Parties to
Instrument and Their Interest

Grantor(s): _____
_____
_____

County: Warrick County, Indiana
107 W. Locust Street
Boonville, IN 47601

Certificate

I hereby certify that I am an attorney duly admitted to practice before the Court of Appeals of Indiana and that the within instrument was prepared under my supervision.

_____
DRAINAGE BOARD ATTORNEY

APPENDIX D

CERTIFICATION FORM

APPENDIX D

CERTIFICATION FORM

Project Name: _____

Address or current location development is occurring: _____
_____
_____

Drainage Plan Date: _____

I hereby certify that to the best of my knowledge and belief:

(1) The Drainage Plan for this project is in compliance with requirements, as set forth in the Warrick County Drainage Ordinance.
(2) The calculations, designs, reproductible drawings, masters and original ideas reproduced in this Drainage Plan are under my dominion and control and they were prepared by me and/or by my employees.

Signature: _____ Date: _____

Typed or Printed Name: _____ Phone: _____

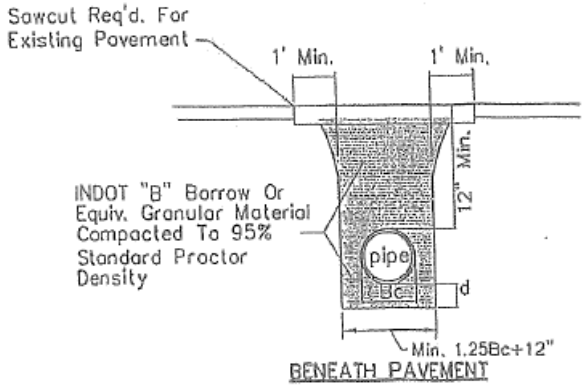
(Seal)

Business Address: _____
_____
_____

Professional Registration No. _____

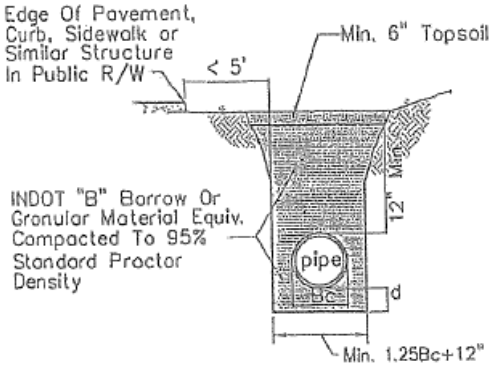
APPENDIX E

TRENCH DETAILS



BENEATH PAVEMENT

NOTE:
Contractor Shall Install Pipe Using The More Stringent Requirements Of These Two Procedures:
1.) That Depicted Hereon
2.) Manufacturer Recommendations

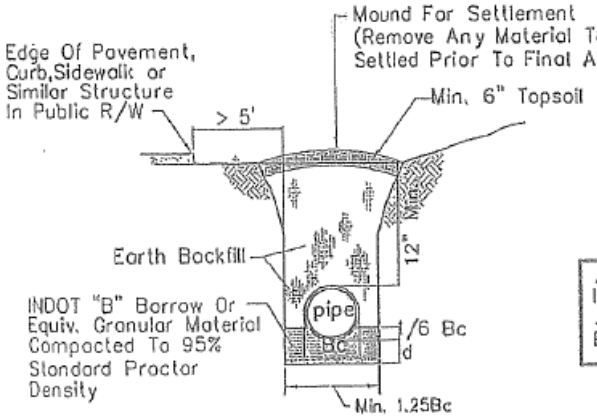


WITHIN 5' OF
EDGE OF PAVEMENT

LEGEND

Bc Outside Diameter
D Inside Diameter
d Depth of Bedding Material Below Pipe

Depth of Bedding Material Below Pipe	
D	d
27" & Smaller	3"
30" to 60"	4"
66" & Larger	6"



