RULES
OF THE
TUSCOLA COUNTY
DRAIN COMMISSIONER

Procedures and Design Criteria
For Stormwater Drainage in Development Plans

Established Pursuant to:

The Land Division Act
Public Act No. 288 of 1967, as amended;
M.C.L. §§ 560.101 – 560.293
&
the Mobile Home Commission Act
Public Act No. 96 of 1987, as amended;
M.C.L. §§ 125.2301 – 125.2350
&
The Condominium Act
Public Act No. 59 of 1978, as amended;
M.C.L. §§ 559.101 – 559.276
&
The Michigan Drain Code
Public Act No. 40 of 1956, as amended
M.C.L. §§ 280.1 – 280.630

August 2025

Tuscola County Drain Commissioner

Order of Adoption of Amendments
To the Rules of the Tuscola County Drain Commissioner

Whereas, the Land Division Act (Act 288 of 1967, as amended), M.C.L. §§ 560.101 – 560.293, and the Mobile Home Commission Act (Act 96 of 1987), M.C.L. §§ 125.2301 – 125.2350, provide for the adoption and publication of rules and standards by the County Drain Commissioner to govern outlet drainage and storm water facilities in developments; and

Whereas, the Michigan Drain Code (Act 40 of 1956, as amended), M.C.L. §§ 280.1 – 280.630, provides the general authority of Drain Commissioners and for other standards and permitting requirements; and

Whereas, the Rules of the Tuscola County Drain Commissioner were originally adopted and published by Drain Commissioner effective January, 1995, and amended May 22, 1996, effective upon re-publication; and

Whereas, it has become necessary to further amend to clarify those rules;

Now, Therefore, It Is Hereby Ordered, that the Rules of the Tuscola County Drain Commissioner are amended to read as follows and such amended rules shall take effect immediately upon publication on the Tuscola County website, August 2025 and shall be reviewed and updated on an annual basis by the Tuscola County Drain Commissioner.

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1.0 INTRODUCTION

These Rules of the Tuscola County Drain Commissioner are adopted pursuant to the general authority granted under the Michigan Drain Code of 1956, Public Act No. 40 of 1956, as amended, M.C.L. §§ 280.1 – 280.630 (hereinafter "Drain Code") and other applicable laws, to protect the public health, safety, and welfare in regarding drainage matters over which the Drain Commissioner has jurisdiction. These Rules are meant to assist in maintaining the County's stormwater drainage systems, waterways and watersheds, focusing on the legally established drainage districts and drains within Tuscola County. Specifically, these Rules are designed to provide guidance in order for project design to minimize flood damage; to preserve farm drainage; to promote best management practices relating to drainage; to protect the quality of surface and ground waters; to protect Tuscola County residents' natural flow rights under common law; and to manage the County's drains, drainage resources, and drainage districts for multiple purposes including drainage, sustainable development, recreation, scenic beauty, and fish and wildlife habitats. These Rules are applicable to all developments subject to review and approval of the Drain Commissioner and over which the Drain Commissioner has jurisdiction. These Rules provide minimum standards for developments covered under the Rules, provided, however, that the Drain Commissioner reserves the right to deviate from the specific design standards set forth in the Rules when, on a case-by-case basis, such deviation is appropriate or necessary in order to accommodate the goals and purposes underlying these Rules. These rules and their implementation are designed to promote low impact designs such as rain gardens or other site control of stormwater. The Drain Commissioner is committed to working with those developing projects or applying for permits to use alternate drainage methods which help meet local landscape ordinance requirements and improve the quality of water in our environment.

The following discussion outlines basic ideas and principals of stormwater management, and provides a conceptual foundation for the design standards contained in this document.

1.1 Impacts of Development on Water Quantity

The hydrology of a watershed changes in response to site clearing and development of the natural landscape. A site's existing stormwater storage capacity can be lost as vegetation is removed, natural depressions are graded and both topsoil and wetlands are eliminated. As the soil is compacted and resurfaced with impervious materials, rainfall may no longer penetrate into the ground and runs off of the land. These modifications, along with the installation of drainage facilities, alter natural drainage patterns within the area drained.

1.1.1 Examples of Changes in Watershed Hydrology and Stream Morphology

- Increases in volume of runoff raise the flood stage and the frequency of severe flood events.
- Bankfull floods fill the stream channel to the top of its banks, but do not spill over into the floodplain. Increased bankfull flooding subjects the stream channel to continual disturbance and scour.
- Increases in flow velocities are caused by the combined effect of greater discharges, shorter times of concentration, and smoother hydraulic surfaces.
- Stream flow fluctuations increase dramatically as runoff is concentrated into more quickly rising, higher peaks with equally abrupt returns to pre-storm level discharges. Increased

flow fluctuations may disrupt habitats and reduce the diversity of aquatic species regardless of water quality.

- If infiltration into the underlying water table is reduced, there is often a lowering of the level of surface waterbodies that are dependent on groundwater to maintain base flows during dry periods.
- Channel widening and down-cutting contribute to increased runoff rates and flow fluctuations.
- Streambank erosion accelerates as channels are disturbed by undercutting, tree-falls and bank slumping.
- Sediment loads increase with streambank erosion and construction site runoff. These sediments settle out and form shifting bars that often accelerate the erosion process by deflecting runoff into sensitive bank areas.
- Increased sedimentation and channel widening affect aquatic habitats. Stream structure changes as the gradient of the stream adjusts to accommodate frequent floods. Sediment deposition damages invertebrate habitat as well as fish spawning areas.

1.2 Impacts of Development on Water Quality

As development occurs, changes in land use may contribute new or additional pollutants to storm-water runoff. In addition, some accompanying impervious surfaces may provide efficient delivery of these pollutants into receiving waterways. Leaves, litter, animal droppings, exposed soil from construction sites, fertilizer and pesticides are all washed off of the land. Vehicles and deteriorating urban surfaces deposit trace metals, oil, and grease onto streets and parking lots. These and other toxic substances may be carried by stormwater and conveyed through creeks, ditches and storm drains into our rivers and lakes.

In short, the ecology of drains and waterways may be re-shaped by the shifts in hydrology, morphology and water quality that can accompany the development process. The stresses that these changes place on the environment are often gradual and invisible, yet they may produce significant effects over time: The Michigan Department of Environment, Great Lakes, and Energy (EGLE) has identified streams in the urban and urbanizing areas as requiring special initiatives to restore degraded habitats, and to improve water quality.

To mitigate drainage impacts, it is necessary to evaluate the way that stormwater and land development are managed. The following discussion provides a framework for this evaluation, which encompasses the entire development process from land use planning and zoning to site design and construction.

1.3 Framework for the Design of Stormwater Management Systems

Thoughtful site planning can substantially reduce environmental and drainage impacts associated with development. Towards this end, communities, regulatory agencies, and designers must evaluate the impact of each individual development project over the long term, and on a watershed scale. Such an approach requires consideration of Best Management Practices (BMPs) that function together as a system to ensure that the volume, rate, timing and pollutant load of runoff remains stable and sustainable. A "BMP" is a practice or combination of practices that prevent or reduce stormwater runoff and/or associated pollutants. This can be achieved through a coordinated

network of structural and nonstructural methods. In such a system, each BMP by itself may not provide major benefits, but becomes very effective when combined with others.

1.3.1 Source Controls

Source controls reduce the volume of runoff generated on-site, and eliminate initial opportunities for pollutants to enter the drainage system. By working to prevent problems, source controls are the best option for controlling stormwater, and include the following key practices:

- Preservation of existing natural features that perform stormwater management functions, such as depressions, wetlands, and woodland and vegetative buffers along streambanks.
- The minimization of impervious surface area through site planning that makes efficient use of paved, developed areas and maximizes open space. Encouraging flexible street and parking standards and the use of permeable ground cover materials can also reduce impervious surfaces.
- Direction of stormwater discharges to open grassed areas such as swales and lawns rather than allowing stormwater to run off from impervious areas directly into the stormwater conveyance system.
- Careful design and installation of erosion control mechanisms and rigorous maintenance throughout the construction period. Effective erosion control measures include minimizing the area and length of time that a site is cleared and graded, and the timely vegetative stabilization of disturbed areas.

1.3.2 Site Controls

Site controls are the subject of this document. After the implementation of source controls, site controls are then required to convey, pre-treat, and treat (e.g., detain, retain or infiltrate) the stormwater runoff generated by development. The range of engineering and design techniques available to achieve these objectives is to some degree dictated by site configuration, soil type, and the receiving waterway. For example, flat or extremely steep topography may preclude the use of grassed swales, which are otherwise preferable to curb and gutter systems. But while each site will be unique, some universal guidelines for controlling stormwater quality and quantity can be stated.

1.3.3 "Drain" and "Drainage District" Defined

The term "Drain" as used in these Rules shall have the meaning as proscribed in Section 3 of the Drain Code as follows:

> The word 'drain', whenever used in this act, shall include the main stream or trunk and all tributaries or branches of any creek or river, any watercourse or ditch, either open or closed, any covered drain, any sanitary or any combined sanitary and storm sewer or storm sewer or conduit composed of tile, brick, concrete, or other material, any structures or mechanical devices, that will properly purify the flow of such drains, any pumping equipment necessary to assist or relieve the flow of such drains and any levee, dike, barrier, or a combination of any or all of same constructed, or proposed to be

> constructed, for the purpose of drainage or for the purification of the flow of such drains, but shall not include any dam and flowage rights used in connection therewith which is used for the generation of power by a public utility subject to regulation by the public service commission.

The term "Drainage District" as used in these Rules shall have the following meaning:

> A Drainage District is any county or inter-county drainage district legally established pursuant to applicable provisions of the Drain Code. Drain Code Section 5 provides that each such drainage district is a body corporate with the power to contract, to sue and be sued, and to hold, manage, and dispose of real property, in addition to any other powers conferred by law. Generally, a drainage district is comprised of all lands which drain to a legally established Drain.

1.4 Purpose of These Rules

It is the purpose of these site development rules to establish minimum stormwater management requirements to meet the following objectives:

- Ensure that stormwater drainage systems and BMPs are adequate to address stormwater management needs within a proposed development and protect the drainage, property and water rights of landowners outside of the proposed development.
- Reduce artificially induced flood damage.
- Minimize the degradation of existing watercourses.
- Prevent an increase in non-point source pollution.
- Maintain site hydrology to avoid detrimental changes in the balance between stormwater runoff, groundwater recharge and evapo-transpiration.

Further documentation of the impacts of development on land and water resources and the importance of stormwater management can be found in Chapter 2 of the Low Impact Development Manual for Michigan (SEMCOG, 2008).

http://www.semcog.org/uploadedfiles/Programs_and_Projects/Water/Stormwater/LID/LID_Manual_chapter2.pdf

2.0 TYPES OF DEVELOPMENTS REQUIRING REVIEW OR A PERMIT

Pursuant to state law, all residential or industrial subdivisions and all manufactured housing communities or mobile home parks must conform to these Rules and design standards adopted by the Drain Commissioner. Additionally, these Rules and design standards will be applied to, and a permit from the Drain Commissioner (see Appendix C) may be required for, all other developments and construction activities that affect drainage conditions or drainage patterns for which one or more of the following conditions[1] applies:

Condition I
The proposed development is located within an established drainage district and the proposed development will impact a drain, for example, by contributing flow into the drain or depositing sediment or contaminants into the drain.

Condition II
The proposed development alters drainage flow to an established drainage district.

Condition III
County or local ordinances or other legal authority require the Drain Commissioner's evaluation. Additionally, the Drain Commissioner may apply these standards if requested by a local municipality or county.

Outlined below are examples of types of developments and construction activities that may be within the jurisdiction of the Drain Commissioner that are expressly addressed in the referenced subsections of this Section of the Rule and which may generally require a Drainage Permit from the Drain Commissioner:

2.1 Platted Subdivisions

2.2 Condominium Developments

2.3 Private Road or Land Split Developments

2.4 Manufactured Housing Communities / Mobile Home Parks

2.5 Commercial or Industrial Developments

2.6 Direct or Indirect Discharges to an Established Drain

2.7 Drain Crossings, Culverts, Tiling and/or Enclosing an Established Drain

2.8 Drain Widening, Deepening or Relocation

2.9 Adding or Subtracting Land to/from a Drainage District and/or Construction of a Drain for Ascription as an Established Drain.

[1] Minor development or construction activities, such as those associated with a typical single-family residence, that are not part of a larger common plan or development may be exempt from the Drainage Permit requirement.

The types of plans to be submitted are listed for each development type. Some of the legal sources of the Drain Commissioner's authority are also cited. Details regarding the submission requirements for plats and plans can be found in the following section, Section 3.0 General Submission Requirements and Procedures.

2.1 Platted Subdivisions

Pursuant to Land Division Act, PA 288 of 1967, as amended, M.C.L. §§ 560.101 – 560.293, and the general authority of Drain Commissioners under the Drain Code

2.1.1 Pre-Preliminary Plats

Section 107 of the Land Division Act, M.C.L. § 560.107, states that a proprietor may submit a pre-preliminary plat to a governing body for their information and review. The pre-preliminary plat will be reviewed by the Drain Commissioner per the same standards as a preliminary plat. Comments on the pre-preliminary plat will be provided for the proprietor's consideration, but approval from the Drain Commissioner is not required to proceed with submission of the preliminary plat. For review of a pre-preliminary plat, the Drain Commissioner may charge the same review fees that would be applicable to a preliminary plat.

2.1.2 Preliminary Plats

Section 105 of the Land Division Act, § 560.105, states that the approval of a preliminary plat shall be conditioned upon compliance with any published rules of a county Drain Commissioner. A checklist of requirements for preliminary plats can be found in Appendix F. Additional requirements for submission of preliminary plats can be found in Section 3.1 Preliminary Plat/Plan Submission Requirements & Procedures. Review fees for preliminary plat apply as outlined in Appendix B. Approval of a preliminary plat does not constitute approval of construction or engineering plans for the proposed subdivision. Construction and engineering plans must be approved prior to the beginning of construction and prior to final approval.

2.1.3 Construction Plans

Construction plans will be reviewed for their compliance with the submission requirements described in Section 3.2 and the design standards listed in Section 4.0 Construction Plan Design Standards for Stormwater Systems. The plans must be approved by the Drain Commissioner prior to any on-site construction or grading. Additionally, a Drainage Permit must be obtained from the Drain Commissioner if one or more of the conditions in Section 2.0 apply. The initiation of grading or building activities before plan approvals and/or permits from the Drain Commissioner is the basis for issuance of a Stop Work Order. In addition, the completion of projects that do not conform to approved plan specifications will not be tolerated by the Drain Commissioner and may entail legal enforcement and/or withholding of approval of any final plats until outstanding issues are resolved.

2.1.4 Final Plats

Section 192 of the Land Division Act, M.C.L. § 560.192, states that the Drain Commissioner shall require that the proprietor provide for adequate stormwater facilities within the lands proposed for platting and outlets thereto. If the stormwater facilities are not installed before approval of the final plat, some form of surety must be posted with the Drain Commissioner. Section 192 also allows the Drain Commissioner to require the proprietor to provide adequate stormwater retention/detention systems and an arrangement for the future maintenance of the stormwater facilities. All these requirements must be addressed before the final plat is submitted for review. Additional details regarding the requirements for final plat approval can be found in Section 3.3 Final Plat Submission Requirements & Procedures. Section 146 of the Land Division Act, M.C.L. § 560.146, states that a certificate shall be signed and dated by the Drain Commissioner signifying that the provisions of Section 192 have been meet and that the final plat meets the Drain Commissioner's approval.

2.2 Condominium Developments

Pursuant to the Condominium Act, PA 59 of 1978, as amended, M.C.L. §§ 559.101 – 559.276, and the general authority of Drain Commissioners under the Drain Code

Section 71 of the Condominium Act, M.C.L. § 559.171, requires that written notice be provided to the Drain Commissioner prior to taking reservations under a preliminary reservation agreement, recording a master deed for the property, or beginning construction for a condominium project. The Drain Commissioner will review plans and offer comments/approval as may be within his jurisdiction. Generally, the Drain Commissioner will review and approve condominium plans using the same criteria that apply to subdivisions. Such review shall be completed prior to the recording of the master deed for the condominium.

2.2.1 Preliminary Plans

Preliminary plans for condominium sites will be reviewed by the Drain Commissioner as per preliminary plats. A checklist of requirements for preliminary plats/plans can be found in Appendix F. Submission requirements for preliminary plans can be found in Section 3.1 Preliminary Plat/Plan Submission Requirements & Procedures. Approval of a preliminary plat does not constitute approval of construction or engineering plans for proposed subdivisions, and construction and engineering plans must be approved prior to the beginning of any construction and prior to the final plat approval.

2.2.2 Construction Plans

Condominium construction plans must be reviewed by, and a Drainage Permit obtained from, the Drain Commissioner if one or more of the Conditions in Section 2.0 apply. Construction plans will be reviewed for their compliance with the submission requirements described in Section 3.2 and the design standards listed in Section 4.0 Construction Plan Design Standards for Stormwater Systems. The plans must be approved by the Drain Commissioner prior to any on-site construction or grading. Only upon their approval will permits required from the Drain Commissioner be issued. The initiation of grading or building activities before obtaining plan approvals and/or

permits by the Drain Commissioner is the basis for issuance of a Stop Work Order. Condominium master deeds shall contain a legally binding plan for long-term maintenance of the stormwater facilities. Such plans shall be reflective of/similar to subdivision stormwater management deed restrictions. Examples of such stormwater facility maintenance agreements can be found in Appendix H. A copy of the stormwater maintenance plan will be submitted to the Drain Commissioner as part of the review process. All review fees and expenses will be paid before final approval is given to proceed with construction activities.

2.3 Private Road or Land Split Developments

The Drain Commissioner may have jurisdiction over private road developments or land split developments depending on how the property will be used and whether the use of the property impacts a Drain. The jurisdictional criteria are set forth in Section 2.0 above. The Drain Commissioner strongly recommends that plans for private road developments or land split developments be submitted for review so as to avoid the risk that a project could be delayed because approval was required but not obtained.

2.3.1 Preliminary Plans

If preliminary plans are submitted, preliminary plans for private road and land split developments will be reviewed by the Drain Commissioner as per preliminary plats. A checklist of requirements for preliminary plats/plans can be found in Appendix F. Submission requirements for preliminary plans can be found in Section 3.1 Preliminary Plat/Plan Submission Requirements & Procedures. Preliminary plans will be approved by the Drain Commissioner contingent upon review of detailed engineering and construction plans.

2.3.2 Construction Plans

Private road and land split development construction plans must be reviewed by, and a Drainage Permit obtained from, the Drain Commissioner if one or more of the Conditions in Section 2.0 apply. Construction plans will be reviewed for their compliance with the submission requirements described in Section 3.2 and the design standards listed in Section 4.0 Construction Plan Design Standards for Stormwater Systems. The plans must be approved by the Drain Commissioner prior to any on-site construction or grading. Only upon their approval will a permit be issued for discharge to an established drain and/or for work in a drain right-of-way. The initiation of grading or building activities before obtaining plan approvals and/or permits by the Drain Commissioner is the basis for issuance of a Stop Work Order. Stormwater facility maintenance must be ensured through a deed restriction or an equivalent legally binding agreement. Examples of such stormwater facility maintenance agreements can be found in Appendix H. A copy of the stormwater maintenance plan must be submitted to the Drain Commissioner as part of the review process. All review fees and expenses must be paid before final approval is given to proceed with construction activities.

2.4 Manufactured Housing Communities / Mobile Home Parks

Pursuant to the Mobile Home Commission Act, Act No. 96 of 1987, as amended, M.C.L. §§ 125.2301 – 125.2350, and the general authority of Drain Commissioners under the Drain Code

Section 11 of the Mobile Home Commission Act, M.C.L. § 125.2311, states that a person who desires to develop a mobile home park shall submit a preliminary plan to the county Drain Commissioner for preliminary approval. It also states that the preliminary plan shall not include detailed construction plans. Subsection 3 states that the Drain Commissioner shall review and may approve the outlet drainage, and that the Drain Commissioner shall adopt and publish standards to implement the subsection. These standards are as published in Section 4.0 Construction Plan Design Standards for Stormwater Systems. Mobile home interior drainage may be reviewed to the extent necessary to determine that the outlet drainage meets these standards, since inadequate interior drainage may result in overflows to the receiving watercourse.

2.4.1 Preliminary Plans

Preliminary plans will include the location, layout, general design, and general description of the mobile home park. A checklist of requirements for preliminary plans can be found in Appendix F. Submission requirements for preliminary plats can be found in Section 3.1 Preliminary Plat/Plan Submission Requirements & Procedures. Preliminary plan approval will be contingent upon a review of the engineering and construction plans and all details related to and affecting outlet drainage

2.4.2 Construction Plans

Construction plans for mobile home parks must be reviewed by the Drain Commissioner to determine that the adequacy of the outlet drainage has been considered. Additional aspects of the plans for mobile home parks must also be reviewed by, and a Drainage Permit obtained from, the Drain Commissioner if one or more of the Conditions in Section 2.0 apply. Construction plans will be reviewed for their compliance with the submission requirements described in Section 3.2 and the design standards listed in Section 4.0 Construction Plan Design Standards for Stormwater Systems. The plans must be approved by the Drain Commissioner prior to any on-site construction or grading. Only upon their approval will any permits from the Drain Commissioner be issued. The initiation of grading or building activities before obtaining plan approvals and/or permits by the Drain Commissioner may result in issuance of a Stop Work Order. Stormwater facility maintenance must be ensured through a deed restriction or an equivalent legally binding agreement. Examples of such stormwater facility maintenance agreements can be found in Appendix H. A copy of the stormwater maintenance plan must be submitted to the Drain Commissioner as part of the review process. All review fees and expenses must be paid before final approval is given to proceed with construction activities.

Communication with the Drain Commissioner is strongly encouraged regarding all proposed developments.

2.5 Commercial or Industrial Developments

Pursuant to the jurisdiction of the Drain Commissioner under the Drain Code as set forth in Section 2 above and to the extent local ordinances require a permit.

Proposed commercial/industrial developments (e.g. shopping malls, apartments, schools, general retail and wholesale establishments, factories, industrial complexes, etc.) or additions/ modifications to such existing developments must be reviewed by and a Drainage Permit obtained from the Drain Commissioner if one or more of the Conditions in Section 2.0 apply or if required by a local ordinance.

2.5.1 Preliminary Plans

If preliminary plans for proposed commercial/industrial construction activities are submitted, they will be reviewed by the Drain Commissioner as per preliminary plats. A checklist of requirements for preliminary plats/plans can be found in Appendix F. Submission requirements for preliminary plans can be found in Section 3.1 Preliminary Plat/Plan Submission Requirements & Procedures. Submission of preliminary plans is encouraged, but not required. Approval of preliminary plans by the Drain Commissioner is not required to proceed with submission of construction plans.

2.5.2 Construction Plans

Construction plans must be submitted to and a Drainage Permit obtained from the Drain Commissioner if one or more of the Conditions in Section 2.0 apply. Construction plans will be reviewed for their compliance with the submission requirements described in Section 3.2 and the design standards listed in Section 4.0 Construction Plan Design Standards for Stormwater Systems. The plans must be approved by the Drain Commissioner prior to any on-site construction or grading. Only upon their approval will any permits from the Drain Commissioner be issued. The initiation of grading or building activities before obtaining plan approvals and/or permits by the Drain Commissioner is the basis for issuance of a Stop Work Order. A copy of the stormwater maintenance plan will be submitted to the Drain Commissioner as part of the review process. All review fees and expenses must be paid before final approval is given to proceed with construction activities.

2.6 Direct or Indirect Discharge to an Established Drain

If point source or sheet flow drainage from any proposed development or any construction activities are to be directed toward and/or empty into an established drain or to any watercourse under the jurisdiction of the Drain Commissioner, compliance with these Rules and a Drainage Permit and fees shall be required. This permit may be required in addition to approval of plats and/or plans. Please refer to Appendix C for a Drainage Permit application: "Application and Permit Authorizing Development or Construction Activities Affecting Drainage." Unrestricted discharge of stormwater from developments to an established drain or other watercourse within the jurisdiction of the Drain Commissioner is unacceptable.

Before commencing to do any work on the site, the proprietor shall notify the Drain Commissioner at least 48 hours in advance to provide for the inspection of the project by the Drain Commissioner if required. The proprietor shall also notify the Drain Commissioner at the completion of the project to provide for a final inspection by the Drain Commissioner if required. Inspections by the Drain Commissioner shall not relieve the proprietor of his obligations. Only upon the satisfactory completion of the project and final inspection will the Drain Commissioner issue the Drainage Permit.

Pursuant to Section 423 of the Drain Code, no sewage or waste matter shall be discharged into an established drain, which is capable of producing in the drain detrimental deposits, objectionable odor nuisance, injury to drainage conduits or structures, or capable of producing such pollution of the waters of the state receiving the flow from the drains as to injure livestock, destroy fish life, or be injurious to public health.

Pursuant to Section 423 of the Drain Code, non-storm water discharges to water courses under the jurisdiction of the Drain Commissioner are prohibited. This may include illicit discharges, direct dumping, disposal of materials, and/or illicit connections to water courses. The following categories of non-storm water discharges are excluded from this prohibition unless they have been identified as significant sources of pollutants to these water courses.

- Discharges or flows from firefighting activities
- Water line flushing and discharges from potable water sources
- Landscape irrigation runoff, lawn watering runoff, and irrigation waters
- Diverted stream flows and flows from riparian habitats and wetlands
- Rising groundwater and springs
- Uncontaminated groundwater infiltration and seepage
- Uncontaminated pumped groundwater, except for groundwater cleanups specifically authorized by NPDES permits
- Foundation drains, water from crawl space pumps, footing drains, and basement sump pumps
- Air conditioning condensation
- Waters from noncommercial car washing
- Street wash water
- Dechlorinated swimming pool water from single, two, or three family residences.

The Tuscola County Drain Commissioner may inspect, investigate, and monitor suspected illicit discharges into watercourses under his/her jurisdiction, and require and enforce the elimination of these discharges. To the maximum extent practicable, illicit discharges shall be eliminated from water courses under the Tuscola County Drain Commissioner's jurisdiction within 120 days of its presence being confirmed by the Tuscola County Drain Commissioner or his/her staff.