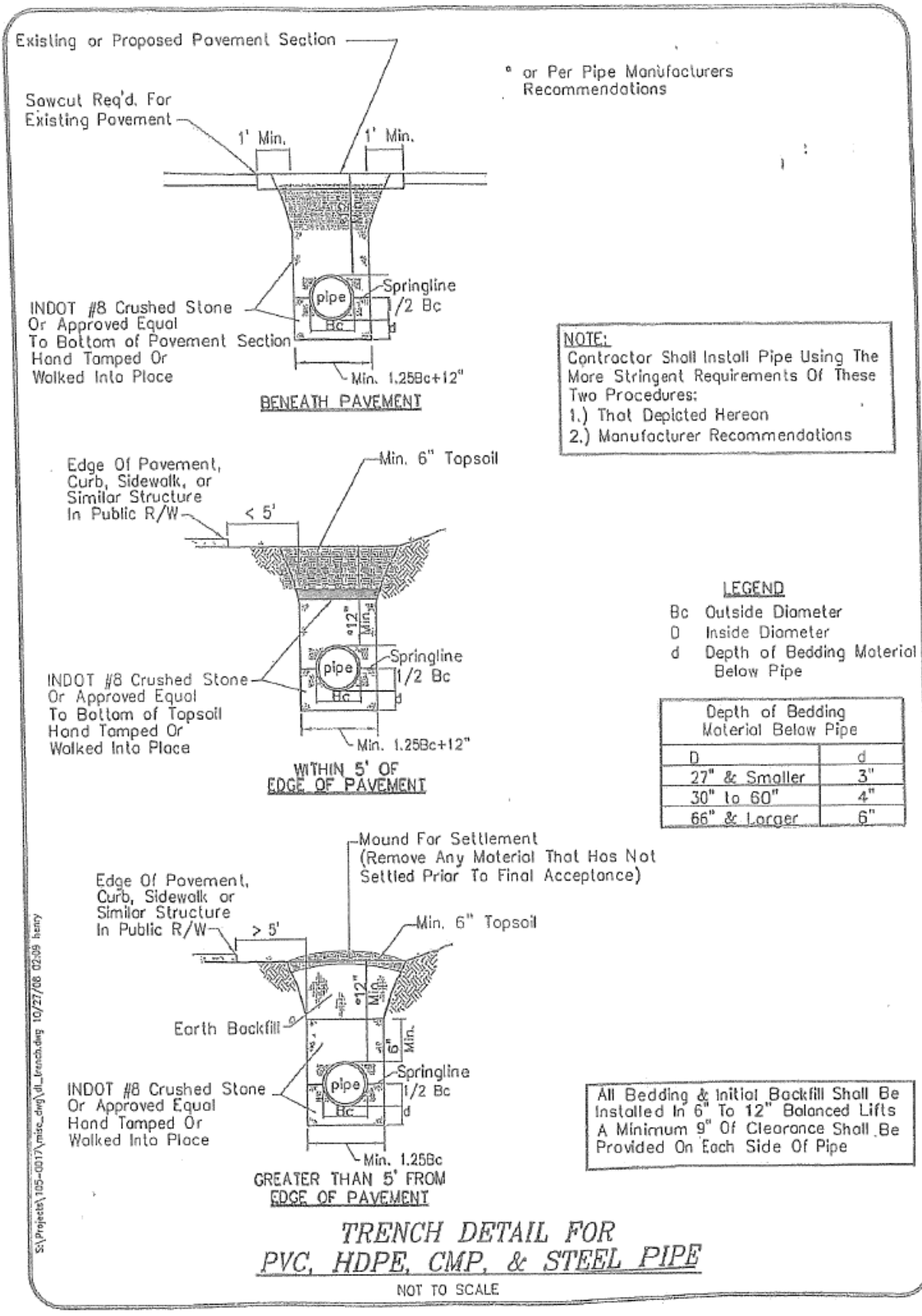
GREATER THAN 5' FROM
EDGE OF PAVEMENT

All Bedding & Initial Backfill Shall Be Installed In 6" To 12" Balanced Lifts A Minimum 9" Of Clearance Shall Be Provided On Each Side Of Pipe