2.7 Drain Crossings, Culverts, Tiling, and/or Enclosing an Established Drain

A Drainage Permit from the Drain Commissioner is required for any and all culverts, bridges, enclosures, and utility crossings of established drains. Section 425 of the Drain Code, M.C.L. § 280.425, states that a land owner may make a written request to the Drain Commissioner for permission to tile or enclose an open drain at his/her own expense. The Drain Commissioner may grant the request, via a Drainage Permit, but in so doing shall prescribe the size of the enclosure to be used. In accordance with Section 421 of the Drain Code, M.C.L. § 280.421, a permit shall not be issued to enclose a drain if the enclosure would obstruct the established drain.

2.8 Drain Widening, Deepening, or Relocation

If the proprietor desires to perform construction activities within an existing drain right-of-way, including, widening, deepening, or relocation of a drain, application for a Drainage Permit will be filed with the office of the Drain Commissioner. This application will be accompanied by the necessary release of right-of-way, in recordable form, accomplished by all owners of interest. Preliminary and/or construction plans may be required for review as appropriate. General submission requirements and procedures for preliminary plans and construction plans are described in Section 3.0.

2.9 Adding or Subtracting Land to/from a Drainage District, and/or Construction of a Drain for Ascription as an Established Drain

If a proprietor desires to add or subtract land to/from a drainage district, and to construct a drain for designation as an established drain, the Drain Commissioner's approval must be obtained prior to construction. Section 433 of the Drain Code, M.C.L. § 280.433, requires that the proprietor enter into an agreement with the Drain Commissioner. The agreement would obligate the proprietor to pay (or put on deposit) all costs associated with the new drain(s). The agreement would require that a registered professional engineer prepare and certify all necessary documents, including but not limited to:

- An updated map of the drainage district showing the district boundary
- A document indicating the total area (in acres) of the drainage district, the area of the lands serviced by the new branches and/or extensions, and the total length (in miles and fractions thereof) of all drains, branches, and/or new extensions within the district.
- A current listing of all parcels partially or totally within district boundary.
- Legal descriptions for each parcel partially or totally within district boundary.
- For each parcel partially within district, a general description of the portion of parcel within district and the area (in acres) of that portion.
- Right-of-way documents dedicating to the drainage district all necessary easements and right-of-ways for the new branches and/or extensions. Said documents must be in a recordable form satisfactory to the Drain Commissioner and the County Register of Deeds.
- Covenants or Restrictions attaching to each new lot in the subdivision clearly stating that said lot is in the drainage district and subject to periodic special assessments for drain maintenance.
- Updated special assessment roll reflecting all parcels within the district subject to drain special assessments.

Subsequent to Drain Commissioner approval, the documents must be recorded, with the originals returned to the Office of the Drain Commissioner.

Before commencing to do any work on the site, the proprietor shall make satisfactory arrangements with the Commissioner to provide for the inspection of the project by the Drain Commissioner. These arrangements shall include, among other things, the submission of three sets of approved drainage plans, satisfactory evidence of insurance coverage, and a copy of the signed contract between the proprietor and his Contractor covering the work to be performed. Inspections by the Drain Commissioner shall not relieve the proprietor of his obligations. Spot inspections by the Drain Commissioner's inspector are to verify the proper construction of the drains in their various

stages of completion. If it is necessary to retain a natural watercourse because this watercourse serves land outside the proposed development, then recordable releases for said watercourse will be submitted. The contract shall show in addition to the name of the Contractor, the items of work involved, the total cost of the project, and the proposed completion date. At the time this information is supplied to the Drain Commissioner, inspection deposits shall be computed and payment of same shall be made to the Commissioner prior to commencing work. The proprietor will be held responsible for the actual inspection costs incurred by the Drain Commissioner. Before work commences, an inspector must be assigned to the project. The inspector may, at his discretion, request that a pre-construction meeting of all involved parties be held.

3.0 GENERAL SUBMISSION REQUIREMENTS AND PROCEDURES

Listed below are submission requirements and procedures for preliminary plats and plans, construction plans, final plats.

All submissions for review by the Drain Commissioner must be accompanied by an Application for Drain Commissioner Review, which can be found in Appendix A. The application must indicate the type of plat/plans being submitted and be signed and dated by the proprietor or the proprietor's legal agent. The application grants permission for the Drain Commissioner or an assigned representative to enter and inspect the site. A check, or equivalent, for the initial review must accompany the application. Initial review fees are presented in Appendix B. These fees are predicated upon the size of the proposed development. Submitted plats/plans shall not be considered "received" for review until the Application for Drain Commissioner Review is completed, signed, and filed along with payment of initial review fees. Proprietors may be responsible for additional fees if additional review time is necessary to perform a satisfactory review of the plat/plans.

3.1 Preliminary Plat/Plan Submission Requirements & Procedures

Submission of a preliminary plat is required for proposed residential and industrial subdivisions prior to submission of construction plans. Submission of preliminary plans is required for Manufactured Housing Communities / Mobile Home Parks. Submission of preliminary plans is optional, but may be required, for all other types of developments subject to review and approval of the Drain Commissioner. If preliminary plans are submitted, they will be reviewed according to the same requirements and standards as preliminary plats. All preliminary plat or plan approvals are contingent upon approval of construction plans and other applicable provisions of the rules.

With the submission of a preliminary plat or preliminary plans, the proprietor or assigned agent must simultaneously submit to the Drain Commissioner:

- five copies of the preliminary plat/plans
- a letter of transmittal
- the Application for Drain Commissioner Review (See Appendix A)
- payment for initial review (See Appendix B)
- the completed Preliminary Plat/Plan Required Item Checklist (See Appendix F)

Preliminary plats/plans submissions shall conform to the following requirements:

A. A preliminary plat or preliminary plans shall show the layout of the area intended to be platted or developed. The plat or plans shall be prepared under the direction of a registered engineer or a registered land surveyor, and shall be drawn to a scale not smaller than 1 inch equal to 100 ft.

B. The preliminary plat or preliminary plans shall give the location of the proposed subdivision/development with reference to the section and part of section in which the parcel is situated and the name of the township, city, or village. The plat/plans shall show

the proposed street and alley layout, lot and plat/site dimensions, all pertinent factors such as adjoining roads and subdivisions, rivers, railroads, high tension tower lines or underground transmission lines, cemeteries, parks, natural watercourses, established drains, sewers, easements, or any other feature, the existence, location, or description of which might be of value in determining the overall requirements for the subdivision/development. If the proposed plat/development is a part of or an addition to an established county or inter-county drainage district, this fact shall be clearly stated and the district boundaries shall be shown on the watershed map.

C. Easements for the public utilities shall be shown with the tentative layout. Inasmuch as improper utility easement location can result in a change in plat/site layout, the proprietor is advised to consult with the respective utility companies before presenting the tentative layout for approval. Contour information shall be shown with a minimum of a 2-ft. contour interval.

D. In the case where the proprietor wishes to develop a given area, but wishes to begin with only a portion of the total area, the original plat/plans shall include the proposed general layout for the entire area. The part that is proposed to be developed first shall be clearly superimposed upon the overall plan in order to illustrate clearly the method of development that the proprietor intends to follow. Each subsequent plat or set of preliminary plans shall follow the same procedure until the entire area controlled by the proprietor is subdivided. The final acceptance of a subdivision/development that is a partial development of a larger general layout does not automatically ensure the final acceptance of the overall layout. Each phase of the development will be required to have adequate stormwater drainage and detention. Drainage plans for a phase of development must not be dependent upon work planned to be performed in a future phase.

E. The names of the proprietor and engineering and/or surveying firm, with mailing addresses and telephone numbers for each, shall be included.

F. If an established drain is involved, preliminary plats/plans shall include a note indicating that "All work performed in the right-of-way of an established drain shall require a permit from the Drain Commissioner."

G. Accompanying each copy of the preliminary plat/plans shall be a copy of the site report furnished to SAFEBuilt, LLC under their rule.

H. All wetlands and floodplains shall be delineated on preliminary plats or plans.

I. The seasonal high groundwater table elevation and basement floor elevations (if applicable) shall be indicated on the preliminary plat or plans. Basement floors shall be at least two feet above the seasonal high water table or a permanently controlled groundwater level associated with a permanent gravity groundwater depression system.

J. The receiving watercourse to serve as the outlet for each proposed detention facility shall be identified on the preliminary plat/plans. If the receiving watercourse identified is not suitable to serve as the outlet, the proprietor may be required to improve the watercourse to conditions approvable by the Drain Commissioner.

K. Careful consideration should be given to the design of detention and/or retention basins during preparation of the preliminary plat/plans. Although design calculations for the volume and size of detention or retention basins are evaluated as part of the construction plan review, unidentified problems could result in significant modifications to the design and/or site layout. Frequently overlooked problems include:

- Failure to provide adequate space for infiltration, detention or retention basins, or other BMPs since unrestricted discharge is not an acceptable option;
- Off-site areas contributing runoff onto a subject property affecting detention or retention pond volume requirements;
- Intrusive floodplain elevations;
- Depth to groundwater as a constraint to a BMP or detention/retention basin's depth; and
- Insufficient elevation change between a detention basin and its receiving watercourse.

L. If the preliminary plat/plans have been revised and are being re-submitted, the letter of transmittal shall indicate how the plat/plans have been revised and how each comment from the Drain Commissioner's previous review letter has been addressed.

M. When concentrated stormwater is proposed to be discharged over, onto, or across property other than that owned by the proprietor, an easement or agreement between the property owners must be executed and submitted to the Drain Commissioner in a form acceptable to the Drain Commissioner.

N. If either the proprietor or the Drain Commissioner finds it advantageous to make changes to a preliminary plat before the final plat is presented to the Commissioner for signature, such changes can be made, provided that a new preliminary plat is submitted for with each change in the layout. The proprietor is reminded that approval of a proposed subdivision by the local governing body is also required under the Subdivision Control Act. Changes made to obtain approval by the local governing body must be incorporated into the layout and a new preliminary plat resubmitted even though the original layout may have already been approved by the Drain Commissioner. If the proprietor does not present his final plat to the Commissioner for approval within a period of two years after receiving approval of the preliminary plat, it may be necessary that he resubmit the preliminary plat for review in the light of new information that may have become available during the interim.

3.2 Construction Plan Submission Requirements and Procedures

Construction plans shall be reviewed subsequent to preliminary plat/plan reviews, if applicable. With the submission of construction plans, the proprietor or assigned agent must simultaneously submit the following to the Drain Commissioner:

- two copies of the construction plans printed
- the construction plans in a common viewable electronic format
- a letter of transmittal
- the Application for Drain Commissioner Review (See Appendix A)

- payment for initial review (See Appendix B)
- the completed Construction Plan Required Item Checklist (See Appendix G)
- an agreement for maintenance of the stormwater management facilities (See Appendix H)
- any needed applications for permits to discharge to an established drain (Drainage Permit) or appeals for inclusion within a drainage district (Section 433 Agreement)
- an agreement between land owners if concentrated stormwater is to be discharged onto private property other than that owned by the proprietor
- a permit from the Michigan Department of Environment, Great Lakes and Energy, if any construction activities are proposed within regulated wetlands

Construction plan submissions must meet the following requirements:

A. For developments required to submit a preliminary plat, the approved preliminary plat or plans shall be incorporated into the construction plans. For developments not required to submit a preliminary plat, the construction plans shall conform to the requirements and standards identified for preliminary plats/plans, items A-M in Section 3.1.

B. Construction plans must conform to the design standards presented in Section 4.0 Construction Plan Design Criteria for Stormwater Systems.

C. Except for developments that will ultimately be owned by a single proprietor (e.g. commercial developments, mobile home parks, municipal developments), construction plans will not be granted approval by the Drain Commissioner until a satisfactory agreement has been submitted regarding long-term maintenance of the stormwater management facilities, including the detention and/or retention basins. Examples of acceptable maintenance agreements include:

   - ***Resolution of Acceptance*** from the municipality (e.g. township, city, or village) or other governmental agency with taxing powers indicating that the municipality or governmental agency is willing to accept, maintain, and operate the proposed stormwater management facilities on a permanent basis.
   - ***Deed Restrictions*** for a subdivision indicating that the homeowners' association will accept, maintain, and operate the proposed stormwater management facilities on a permanent basis.
   - ***Master Deed*** for a condominium development indicating the condominium association will accept, maintain, and operate the proposed stormwater management facilities on a permanent basis.

   Examples of such maintenance agreements can be found in Appendix H.

D. When concentrated stormwater is proposed to be discharged over, onto, or across private property other than that owned by the proprietor, an agreement between the land owners must be executed relieving the Drain Commissioner and municipality of any and all responsibility for damage that might occur. Such an agreement shall be submitted to the Drain Commissioner and municipality prior to construction.

3.3 Final Plat Submission Requirements and Procedures

Final plats are required to be submitted for residential and industrial subdivision developments only; all other types of developments are considered approved by the Drain Commissioner upon approval of the construction plans. The Drain Commissioner's evaluation of final plats will occur subsequent to construction plan approvals.

Five copies of the final plat shall be submitted to the Drain Commissioner. If approved, the Drain Commissioner's signature will be affixed to the plats for execution. Six copies may be submitted if the proprietor requests the return of a copy with the Drain Commissioner's signature.

The following requirements must be satisfied prior to final plat approval:

A. The final plat must strictly adhere to the construction plans as approved by the Drain Commissioner.

B. The proprietor must submit a copy of the concerned municipality's approval of the preliminary plat. The municipality's approval shall be considered valid for two years from the date of their approval.

C. The proprietor must submit a notarized letter in which the proprietor or assigned agent attests to the fact that all necessary permits (e.g. Wetland, Floodplain, Inland Lakes and Streams, Erosion Control, etc.) and required governmental approvals (e.g. Environment, Great Lakes, and Energy (EGLE) Compliance Analysis determination of adequacy, EGLE Baseline Environmental Assessment determination of adequacy, EGLE risk assessment determination of adequacy, etc.) have been granted.

D. The proprietor's engineer shall furnish a certificate bearing a clear statement that all of the drainage facilities within the subject plat have been constructed in accordance with the approved construction plans and specifications (See Section 3.3.1 below), or, if the construction has not been completed at the time of final plat submittal, the proprietor must enter into an agreement with the Drain Commissioner and post surety for faithful performance of the agreement (See Section 3.3.2 below).

3.3.1 Procedure for the Construction of Drainage Systems Prior to Final Plat Approval

If a drainage system is to be completed before submission of the final plat, the proprietor must request the Drain Commissioner's inspection of the project. The Commissioner must receive an Inspection Request Letter proposing an available time and date for inspection. Requested inspection dates must be no less than 15 working days from the Drain Commissioner's receipt of the request.

Approval of the final plat shall be contingent upon strict adherence to the construction plans as approved in writing by the Drain Commissioner. The proprietor shall be responsible for cleaning all sewers, manholes, catch basins, or other structures affected by the operations in the development before final plat approval. The proprietor should take whatever precautions he deems necessary in direct relations with his contractor in order to assure the work performed by the

contractor meets the approval of the Drain Commissioner. The proprietor shall be held totally responsible for the fulfillment of his obligations to the Drain Commissioner notwithstanding that his contractor or consulting engineer may be at fault. The proprietor may be required to post a nominal bond with the Drain Commissioner to guarantee repairs of any defects, which may show up as a result of poor workmanship or defective materials within one year after completion of the improvements. Should no defects occur within this period of one year and should no adjustments be required, this bond will be returned to the proprietor in its entirety.

3.3.2 Procedure for Drainage Systems Constructed Subsequent to Final Plat Approval

As required under Section 192(b) of the Land Division Act, as amended; M.C.L. § 560.192(b), if adequate stormwater facilities within the land proposed for platting are not installed before approval of the final plat, the proprietor shall enter into an agreement with the governing body or county drain commissioner and shall post a cash deposit, certified check or irrevocable bank letter of credit whichever the proprietor selects, or a surety bond acceptable to the approving authority, in an amount sufficient for the faithful performance of the agreement. A rebate shall be made to the proprietor, as the work progresses, of amounts of any cash deposits equal to the ratio of the work completed to the entire project.

Prior to the final release of surety money, the proprietor's engineer shall submit a complete set of as-built drawings showing all of the approved field changes. The as-built drawings will be kept on file with Drain Commissioner for permanent public record.

3.4 Submissions throughout Construction

Below are requirements for submissions that may be required during and after construction.

3.4.1 Soil Erosion and Sedimentation Control Permit Requirements

The development may require a Soil Erosion and Sedimentation Control Permit from the County Enforcing Agency (SAFEBUILT, LLC) for Part 91, Soil Erosion & Sedimentation Control, of the Natural Resources Environmental Protection Act (NREPA), Public Act 451 of 1994, as amended. In the event that it does require the above permit, the permit shall be obtained before any work commences on site. The permit application can be obtained from

SAFEBuilt, LLC
The address is: 141 S. Almer St. Caro, MI 48723
Phone: 989-262-4546
Email: tuscolapermits@safebuilt.com
Office Hours: Monday-Friday, 8am-12pm and 12:30pm-4:30pm

The site shall be reviewed weekly and after each substantial rain event by a Michigan Certified Soil Erosion and Sedimentation Control Inspector supplied by the Contractor/Owner. The cost of the Inspector shall be reflected in the budget for construction. The Inspector shall submit a report to the TCDO after every inspection. Where issues arise in which sediment/soil management procedures are not operating, it shall be noted on the report and brought to the attention of TCDO and the representative in charge of the construction site.

3.4.2 NPDES Permit-by-Rule Requirements

The development may require a National Pollutant Discharge Elimination System (NPDES) Permit-by-Rule. The National Pollutant Discharge Elimination System (NPDES) Permit Program is the Construction Storm Water Coverage under Permit-by-Rule under Part 31, Water Resources Protection of the Natural Resources and Environmental Protection Act (NREPA), Public Act 451 of 1994, as amended and the Federal Water Pollution Control Act, 33 U.S.C. 1251, et seq. (Clean Water Act)

In the event that it does, a permit shall be obtained under the above program from the EGLE. The site shall be reviewed weekly and after each substantial rain event by a Michigan Certified Storm Water Operator supplied by the Contractor/Owner. The cost of the Operator shall be reflected in the budget of construction. The storm water operator shall submit a report to the TCDO after every inspection. Where issues arise in which sediment/soil management procedures are not operating, it shall be noted on the report and brought to the attention of TCDO and the representative in charge of the construction site.

All NPDES permit applications for projects within Tuscola County should be submitted to the following **Department of Environment, Great Lakes, and Energy** local district office:

Tiffany Wilson, Lansing
517-256-1425
Permits to be submitted through MiEnviro Portal at
https://www.michigan.gov/egle/maps-data/mienviroportal

3.4.3 Other Requirements

In any case where construction will occur within a County Drain Right of Way, the following conditions also apply:

The facility shall be constructed at the location, elevation, and manner shown in the construction drawings. All underground lines must be buried a minimum of 10 feet below the existing bottom and side slopes of the drain unless a written agreement is reached between both parties stating otherwise.

All work done in connection with the construction and the drain facility will be documented to have been restored substantially to the working condition as designed.

Drainage shall be maintained and left unobstructed during construction so as to prevent the backing up of water which would cause flooding of adjacent land.

The Developer assumes all liability for any loss or damage sustained by any person or property as a result of operations performed by him and will repair any damage which it causes. Documentation of the final condition will be provided to the Tuscola County Drain Commissioner.

The Developer will notify the Tuscola County Drain Commissioner 48 hours prior to the commencement of work and an inspector will be present while the work is in progress. Fees for inspection by the Tuscola County Drain Commissioner will be the responsibility of the Developer and the Developer agrees to pay the necessary expense of the Drain Commissioner's inspector. The cost of the Inspector shall be reflected in the budget for construction.

At the discretion of the Tuscola County Drain Commissioner, progress meetings may be required for any work done within County Drain Right of Way. The Developer will prepare agendas and publish minutes of the progress meetings to accurately record the proceedings.

An accurate record of facility construction in the form of scale drawings will be submitted to the Tuscola County Drain Commissioner within 6 months of the completion of construction.

3.5 Procedures for Appeal of Decision of Drain Commissioner

If a proprietor, or other person aggrieved by a decision made by the Drain Commissioner pursuant to these Rules, wishes to appeal the decision of the Drain Commissioner, such appeal shall be made in writing to the Tuscola County Drain Commissioner within 20 calendar days of the decision. Examples of decisions subject to these appeal procedures include, but are not limited to, approvals or denials relating to plats, condominium developments, mobile home developments, or other construction and development activities subject to 425 permits. The written appeal shall identify which aspects of the decision of the Drain Commissioner are the subject of the appeal, and should specify in detail the basis and rationale for the appeal. The appellant may rely on the documentation previously presented to the Drain Commissioner or may include any additional information or documentation to be considered by the Drain Commissioner as part of the appeal. Additionally, the appellant may request an informal hearing with the Drain Commissioner. If an informal hearing is requested, the Drain Commissioner will schedule the hearing within 10 calendar days from the date of having received the appeal.

At the appeal hearing, the proprietor and/or its representatives shall be allowed an opportunity to submit additional information or re-emphasize previously submitted data supporting positions taken in their appeal; to further explain the nature and basis for the appeal; and/or to present an alternative disposition for the decision appealed. Following the Drain Commissioner's review of the information presented during the appeal process, the Drain Commissioner shall make a final decision on the appeal within 20 days of the appeal if no hearing is requested. If a hearing is requested and held, the final decision shall be made within 20 days of the hearing. The final decision of the Drain Commissioner shall be mailed to the proprietor by first class mail.

Undertaking an administrative appeal pursuant to these rules shall be a prerequisite to seeking relief by way of filing court proceedings regarding the subject of the appeal, unless different procedures are expressly provided under the Drain Code pertaining to decisions of the Drain Commissioner or Drain Board or other applicable state laws.

4.0 CONSTRUCTION PLAN DESIGN STANDARDS FOR STORMWATER SYSTEMS

Unless otherwise noted, the following design standards and requirements apply to construction plans submitted for review by the Tuscola County Drain Commissioner for all types of developments or drain-related construction activities. See appendix I for additional standards. Any conflict between various sections shall be brought to the attention of the drain commissioner who shall resolve the conflict. Such resolution by the drain commissioner is final except where grievance resolution is applied.

DEVELOPMENT WITHIN AREAS OF THE 100-YEAR FLOODPLAIN

NATIONAL FLOOD INSURANCE PROGRAM

Projects located within the 100-year floodplain of a river or stream come under the jurisdiction of the Flood Hazard Regulatory Authority as found in Part 31, Water Resources Protection of the Natural Resource and Environmental Protection Act, Act 451 of the Public Acts of 1994. A permit needs to be filed with the Department of Environmental Quality (DEQ) for projects that involve construction, filling, and grading within a floodplain area.
The objectives of Part 31 are: a) to ensure that the flood carrying capabilities of the rivers and streams is maintained such that the floodways are not obstructed and that flood elevations are not increased or flow diverted, and b) to ensure that the floodway portion of floodplains are not inhabited.

Twenty communities in Tuscola County participate in the National Flood Insurance Program (NFIP). The program makes flood insurance available in those communities agreeing to regulate future floodplain construction. Associated with the program are community floodplain mapping, building standards, federal lending restriction, and flood insurance rates supportive of local floodplain regulation. In order for a community to participate in the NFIP local regulations must be in force to:

1. Require that new construction and substantial improvements in flood prone areas be designed and anchored to prevent flotation, collapse, or lateral movement, be constructed with materials and utility equipment resistant to flood damage, and be constructed by methods and practices to minimize flood damages.
2. Require, where flood elevation data are available, that
   a. All new construction and substantial improvements of residential structures located in flood hazard areas have the lowest floor (including basement) elevated to or above the 100-year flood level.
   b. All new construction and substantial improvements of nonresidential structures in flood hazard areas have the lowest floor (including basement) elevated or dry floodproofed to or above the 100-year flood level. A registered professional engineer or architect must certify Floodproofing.
3. Require anchoring of mobile homes in flood prone areas.
4. Maintain a record of all lowest floor elevations to which new buildings have been constructed or existing buildings have been floodproofed when the structures are located in a flood hazard area.

Floodplains are mapped for most communities that participate in the FIPF. Floodplain maps are available for inspection in city, village, and township offices, or may be obtained from the Department of Environment, Great Lakes, and Energy (EGLE). EGLE may also be able to provide estimates of flood elevations in many streams, and in communities where maps do not exist.

In Tuscola County, the following communities participate in the NFIP and may have a floodplain map:

Cities:

1. Caro
2. Vassar

Townships:

1. Akron Township
2. Almer Township
3. Columbia Township
4. Dayton Township
5. Fairgrove Township
6. Fremont Township
7. Juniata Township
8. Millington Township
9. Novesta Township
10. Tuscola Township
11. Vassar Township
12. Wisner Township

Villages:

1. Village of Akron
2. Village of Fairgrove
3. Village of Mayville
4. Village of Millington
5. Village of Reese
6. Village of Unionville

FLOODPLAIN MITIGATION

Natural floodway filling or alteration shall not be allowed without review and approval by the Tuscola County Drain Commission and compliance with the Floodplain Regulatory Authority found in Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA) on watercourses with contributing drainage area of 2 square miles or greater. If a floodway has not been mapped, the applicant's consultant shall provide the floodway delineation to the Tuscola County Drain Commission for approval.

Natural floodway fringe filling or alteration shall not be allowed without review and approval by the Tuscola County Drain Commission and compliance with the Floodplain Regulatory Authority found in Part 31, Water Resources Protection, of the Natural Resources and Environmental Protection Act, 1994

PA 451, as amended (NREPA) on watercourses with contributing area of 2 square miles or greater. If a floodplain has not been mapped, the applicant's consultant shall provide the floodplain delineation including the floodway to the Tuscola County Drain Commission for approval.

To provide for streambank stability a buffer zone is to be established and called out on a recorded plat, an approved block grading plan, a site plan, or an improvement plan. This zone shall consist of existing natural tree and vegetation slope protection within a minimum of 25 feet from the ordinary high water mark. This buffer zone shall be maintained as is, that is, no earth change or disturbance is to take place.

Replacement of lost floodplain shall meet the following criteria.