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TRENCH DETAIL FOR REINFORCED CONCRETE PIPE (RCP) OR BOX CULVERT

NOT TO SCALE


Existing or Proposed Pavement Section
Sawcut Req'd. For Existing Pavement
1' Min.
1' Min.
* or Per Pipe Manufacturers Recommendations
Springline
1/2 Bc
pipe
Bc
d
INDOT #8 Crushed Stone Or Approved Equal To Bottom of Pavement Section Hand Tamped Or Walked Into Place
Min. 1.25Bc+12"
BENEATH PAVEMENT
NOTE:
Contractor Shall Install Pipe Using The More Stringent Requirements Of These Two Procedures:
1.) That Depicted Hereon
2.) Manufacturer Recommendations
Edge Of Pavement, Curb, Sidewalk, or Similar Structure In Public R/W
< 5'
Min. 6" Topsoil
12" Min.
Springline
1/2 Bc
pipe
Bc
d
INDOT #8 Crushed Stone Or Approved Equal To Bottom of Topsoil Hand Tamped Or Walked Into Place
Min. 1.25Bc+12"
WITHIN 5' OF EDGE OF PAVEMENT
LEGEND
Bc Outside Diameter
D Inside Diameter
d Depth of Bedding Material Below Pipe
Depth of Bedding Material Below Pipe
D | d
27" & Smaller | 3"
30" to 60" | 4"
66" & Larger | 6"
Mound For Settlement (Remove Any Material That Has Not Settled Prior To Final Acceptance)
Edge Of Pavement, Curb, Sidewalk or Similar Structure In Public R/W
> 5'
Min. 6" Topsoil
12" Min.
Earth Backfill
6" Min.
Springline
1/2 Bc
pipe
Bc
d
INDOT #8 Crushed Stone Or Approved Equal Hand Tamped Or Walked Into Place
Min. 1.25Bc
GREATER THAN 5' FROM EDGE OF PAVEMENT
All Bedding & Initial Backfill Shall Be Installed In 6" To 12" Balanced Lifts
A Minimum 9" Of Clearance Shall Be Provided On Each Side Of Pipe
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TRENCH DETAIL FOR PVC, HDPE, CMP, & STEEL PIPE
NOT TO SCALE

APPENDIX F

RAINFALL INTENSITY TABLE

RAINFALL INTENSITY CALCULATIONS

$$i = \frac{cT_r^{\alpha}}{(t+d)^{\beta}}$$

For Evansville	C	A	d	B
0.083 hour to 1 hour	1.9533	0.1747	0.522	1.6408
1 hour to 36 hours	1.3411	0.2166	0.3	0.8154

		RECURRANCE INTERVAL (YEARS)					
		2	5	10	25	50	100
Time (min)	Time (hrs.)						
10	0.17	4.07	4.77	5.39	6.32	7.13	8.05
15	0.25	3.37	3.96	4.47	5.24	5.92	6.68
30	0.50	2.13	2.50	2.82	3.31	3.73	4.21
45	0.75	1.49	1.74	1.97	2.31	2.61	2.94
60	1.00	1.18	1.42	1.62	1.95	2.23	2.56
120	2.00	0.79	0.96	1.12	1.37	1.59	1.84
180	3.00	0.59	0.72	0.83	1.02	1.18	1.37
240	4.00	0.47	0.58	0.67	0.82	0.95	1.11
300	5.00	0.40	0.49	0.57	0.69	0.80	0.93
360	6.00	0.35	0.42	0.49	0.60	0.70	0.81
420	7.00	0.31	0.38	0.44	0.53	0.62	0.72
480	8.00	0.28	0.34	0.39	0.48	0.56	0.65
540	9.00	0.25	0.31	0.36	0.44	0.51	0.59
600	10.00	0.23	0.28	0.33	0.40	0.47	0.54
660	11.00	0.22	0.26	0.31	0.37	0.43	0.50
720	12.00	0.20	0.25	0.29	0.35	0.40	0.47
780	13.00	0.19	0.23	0.27	0.33	0.38	0.44
840	14.00	0.18	0.22	0.25	0.31	0.36	0.42
900	15.00	0.17	0.21	0.24	0.29	0.34	0.39
960	16.00	0.16	0.20	0.23	0.28	0.32	0.37
1020	17.00	0.15	0.19	0.22	0.26	0.31	0.36
1080	18.00	0.15	0.18	0.21	0.25	0.29	0.34
1140	19.00	0.14	0.17	0.20	0.24	0.28	0.33
1200	20.00	0.13	0.16	0.19	0.23	0.27	0.31
1260	21.00	0.13	0.16	0.18	0.22	0.26	0.30
1320	22.00	0.12	0.15	0.18	0.21	0.25	0.29
1380	23.00	0.12	0.15	0.17	0.21	0.24	0.28
1440	24.00	0.12	0.14	0.16	0.20	0.23	0.27