5. Replacement of the loss of floodplain storage volume at a 1 to 1 ratio unless watershed conditions warrant a higher ratio. This applies to floodplain associated with rainfall events up to a 100-year frequency. The grading plan shall provide for an equivalent volume of storage for floodplains associated with more frequent events such as 10 and 25 year frequencies.
6. Storm water detention does not apply toward the replacement volume.
7. Floodplain storage volume shall be computed above the seasonal high ground water level only.
8. The inflow and outflow rates to the area shall be consistent with predevelopment rates.
9. Up to 50 percent of the floodplain mitigation storage volume may be used for snow storage.
10. The proximity of the floodplain mitigation area shall provide for an equivalent hydrologic impact to the receiving stream and adjacent parcels.

4.1 General Requirements

The following general stormwater management requirements apply to all new developments and redevelopments in Tuscola County.

A. The design process shall begin by identifying sensitive areas located on the site and laying out the site to protect the sensitive areas.

B. Best Management Practices (BMPs) that reduce the amount of stormwater runoff and improve water quality are required and shall be designed on a site specific basis. Rate and volume reduction BMPs shall be used to protect open channel storm drains. All BMPs shall be included on the plans and will be subject to review and approval by the TCDO and EGLE as necessary for permits. BMP usage shall be monitored and recorded in the weekly SESC reports. Areas with potential for significant pollutant loading, as determined by the TCDO , will require BMPs which address regulation of the specific hazard.

The Developer/Owner shall include a long-term operation and maintenance schedule for all permanent BMPs. A maintenance agreement between the applicant and the owners or operators is necessary for permanent BMPs which shall include but not be limited to: inspection of structural or vegetative BMPs, performance of maintenance and corrective actions when BMPs are neglected by the owner, and deed restrictions.

C. Onsite management of stormwater is required first and foremost, unless site constraints preclude this approach.

D. Stormwater shall be managed using four standards: stream protection, flood control, water quality and pre-treatment to protect both water resources and real property.

E. Stream protection shall be provided for surface water discharges to natural water courses (directly or through pipes or ditches) by retaining onsite the difference in stormwater runoff volume between pre-development and post-development conditions for the 2-year, 24 hour storm (2.26 inches of rain). Stream protection for redevelopments shall be provided through retention of the difference in the 2-year stormwater runoff volume between existing and post-development conditions. If site constraints preclude meeting the retention standard, extended detention of the 1-year, 24-hour storm (1.87 inches of rain) will be allowed.

F. Flood control shall be provided for all sites through retention or detention. One inch of runoff from disturbed pervious and impervious areas should be detained for treatment and flood control. The maximum allowable detention release rate is equal to the pre-settlement volume for all storms up to the 100 year storm event using the Runoff Curve Number Method to determine pre-settlement volume. Onsite flood control may be waived for direct discharges to large lakes and rivers if the Developer demonstrates no negative impacts, or if provided in a regional facility with adequate upstream infrastructure.

G. Overland flow routes and the extent of high water levels for the 100-year storm shall be identified for all sites.

H. Water quality treatment shall be provided for all sites. A minimum treatment volume equal to 0.5-inches of runoff from the directly contributing impervious area is required. A minimum volume of 750 cubic feet per acre is required for directly connected disturbed pervious areas (i.e. lawns). BMP's shall be designed to reduce post development solids loadings by 80% or to not exceed solids loadings of 80 milligrams per liter.

I. Pre-treatment is required for infiltration, filtration and detention BMPs for ease of maintenance and to protect BMP integrity and preserve longevity.

J. Stormwater discharges from activities with a high risk for an accidental spill of pollutants (stormwater hot spots) shall provide spill containment.

K. Stormwater discharges to cold water streams shall employ management strategies to reduce stormwater runoff temperature and promote groundwater recharge.

L. The design maximum release rate, volume or concentration of stormwater discharged from a site shall not exceed the capacity of existing infrastructure or cause impairment to the offsite receiving area. Evaluation of the existing outlet must be performed and an adequate outlet must be provided.

M. The use of many decentralized Low Impact Development (LID) BMPs is not mandated, but is encouraged on private sites.

N. Construction plans for a phased development shall show the existing and/or proposed drainage systems for all prior phases of the development, unless the drainage system for the current phase is entirely independent of the prior phases. Furthermore, drainage plans for a phase of a development must not be dependent upon work planned to be performed in a future phase.

O. Plans shall include a grading plan showing existing and proposed topographic contour lines and proposed finish floor and basement floor elevations.

P. All existing natural or manmade watercourses shall be shown on the plans. The proposed changes to the site must not interfere with Common Law Natural Flow Rights. Existing watercourses must be preserved or relocated, or the flow otherwise accommodated by the proposed plans. Provisions for the maintenance of the watercourse must be included in the deed restriction or an equivalent legally binding agreement. EGLE and/or the Army Corp. of Engineers may also require permits for changes made to such watercourses.

Q. No construction activities shall be allowed without approval of the Drain Commissioner in a 100-year floodplain as determined by the Drain Commissioner.

R. The cover sheet of the plans shall include a "Permit Status Table" indicating the status of all permits being obtained. An example of such a table is provided in Appendix E.

S. If an established drain is involved, construction plans shall include a note indicating that "All work performed in the right-of-way of an established drain shall require a permit from the Drain Commissioner."

T. The engineer's seal shall be affixed to the construction plans.

4.2 Established Drains

A. Plans shall include plans and profiles of all existing and proposed drains within road right-of-way and drainage easements on site. These drawings shall indicate the channel bottom, banks, base flow water elevation, and the location of the outlet from the detention facility, if applicable.

B. Minimum right-of-way widths for proposed drains:

11. Proposed open drains shall have a minimum right-of-way of 50 feet plus top width of channel centered on drain centerline. A consistent right-of-way width shall be maintained along the entire reach of drain on the proposed site. A minimum width of 25 feet must be maintained from the top-of-bank to the edge of the right-of-way to allow for maintenance of the drain.

12. Proposed enclosed drains shall have a minimum right-of-way of 40 feet centered on the centerline of the enclosure.

13. The above minimum widths shall govern generally; however, wider right-of-ways may be required at the discretion of the Commissioner.

C. Where drainage is to be discharged to an established drain, either directly or through secondary routes, the drain shall be improved to standards approved by the Drain Commissioner when necessary for proper drainage of the proposed development. The drain restoration can be performed by and/or at the expense of the Developer (See Section 2.8), or by the Drain Commissioner by means of a petition to clean out the drain.

D. Where drainage is discharged to an established drain, the outlet shall be so designed as to enter the drain at an angle of 90 degrees or less, as determined by the upstream centerline. Preformed end sections, grouted riprap, or specially designed outlet structures will be required.

E. If cutting and/or filling is to be performed within a drain right-of-way, a table shall be provided indicating at one-foot elevation intervals the total cut and fill volumes below each elevation. At each one-foot elevation interval, the total cut volume must equal or exceed the total fill volume. (Note that additional permit(s) may be required from the EGLE.)

F. Sodding, seeding, and mulching within a drain right-of-way shall be done in accordance with the requirements of the "Soil Erosion and Sedimentation Control, Authorized Public Agency Procedures Manual" of the Tuscola County Drain Commissioner, and performed only after prior approval of the Drain Commissioner as to the time of performance and acceptability of the finished grade. This work must be performed under the inspection of the Drain Commissioner.

4.3 Storm Sewers

A. Plans shall show boundaries and acreages of catchment areas contributing runoff to each proposed or existing catch basin and/or inlet. Runoff from off-site tributary areas must be accommodated in design or rerouted.

B. The required discharge capacity for each reach of sewer shall be determined by the Rational Method.

   1. A 10-year design storm shall be used such that rainfall intensity, $I = 175 / (T + 25)$, where T = time of concentration in minutes.

   2. The runoff coefficient, C, shall be in conformance will normal design practice. Where a weighted average coefficient is employed, the computations shall be submitted for review.

C. A complete set of storm sewer design calculations shall accompany every set of construction plans submitted for review.

   1. Sewer capacities shall be based on the Manning equation.

   2. Energy losses from friction shall be based on calculated design storm peak discharges and velocities, not Manning design (i.e. full-pipe) capacities.

   3. Energy losses from friction shall be based on typical Manning "n" roughness values as shown in Table J-3.

   4. Energy losses through manholes and other appurtenances shall be included in the design calculations OR reflected in friction losses through use of conservative Manning "n" roughness values as shown in Table J-3.

D. The storm sewer pipe shall have a minimum diameter of 12 inches when constructed in a public right-of-way or easement.

E. Storm sewer slopes must not be flatter than the minimum slopes indicated in Table J-2.

F. Minimum allowable pipe velocity shall be 2.5 ft/sec. (except where the minimum diameter requirement makes this unachievable.) Desirable pipe velocity range shall be 4-8 ft/sec. Maximum allowable pipe velocity shall be 10 ft/sec.

G. Hydraulic grade lines shall be calculated and shown as a part of all storm sewer profiles. In no case shall the elevation of the hydraulic grade line exceed the elevation of a point lying 1 foot below the rim elevation of a manhole, catch basin or inlet. The hydraulic grade line upstream of a detention or retention storage facility shall be calculated assuming the design high water elevation (e.g. full detention basin).

H. The storm sewer plan and profile drawing shall show the following data:

1. Proper identification and numbering of manholes, catch basins and inlets
2. Invert and casting elevations for all structures
3. Pipe length (C/L to C/L to structures)
4. Pipe diameter
5. Pipe slope
6. Pipe class or designation
7. Detail of trench construction and type of backfill material

I. Generally, manholes shall be placed not more than 400 feet apart for sewers less than 30 inches diameter and 600 feet apart for larger sewers.

J. The minimum inside diameter of all manholes, catch basins and inlets shall be 48 inches, with the following exception: Inlet structures from which water will be discharged directly into a catch basin may be 24 inches inside diameter. The depth of such inlets shall be no greater 5.0 feet and no less than 3.5 feet from the top of frame and cover to the invert.

K. Manholes and inlets structures may be constructed of brick, manhole block, precast concrete (ASTM C478) or cast-in-place concrete.

L. All manhole block or brick structures shall be plastered on the outside with 1 to 2.5 mix of portland cement mortar, ½-inch thick. No calcium chloride or other chemical shall be added to lower the freezing point of the mortar, as the strength of the mortar may be lessened.

M. Inlet structures in the public street right-of-way shall be spaced a maximum of 400 feet apart (or a maximum of 400 feet on either side of a high point). The spacing and/or number of inlet structures required to accommodate the design flows in streets and in private drives and parking areas, shall be based on a maximum of 1 cfs per 90 square inches of opening in an inlet or catch basin cover.

N. All storm sewer pipe, manholes, catch basins, and inlets shall meet MDOT specifications.

O. Generally, drops of over 2.0 feet at manholes, from invert of higher pipes to lower pipes, shall be avoided.

P. Joints in concrete pipe having a diameter of 30 inches or larger shall be pointed up on inside with mortar after backfilling has been completed.

Q. Where drainage is discharged to an established drain or natural watercourse, such outlets shall be so designed as to enter the drain or watercourse as an angle of 90 degrees or less, as determined by the upstream centerline. Preformed end sections, grouted riprap or specially designed outlet structures will be required.

R. Unless the storm sewers are to be owned and maintained by a single private entity (i.e. municipal or commercial development, manufactured housing community, etc.), all storm sewers shall be located within an easement. The minimum easement width for a storm sewer shall be 40 feet centered on the sewer centerline.

S. All existing and proposed on-site drainage easements shall be clearly shown.

T. If any utilities are to be located within existing or proposed drainage easements within a development, the proprietor's engineer shall present plans of such utilities to the Commissioner for his approval as to location. If possible, such plans should be presented at the same time as drainage plans so that all details of construction and location may be checked and properly oriented with each other. In order to avoid conflict, it is important that a careful investigation be made where underground utilities are in close proximity to proposed storm sewers, or where they cross each other.

4.4 Open Channels

The most frequently used rainfall data has been compiled by Huff, F.A. and Angel, J.R. See: Rainfall Frequency Atlas of the Midwest, 1992, Bulletin 71 Midwestern Climate Center and Illinois State Water Survey. MCC Research Report 92-03, available for free download at: https://www.isws.illinois.edu/pubdoc/B/ISWSB-71.pdf

Long-term daily and monthly precipitation data for about 25 stations throughout Michigan is available free from the United States Historical Climatology Network (USHCN) at: https://www.ncei.noaa.gov/products/land-based-station/us-historical-climatology-network

A. The peak 10-year flow in each reach of open channel shall remain within the banks of the channel and below adjacent low ground. Off-site tributary area shall be included in the design, or the off-site tributary runoff shall be rerouted around the channel.

B. The values of Manning's "n" shall be no less than 0.040 except where the channel is smooth and paved in which case an "n" value of 0.013 to 0.022 shall be used.

C. The maximum velocity for grass lined channels shall not exceed 5 ft/sec. Where above velocity is exceeded, the channel shall be protected by cobble paving or other means to prevent scour.

D. The minimum acceptable non-siltation velocity at design discharge should be 1.5 ft/sec.

E. Unless the open channels are to be owned and maintained by a single private entity (i.e. industrial/commercial development, manufactured housing community, etc.), all open channels shall be located within an easement. Open channels shall have a minimum right-of-way of 50 feet plus top width of channel centered on the centerline. A consistent right-of-way width shall be maintained along the entire reach of channel on the proposed site. A minimum width of 25 feet must be maintained from the top-of-bank to the edge of the

right-of-way to allow for maintenance. The above minimum width shall govern generally; however, wider right-of-ways may be required at the discretion of the Commissioner.

F. Side slopes of open channels shall normally be no steeper than 1 vertical to 3 horizontal. Where conditions dictate steeper side slopes, consideration should be given to slope paving and fencing. The final decision in such matters rests with the Drain Commissioner.

G. All existing and proposed on-site drainage easements shall be clearly shown on the plans.

4.5 Culverts

A. All culverts should be labeled on the plans as "existing", "proposed", or "to be extended".

B. Plans shall show boundaries and acreages of tributary areas contributing runoff to each proposed or existing culvert on the proposed site.

C. Proposed or extended culverts with tributary areas exceeding 2 square miles must be approved by both the Drain Commissioner and the Michigan Department of Environment, Great Lakes, and Energy. A copy of the permit obtained from EGLE must be submitted to the Tuscola County Drain Commissioner. Culverts with tributary areas of less than 2 square miles must be approved by the Tuscola County Drain Commissioner. Proposed or extended culverts may also require the approval of the Tuscola County Road Commission and/or the Michigan Department of Transportation (MDOT).

D. The Rational Method shall be used to determine the peak design flow for the culvert, if the tributary area to the culvert is less than 20 acres. For larger tributary areas, the SCS Method shall be used. The runoff coefficients used should be consistent with those in Table J-1, and selected to reflect the future land use of the tributary area.

E. All culverts shall be designed using standard nomographs for inlet and outlet control conditions. Calculations of the 10-year and 100-year headwater elevations for all culverts thus designed shall accompany the final plans. (See Example J-3, Culvert Design Calculations.)

1. The 10-year headwater elevation of each culvert shall not exceed an elevation one-half foot above the crown elevation of the road or driveway culvert. The backwater shall not extend beyond the limits of the proprietor's property.

2. The 100-year headwater elevation of each culvert may overtop the road or driveway centerline elevation, but must remain below proposed finish floor elevations of all nearby existing and proposed structures.

3. The tailwater elevation assumed for each culvert should be estimated as the normal depth of the peak flow in the downstream channel, unless the tailwater is influenced by the headwater of another downstream culvert or the confluence of another watercourse.

F. Wing walls, headwalls, end sections, and all other culvert extremities shall be designed to ensure the stability of the surrounding soil, and to meet the requirements of other governing agencies (e.g. Tuscola County Road Commission, MDOT, EGLE)

G. Roadways over culverts or bridges may be required to be paved or designed in such a way as to prevent the erosion of road material into the established drain or watercourse.

H. The following data shall be provided for all proposed or extended culverts:
   - Length
   - Diameter
   - Invert elevations
   - Material type
   - Protection for culvert ends

I. Riprap must be provided as warranted for all culverts in established drains or significant watercourses. The rip-rap provided for the protection of culvert ends shall be warranted at outlet velocities above 3 ft/second and:

   1. Extend at least one culvert diameter upstream of the culvert inlet and at least three culvert diameters downstream of the culvert outlet;

   2. Extend across the bottom of the channel and up the banks of the channel to at least the elevation of the crown of the culvert;

   3. Be inlayed such that it does not cause an obstruction in the watercourse; and

   4. Have a minimum dimension no smaller than that consistent with HEC-11 Design Guidelines for Rock Riprap and MDOT standards. (A conservative guideline for water depths less than 3 feet would be to use 8-inch diameter riprap for flow velocities up to 6 feet/sec, and 16-inch diameter riprap for flow velocities up to 11 feet/sec.)

J. Minimum diameter for a driveway or crossroad culvert shall be 18 inches or equivalent pipe arch.

K. The pipe used in culverts shall meet MDOT specifications and Tuscola County Road Commission standards.

4.5 Culverts

A. All culverts should be labeled on the plans as "existing", "proposed", or "to be extended".

B. Plans shall show boundaries and acreages of tributary areas contributing runoff to each proposed or existing culvert on the proposed site.

4.6 Bioretention

A bioretention system consists of a soil bed planted with native vegetation located above an underdrained sand layer. It can be configured as either a bioretention structure or a bioretention swale. Stormwater runoff entering the bioretention system is filtered first through the vegetation and then the sand/soil mixture before being conveyed downstream by the underdrain system. Runoff storage depths above the planting bed surface are typically shallow. The adopted TSS removal rate for bioretention systems is 90 percent.

Bioretention systems are used to remove a wide range of pollutants, such as suspended solids, nutrients, metals, hydrocarbons, and bacteria from stormwater runoff. They can also be used to reduce peak runoff rates and increase stormwater infiltration when designed as a multi-stage, multi-function facility.

4.6.1 Pre-Design Site Evaluation

For infiltration trench and structure practices, a minimum field infiltration rate (fc) of 0.52 inches per hour is required; lower rates preclude the use of these practices. For surface sand filter and bioretention practices, no minimum infiltration rate is required if these facilities are designed with a "day-lighting" underdrain system; otherwise these facilities require a 0.52 inch per hour rate.

Feasibility testing is to be conducted to screen unsuitable sites, and reduce testing costs. A soil boring is not required at this stage. However, a designer or landowner may opt to engage Concept Design Borings at his discretion, without feasibility testing.

Initial testing involves either one field test per facility, regardless of type or size, or previous testing data, such as the following:

* on-site septic percolation testing, within 200 feet of the proposed BMP location, and on the same contour which can establish initial rate, water table and/or depth to bedrock,

* geotechnical report on the site prepared by a qualified geotechnical consultant, or

* Natural Resources Conservation Service (NRCS) County Soil Mapping showing an unsuitable soil group such as a hydrologic group "D" soil in a low-lying area.

If the results of initial feasibility testing as determined by a qualified professional show that an infiltration rate of greater than 0.52 inches per hour is probable, then the number of concept design test pits shall be 2 per 400 square feet areas. An encased soil boring may be substituted for a test pit, if desired.

4.6.2 Design Criteria

A. Storage Volume, Depth, and Duration
Bioretention systems shall be designed to treat the runoff volume generated by the stormwater quality design storm (2 year). The maximum water depth during treatment of the stormwater quality design storm shall be 12 inches in a bioretention structure and 18

inches in a bioretention swale. The minimum diameter of any outlet or overflow orifice is 2.5 inches. The bottom of a bioretention system, including any underdrain piping or gravel layer, must be a minimum of 1 foot above the seasonal high groundwater table. The planting soil bed and underdrain system shall be designed to fully drain the stormwater quality design storm runoff volume within 72 hours.

B. Permeability Rates

The design permeability rate through the planting soil bed must be sufficient to fully drain the stormwater quality design storm runoff volume within 72 hours. This permeability rate must be determined by field or laboratory testing. Since the actual permeability rate may vary from test results and may also decrease over time due to soil bed consolidation or the accumulation of sediments removed from the treated stormwater, a factor of safety of two shall be applied to the tested permeability rate to determine the design permeability rate. Therefore, if the tested permeability rate of the soil bed material is 4 inches/hour, the design rate would be 2 inches/hour (i.e., 4 inches per hour/2). This design rate would then be used to compute the system's stormwater quality design storm drain time.

C. Planting Soil Bed

The planting soil bed provides the environment for water and nutrients to be made available to the vegetation. The soil particles can adsorb some additional pollutants through cation exchange, and voids within the soil particles can store a portion of the stormwater quality design storm runoff volume. The planting soil bed material should consist of 10 to 15 percent clays, a minimum 65 percent sands, with the balance as silts. The material's pH should range from 5.5 to 6.5. The material shall be placed in 12 to 18 inch lifts. The total depth or thickness of the planting soil bed should be a minimum of 3 feet. As noted above, the design permeability rate of the soil bed material must be sufficient to drain the stormwater quality design storm runoff volume within 72 hours. Filter fabric should be placed along the sides of the planting soil bed to prevent the migration of soil particles from the adjacent soil into the planting soil bed.

D. Vegetation

The vegetation in a bioretention system removes some of the nutrients and other pollutants in the stormwater inflow. The use of native plant material is recommended for bioretention systems wherever possible. The goal of the planting plan should be to simulate a forest-shrub community of primarily upland type. In general, trees should dominate the perimeter zone that is subject to less frequent inundation. Shrubs and herbaceous species that are adapted to moister conditions and expected pollutant loads should be selected for the wetter zones. The number of stems per acre should average 1,000, with tree spacing of 12 feet and shrub spacing of 8 feet.

E. Sand Layer

The sand layer serves as a transition between the planting soil bed and the gravel layer and underdrain pipes. It shall be a minimum thickness of 12 inches and consist of clean medium aggregate sand (AASSHTO M-6/ASTM C-33 or MDOT Class II). To ensure proper system operation, the sand layer must have a permeability rate at least twice as fast as the design permeability rate of the planting soil bed.

F. Underdrain

The underdrain piping must be rigid Schedule 40 PVC pipe. The portion of drain piping beneath the planting soil bed and sand layer must be perforated. All remaining underdrain piping, including cleanouts, must be nonperforated. All joints must be secure and watertight. The underdrain piping must connect to a downstream storm sewer manhole, catch structure, channel, swale, or ground surface at a location that is not subject to blockage by debris or sediment and is readily accessible for inspection and maintenance. Blind connections to downstream storm sewers are prohibited.

G. Overflows

All bioretention systems must be able to safely convey system overflows to downstream drainage systems. The capacity of the overflow must be consistent with the remainder of the site's drainage system and sufficient to provide safe, stable discharge of stormwater in the event of an overflow.

H. Tailwater

The hydraulic design of the underdrain and overflow systems, as well as any stormwater quantity control outlets, must consider any significant tailwater effects of downstream waterways or facilities. This includes instances where the lowest invert in the outlet or overflow structure is below the flood hazard area design flood elevation of a receiving stream.

Bioretention systems must be constructed off-line from County Drains.

I. Maintenance

The following requirements must be included in the system's maintenance plan.

1. General Maintenance

All bioretention system components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four times annually as well as after every storm exceeding 1 inch of rainfall. Such components may include bottoms, trash racks, low flow channels, outlet structures, riprap or gabion aprons, and cleanouts.

Sediment removal should take place when the structure is thoroughly dry. Disposal of debris, trash, sediment, and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state, and federal waste regulations.

2. Vegetated Areas

Mowing and/or trimming of vegetation must be performed on a regular schedule based on specific site conditions. Grass should be mowed at least once a month during the growing season. Vegetated areas must be inspected at least annually for erosion and scour. Vegetated areas should also be inspected at least annually for unwanted growth,

which should be removed with minimum disruption to the planting soil bed and remaining vegetation.

When establishing or restoring vegetation, biweekly inspections of vegetation health should be performed during the first growing season or until the vegetation is established. Once established, inspections of vegetation health, density, and diversity should be performed at least twice annually during both the growing and non-growing seasons. The vegetative cover should be maintained at 85 percent. If vegetation has greater than 50 percent damage, the area should be reestablished in accordance with the original specifications and the inspection requirements presented above.

All use of fertilizers, mechanical treatments, pesticides and other means to assure optimum vegetation health should not compromise the intended purpose of the bioretention system. All vegetation deficiencies should be addressed without the use of fertilizers and pesticides whenever possible.

3. Structural Components

   All structural components must be inspected for cracking, subsidence, spalling, erosion, and deterioration at least annually.

4.7 Infiltration

An infiltration structure is a facility constructed within highly permeable soils that provides temporary storage of stormwater runoff. An infiltration structure does not normally have a structural outlet to discharge runoff from the stormwater quality design storm. Instead, outflow from an infiltration structure is through the surrounding soil. An infiltration structure may also be combined with an extended detention structure to provide additional runoff storage for both stormwater quality and quantity management. The adopted TSS removal rate for infiltration structures is 80 percent.

Infiltration structures are used to remove pollutants and to infiltrate stormwater back into the ground. Such infiltration also helps to reduce increases in both the peak rate and total volume of runoff caused by land development. Pollutant removal is achieved through filtration of the runoff through the soil as well as biological and chemical activity within the soil.

4.7.1 Pre-Design Site Evaluation

Infiltration structures can present some practical design problems. When planning for an infiltration structure that provides stormwater quality treatment, consideration should be given to soil characteristics, depth to the groundwater table, sensitivity of the region, and runoff water quality. Specifically, infiltration structures must not be used in the following locations:

- Industrial and commercial areas where solvents and/or petroleum products are loaded, unloaded, stored, or applied or pesticides are loaded, unloaded, or stored.

• Areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the U.S. Environmental Protection Agency in the Code of Federal Regulations at 40 CFR 302.4.

• Areas where infiltration structure use would be inconsistent with an NJDEP-approved remedial action work plan or landfill closure plan.

• Areas with high risks for spills of toxic materials such as gas stations and vehicle maintenance facilities.

• Areas where industrial stormwater runoff is exposed to "source material." "Source material" means any material(s) or machinery, located at an industrial facility, that is directly or indirectly related to process, manufacturing, or other industrial activities, that could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to raw materials, intermediate products, final products, waste materials, by-products, industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.

• Areas where their installation would create a significant risk for basement seepage or flooding, cause surficial flooding of groundwater, or interfere with the operation of subsurface sewage disposal systems and other subsurface structures. Such adverse impacts must be assessed and avoided by the design engineer.

Infiltration structures must be configured and located where their construction will not compact the soils below the structure. In addition, an infiltration structure must not be placed into operation until the contributing drainage area is completely stabilized.

General Setback Requirements for Infiltration Structures:

Soil Absorption Systems for Title 5 Systems: 50ft.
Private wells: 100 ft.
Public wells: 150 ft.
Public reservoir, surface water sources for public water systems and their tributaries: 400 ft.
Other surface waters: 50 ft.
Property Lines: 10 feet
Building foundations: >10 to 100 ft, depending upon soil types and Infiltration Structure type

Soils are perhaps the most important consideration for site suitability. In general, County Soil Surveys can be used to obtain necessary soil data for the planning and preliminary design of infiltration structures. For final design and construction, soil tests are required at the exact location of a proposed structure in order to confirm its ability to function without failure.
Tests should include:

- determination of the textural classification
- permeability of the subgrade soil at and below the bottom of the proposed infiltration structure

The recommended minimum depth for subgrade soil analysis is 5 feet below the bottom of the structure or to the groundwater table. Soil permeability testing can be conducted in accordance with the Standards for Individual Subsurface Sewage Disposal Systems.

4.7.2 Design Criteria

A. Storage Volume, Depth, and Duration
An infiltration structure must be designed to treat the total runoff volume generated by the structure's maximum design storm. This may either be the groundwater recharge or stormwater quality design storm, depending upon the structure's proposed use. An infiltration structure must also fully drain this runoff volume within 72 hours. Runoff storage for greater times can render the structure ineffective and may result in anaerobic conditions, odor, and both water quality and mosquito breeding problems. The bottom of the infiltration structure must be at least 2 feet above seasonal high water table or bedrock. For surface structures, this distance must be measured from the bottom of the sand layer. The structure bottom must be as level as possible to uniformly distribute runoff infiltration over the subgrade soils.

To enhance safety by minimizing standing water depths, the vertical distance between the structure bottom and the maximum design storm water surface in surface infiltration structures should be no greater than 2 feet. Construction of an infiltration structure must be done without compacting the structure's subgrade soils. Excavation must be performed by equipment placed outside the structure whenever possible. This requirement should be considered when designing the dimensions and total storage volume of an infiltration structure. It is important to note that the use of infiltration structures is recommended only for the stormwater quality design storm and smaller storm events. Use of infiltration structures for larger storm events and the requirements by which such structures are to be designed, constructed, and maintained should be reviewed and approved by all applicable reviewing agencies.

B. Permeability Rates
The minimum design permeability rate of the soils below an infiltration structure will depend upon the structure's location and maximum design storm. The use of infiltration structures for stormwater quality control is feasible only where soil is sufficiently permeable to allow a reasonable rate of infiltration. Therefore, infiltration structures designed for storms greater than the groundwater recharge storm can be constructed only in areas with Hydrologic Soil Group A and B soils.

Maximum Design Structure Location	Minimum Design Permeability Rate (Inches/Hour)
Groundwater Recharge Subsurface	0.2
Groundwater Recharge Surface	0.5
Stormwater Quality Surface and Subsurface	0.5

In addition to the above, the design permeability rate of the soil must be sufficient to fully drain the infiltration structure's maximum design storm runoff volume within 72 hours. This design permeability rate must be determined by field testing (See Bioretention Pre

Design). Since the actual permeability rate may vary from test results and may also decrease over time due to soil bed consolidation or the accumulation of sediments removed from the treated stormwater, a factor of safety of two must be applied to the tested permeability rate to determine the design permeability rate. Therefore, if the tested permeability rate of the soils is 4 inches/hour, the design rate would be 2 inches/hour (i.e., 4 inches per hour/2). This design rate would then be used to compute the structure's maximum design storm drain time.

C. Bottom Sand Layer

To help ensure maintenance of the design permeability rate over time, a 6 inch layer of sand must be placed on the bottom of an infiltration structure. This sand layer can intercept silt, sediment, and debris that could otherwise clog the top layer of the soil below the structure. The sand layer will also facilitate silt, sediment, and debris removal from the structure and can be readily restored following removal operations. The sand layer must meet the specifications of a MDOT Class II sand. This must be certified by a certified testing lab.

D. Overflows

All infiltration structures must be able to convey overflows to downstream drainage systems in a safe and stable manner. The capacity of the overflow must be consistent with the remainder of the site's drainage system and sufficient to provide safe, stable discharge of stormwater in the event of an overflow.

E. Subsurface Infiltration Structures

A subsurface infiltration structure is located entirely below the ground surface. It may consist of a vault, perforated pipe, and/or stone bed. However, due to the greater difficulty in removing silt, sediment, and debris, all runoff to a subsurface infiltration structure must be pretreated. This pretreatment must remove 80 percent of the TSS in the runoff from the structure's maximum design storm.

Infiltration Structures must be constructed off-line from County Drains.

F. Basis of Design

The design of an infiltration basin is based upon Darcy's Law:

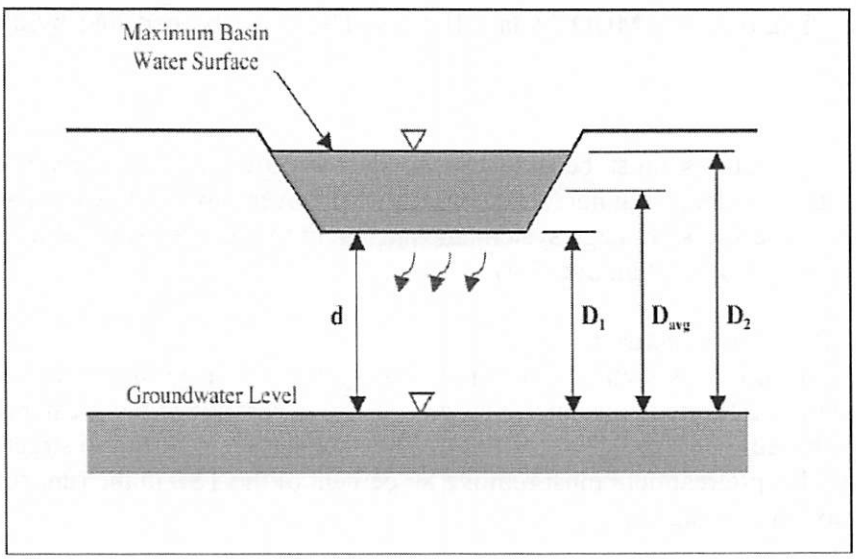
$Q = KIA$

where:

Q = the rate of infiltration in cubic feet per second (cfs)
K = the hydraulic conductivity of the soil in feet per second (fps)
I = the hydraulic gradient
A = the area of infiltration in square feet (sf)

From the variables shown in the Figure below:

Average Hydraulic Gradient = D_{avg} /d
Minimum Hydraulic Gradient = D_1/d
Maximum Hydraulic Gradient = D_2/d



G. Maintenance

The following requirements must be included in the system's maintenance plan.

General Maintenance

All infiltration structure components expected to receive and/or trap debris and sediment must be inspected for clogging and excessive debris and sediment accumulation at least four times annually as well as after every storm exceeding 1 inch of rainfall. Such components may include bottoms, riprap or gabion aprons, and inflow points. This applies to both surface and subsurface infiltration structures. Sediment removal should take place when the structure is thoroughly dry. Disposal of debris, trash, sediment, and other waste material should be done at suitable disposal/recycling sites and in compliance with all applicable local, state, and federal waste regulations.

4.8 Detention Storage Facilities

Detention storage facilities are designed to detain runoff for a short period of time and then release it to a watercourse where it returns to the hydrologic cycle. The objective of detention storage is to regulate the released runoff rate and to reduce the impact on downstream drainage systems. Detention storage should not be confused with retention storage (i.e. retention basins), a facility with no engineered outlet (other than an emergency-type outlet) designed to hold runoff for a considerable length of time. The water in a retention basin is not discharged to surface water, although it may infiltrate in to the ground, evaporate, or be consumed by plants.

In keeping with Common Law Natural Flow Rights and the Michigan Drain Code, concentrated discharges of stormwater (such as the outflow from a detention facility) or increased surface water runoff over property owned by others must be pursuant to a valid right-of-way, easement, or other written permission from all property owners affected. The outflow from a detention facility is considered to be such a concentrated discharge of stormwater.

All forms of detention storage shall meet the following criteria:

A. On-site detention (or retention – See Section 4.7 Retention Basin below) of stormwater is required of all new developments or redevelopments to maintain the peak outflow to a rate similar to the pre-development runoff rate. The maximum allowable release rate shall be 0.15 cfs per acre, or to a discharge rate approved by the Tuscola County Drain Commissioner. In no case shall the outflow from a site exceed the capacity of the receiving watercourse to accept the flow.

B. Detention requirements may be more stringent in certain watersheds according to local ordinances or policies of the drainage district. In the Crapaud Creek watershed, the peak allowable discharge rate is limited to 0.1 cfs/acre.

C. The detention basin volume shall be determined for the 100-year flood volume from all tributary area, including off-site area. Rational, SCS or other software based calculations may be used if properly documented and submitted for review.

   1. The tributary area shall include all acreage contributing runoff to the detention storage facility, including any off-site tributary area in its existing state, whether developed or undeveloped.

   2. The following equations shall be used to determine the 100-year detention volume:

      Q_a = Allowable release rate, cfs

      $Q_o = Q_a / (A\ C)$, where A = Tributary area in acres, C = weighted runoff coefficient

      Detention time in minutes, $T = -25 + \text{sqrt}(10{,}312.5 / Q_o)$

      Storage volume per impervious acre, $V_s = 16{,}500\ T / (T + 25) - 40\ Q_o\ T$

      Required detention volume in cubic feet, $V = V_s \times A \times C$

D. If the site is located near the downstream end of a watercourse or drainage district, the Drain Commissioner may require that the proprietor (or his engineer) generate and submit hydrographs of the outflow from the existing site and from the proposed site (i.e. detention facility) and a hydrograph of the flow in the receiving watercourse to verify that the detained outflow would not result in an increase in the peak flow in the receiving watercourse. If the detained outflow would result in an increase in the peak flow in the receiving watercourse, then stormwater detention is not an acceptable stormwater management option. Retention of stormwater or other stormwater management design approved by the Drain Commissioner must be provided. See Section 4.7 Retention Basins for design requirements. The Tuscola County Drain Commissioner's office may be able to assist in the determination of the required hydrographs, if needed.

E. Portions of the developing site may be allowed to drain unrestricted (i.e. not through a detention facility) if either of the following conditions are met:

1. The areas draining unrestricted are not being disturbed or altered by the construction, such that they will maintain their existing drainage characteristics and patterns.

2. The areas draining unrestricted are being disturbed or altered but will be permanently stabilized to prevent erosion and will not contain any impervious surface post-construction. In this case, the unrestricted flow must be draining to a receiving watercourse with valid rights-of-way, or else written agreement from the affected property owners would have to be obtained per Common Law Natural Flow Rights and the Michigan Drain Code. In addition, the post-construction peak 100-year flow from these areas should be calculated and deducted from the total allowable peak flow from the detention facility (Q_a). The detention outlet(s) should be designed to restrict the basin outflow(s) to this reduced allowable peak flow rate.

F. Where the detention facility is to be equipped with a pump discharge, the Tuscola County Drain Commissioner may require the proprietor to furnish design data on pump(s) and discharge force main so that the capacity of the system can be verified. These data will include system curve calculations, the pump performance curves, and a profile of the system piping. The pumping station should be able to release the first flush volume over approximately 24 hours, the bankfull flood volume over 24-48 hours, and the 100-year flood volume at a rate not to exceed 0.15 cfs/ac of tributary area. A back-up generator will be required to ensure the operation of the pumping station in the event of power loss. The Drain Commissioner discourages the use of pumped outlets, and will not accept responsibility for damages due to power failure, pump malfunction, or Acts of God that result in storm conditions that exceed the design conditions of the pump station.

G. An agreement for acceptance and maintenance of the detention facility, if executed by the proprietor, shall be submitted to the Tuscola County Drain Commissioner prior to plat approval. The agreement both as form and content shall be subject to the approval of the Drain Commissioner's legal counsel.

H. Under no conditions shall a detention facility be located within the 100-year flood plain of a stream, creek or lake, as determined by the Drain Commissioner.

I. In-line detention (i.e. detention along the drain) will not be permitted unless it can be proven beneficial to the drainage district as a whole.

4.8.1 Detention Basins

A detention basin is a form of detention storage where the stormwater is detained above ground as surface water. Notes and examples of a typical detention basin cross section can be found in Appendix M.

In addition to the general requirements indicated above in Section 4.6, detention basins shall meet the following requirements:

J. Detention volume in a gravity-outlet detention basin must be located:

1. Above the invert of the lowest row of orifices in the outlet standpipe,

2. Above the elevation of the dry weather base flow in the receiving watercourse,

3. Above the elevation of the groundwater table. Soil boring data used to determine the groundwater table elevation shall be submitted with the plans.

K. The detention basin outlet shall consist of a vertical standpipe with multi-level orifices to control the release of stormwater from the basin unless otherwise agreed upon. It shall accommodate the first flush volume, bankfull flood volume, and 100-year flood volume. (See example Standpipe Details in Appendix M.)

1. The standpipe shall not be less than 36 inches in diameter.

2. The standpipe shall contain multiple rows of orifices (i.e. holes) to control the release of the first flush runoff volume, the bankfull flood volume, and the 100-year flood volume.
   - First flush orifices shall be located at the elevation of the basin floor (or permanent pool water level, if a wet basin),
   - Additional bankfull flood orifices shall be at the elevation of the first flush volume in the basin, where the first flush volume is calculated as the first half inch of runoff over the site, or
     V_{ff} (cf) = 1815 x A(acres) x C, where C is the runoff coefficient
   - Additional 100-year flood control orifices shall be located at the elevation of the bankfull flood volume in the basin, where the bankfull flood volume is calculated as the rainfall from a 1.5-year storm, or
     V_{bf} (cf) = 8170 x A(acres) x C

   To promote improved filtering of runoff sediment from smaller, more frequent storm events, the bankfull flood and first flush volumes shall be based on the developing tributary site area only, and not include off-site tributary area.

3. Orifices should not be less than 1 inch in diameter or greater than 4 inches in diameter.

4. The top of the standpipe shall consist of a grating at or above the design (high) water level to serve as an overflow mechanism, in addition to the overflow spillway/berm.

5. The standpipe shall be encased in stone extending to the design (high) water level to allow for filtering of the stormwater prior to discharge from the basin. The encasement stone size shall be large enough so as not to plug or pass through the orifices in the standpipe.

6. The standpipe shall contain a sediment sump with a depth of at least one foot.

7. Double standpipes (e.g. a 36-inch diameter inner standpipe within a 48-inch diameter outer standpipe) are encouraged. Double standpipes are believed to be less prone to blockages of the control orifices, and therefore require less maintenance. The inner standpipe should contain the appropriate number and configuration of orifices to provide the controlled release of the first flush volume, the bankfull flood volume, and the 100-year flood volume. The outer standpipe should contain at least several times the orifice area as the inner standpipe over the entire height of the standpipe, such that the head loss across the outer standpipe orifices is negligible. (See example Double Standpipe Details in Appendix M.)

8. The outlet pipe extending from the standpipe to the receiving watercourse shall be sized to convey the calculated 10-year peak inflow to the detention basin.

9. The location of the outlet pipe extending downstream of the standpipe shall be indicated on a profile drawing of the receiving watercourse, whether or not the receiving watercourse is an established drain. The receiving watercourse profile shall extend at least from the upstream end of the site to the downstream end of the site.

L. A sediment sump or forebay shall be provided within the basin, below the lowest orifice elevation but above the groundwater table, to provide for sediment accumulation.

1. The volume of the sump shall be equivalent to the first flush volume, or 0.5 inch of runoff over the site area. (Sump Volume, cf = V_{ff} = 1815 x A x C)

2. Appropriate precautions shall be taken to protect public safety and to ensure that the sump does not constitute a nuisance.

M. All detention basins must have standpipe overflow grates and spillways berms for emergency overflow at the high water level.

1. The standpipe overflow grate and spillway must provide adequate capacity to overflow the peak 10-year basin inflow with no more than one foot of head (i.e. water level must not exceed the one foot of freeboard).

2. Downstream of the overflow spillway, the stormwater overflow must be directed (either by overland flow or via a swale or ditch) to the receiving watercourse.

N. A minimum of one-foot freeboard shall be provided above the design high water elevation.

O. The side slopes shall not be steeper than 6 ft. horizontal to 1 ft. vertical. Slope protection shall be provided as necessary. Basin side slope elevation contours shall be shown on the plans.

P. Unless the detention basin contains a permanent pool, the bottom of all detention basins shall be graded in such a manner as to provide positive flow to the outlet. A minimum bottom slope of 1% should be provided.

Q. A 12-ft. wide minimum access easement shall be provided for all detention basins, as measured from the top of bank.

R. A 25-ft. wide minimum setback from property lines shall be provided for all detention basins, as measured from the top of bank.

S. Detention basin configurations where stormwater must "back-up" into the basin (i.e. stormwater enters the conveyance system downstream of the basin) will not be permitted.

T. Multiple detention basins serving a single development should function independently. If the outflow from one basin passes through another basin before being discharged to the receiving watercourse, a full hydraulic analysis (i.e. a computer model simulation) will be required to ensure that the system functions satisfactorily.

U. If at any time the detention basin is to function as a sediment basin (for use during the construction phase), an outlet filter shall be provided. Such an outlet filter is to be designed in accordance with criteria established by the Tuscola County Department of Public Health for Soil Erosion and Sedimentation Control. Such use of a detention pond shall be considered a temporary measure only. The proprietor shall be responsible for sediment removal upon completion of construction.

V. Detention basins shall meet all local ordinances and/or requirements for "ponds."

4.8.2 Underground Storage

Underground storage is a form of detention storage where the stormwater is detained in underground pipes. Like a detention basin, the water is released at a controlled rate to a receiving watercourse.

In addition to the general requirements indicated above in Section 4.6, underground detention facilities shall meet the following requirements:

A. Detention volume in an underground detention facility shall be located above the elevation of the dry weather baseflow in the receiving watercourse and above the elevation of the groundwater table. Soil boring data used to determine the groundwater table shall be submitted with the plans.

B. To minimize sedimentation in the downstream drainage district, sediment shall be removed from the stormwater before water enters the underground storage facility (e.g. in first flush forebay or within the catch basins using removable filtration inserts).

C. The pipe material used for the underground storage facility shall have an expected life of at least 50 years.

D. Access manholes shall be provided along the underground storage facility to allow for maintenance.

E. A minimum of one foot of freeboard shall be provided between the design hydraulic grade line in the underground storage facility and the rim elevations of all access manholes.

F. A 25-ft. wide setback from property lines shall be provided for all underground storage facilities.

G. An access easement shall be provided to and above the underground storage facility.

H. No permanent structures shall be constructed above the underground storage facility.

4.9 Retention Basins

A "Retention Basin" is a facility with no engineered outlet (other than an emergency-type outlet) designed to hold runoff for a considerable length of time. The water in a retention basin is not discharged to a natural watercourse, although it may be consumed by plants, evaporate, or infiltrate into the ground. A Retention Basin should not be confused with a "Detention Basin," a facility designed to detain runoff for a short period of time and then release it to a watercourse.

A. On-site retention (or detention – See section 4.8 Detention Storage Facilities) is required of all new developments or redevelopments to prevent an increase in peak flows downstream in the drainage district.

   1. Retention basins are an acceptable stormwater management practice on sites where the soil has an infiltration rate of at least 0.52 inches per hour and a clay content of less than 30% (per recommendations in *Guidebook of Best Management Practices for Michigan Watersheds*). The required storage volume of a retention basin is that of the runoff from a 100-year design storm as determined using the SCS Method. On sites with soils having a lower infiltration rate and/or higher clay content, the Drain Commissioner may allow retention basins with storage volume for the runoff from two consecutive 100-year design storms.

   2. Retention basins shall accommodate runoff from off-site areas that drain onto/across the developing site. (An exception to this rule would be if off-site runoff were to be routed around the site to a receiving watercourse, if done in a manner such that runoff from the developing site would not contribute to this off-site flow. If the off-site flow were to be concentrated from overland flow to a point discharge into an receiving watercourse without valid rights-of-way, written agreement from the affected property

owners would have to be obtained per Common Law Natural Flow Rights and the Michigan Drain Code.)

B. One foot of freeboard shall be provided above the design high water elevation.

C. Retention volume must be provided above the elevation of the groundwater table. Soil boring data used to determine the groundwater table elevation shall be submitted with the plans.

D. All retention basins must have a spillway for emergency overflow at the high water level.

1. The spillway must provide adequate capacity to overflow the peak 10-year basin inflow with no more than two feet of head (i.e. water level must not exceed the two feet of freeboard).
2. The plans must identify where the overflow would be directed to flow or stored in the event of an overflow.

E. The side slopes shall not be steeper than 6 ft. horizontal to 1 ft. vertical unless fenced in accordance with local township or city requirements. Slope protection shall be provided as necessary. Basin side slope elevation contours shall be shown on the plans.

F. A 12-ft. wide access easement shall be provided to and around all retention basins.

G. An agreement for acceptance and maintenance of the retention basin system, if executed by the proprietor, shall be submitted to the Tuscola County Drain Commissioner prior to plat approval. The agreement both as form and content shall be subject to the approval of the Drain Commissioner's legal counsel.

H. If at any time during the construction period the retention basin is to function as a sediment basin, the proprietor shall be responsible for sediment removal prior to completion of construction. (See Tuscola County Department of Public Health for requirements regarding Soil Erosion and Sedimentation Control during construction.)

I. Under no conditions shall a retention basin be located within the flood plain of a stream, creek or lake.

4.10 Wetlands and Low Lying Areas

A. In order to help in analyzing site hydrology and the pre-development runoff rate, soil types, the normal groundwater table, and an accurate delineation of wetlands must be provided as part of preliminary plats/plans. The Drain Commissioner may require confirmation of the absence or presence of regulated wetlands from the Michigan Department of Environment, Great Lakes, and Energy (EGLE) through its wetland assessment program. Construction activities to be performed within a regulated wetland may require a permit from the EGLE and/or local municipalities.

B. Any regulated wetlands or other wetlands that will be part of the drainage system shall be designated as a common area and placed within a conservation easement.

C. If existing wetlands or low lying areas are to be used for stormwater storage, all requirements under either section 4.8.1 Detention Basins or section 4.9 Retention Basins would apply, depending on whether the wetlands/area would have an outlet.

D. If any disturbed or impervious surfaces will drain into an existing wetland or low lying area, calculations may be required to be submitted indicating that the wetland will accommodate runoff from a 100-year design storm without exceeding the finished grade elevation of any adjacent existing or proposed structure.

E. If a wetland will be used for stormwater storage, a sediment forebay shall be provided upstream of the wetlands to reduce the stormwater velocity and encourage sedimentation. Additionally, a permit from the EGLE and/or local municipalities may be required.

4.11 Oil Separators

A. Oil must be removed from stormwater as appropriate prior to discharge to a receiving watercourse. Examples of acceptable Best Management Practices for low oil applications and for high oil applications can be found in Appendix M. The Drain Commissioner will consider other means of oil removal on a case-by-case basis.

4.12 First Flush Basins and Sediment Collection Units

Stand-alone, permanent first flush basins and prefabricated sediment collection units are stormwater Best Management Practices not generally required for developments by the Drain Commissioner. However, when such BMPs are proposed or required for a specific site, the following design standards shall apply:

A. A first flush basin or pre-fabricated sediment collection unit shall contain storage volume for the first 0.5-inch of runoff from the on-site impervious tributary area. The storage volume of a first flush basin can be calculated as:

$$V_{ff}\,(cf) = A \times C \times 1815\ cf/ac\text{-}impervious$$

B. The outlet of a first flush basin or sediment collection unit shall be designed to release the first flush volume over 24-36 hours.

C. The outlet of a first flush basin or sediment collection unit shall not be submerged by the receiving watercourse at a 10-year design level.

D. The first flush basin or sediment collection unit shall contain a bypass structure and/or berm to allow the 10-year peak flow to bypass without hydraulic interference.

4.13 Design Reference Material

Additional material regarding stormwater design can be obtained from the sources below.

http://www.semcog.org/uploadedfiles/Programs_and_Projects/Water/Stormwater/LID/LID_Manual_chapter2.pdf

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: MI
http://hdsc.nws.noaa.gov/hdsc/pfds/

Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act, EPA 841-B-09-001 December 2009
Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects under Section 438 of the Energy Independence and Security Act (epa.gov)
Claytor, R. and T. Schueler. December 1996. Design of Stormwater Filtering Systems. The Center for Watershed Protection. Ellicott City, MD.

Livingston, E.H., H.E. Shaver, J.J. Skupien and R.R. Horner. August 1997. Operation, Maintenance, & Management of Stormwater Management Systems. In cooperation with U.S. Environmental Protection Agency. Watershed Management Institute. Crawfordville, FL.

Schueler, Thomas R. and Richard A. Claytor. 2000. Maryland Stormwater Design Manual. Maryland Department of the Environment. Baltimore, MD.

APPENDIX A

APPLICATION FOR DRAIN COMMISSIONER REVIEW

Application for Drain Commissioner Review

TUSCOLA COUNTY DRAIN COMMISSIONER
125 W. Lincoln St., Caro, Michigan 48723

The undersigned hereby requests the Tuscola County Drain Commissioner review plans for:

_____
Name of project

Please indicate the type of development or construction activity for which plans are being submitted for review:

- **Platted Subdivision** (Pursuant to Land Division Act, Act No. 288 of 1967, as amended, M.C.L. §§ 560.101 – 560.293)
  ___ Pre-preliminary Plat
  ___ Preliminary Plat
  ___ Construction Plans
  ___ Final Plat

Is a Drainage Permit required? _____ Yes _____ No (Check one)

- **Condominium Development** (Pursuant to Condominium Act, Act No. 59 of 1978, as amended, M.C.L. §§ 559.101 – 559.276; the general authority of Drain Commissioners under the Drain Code including Drain Code Sections 425 and 433; and Local Ordinances)
  ___ Preliminary Plans
  ___ Master Deed
  ___ Construction Plans

Is a Drainage Permit required? _____ Yes _____ No (Check one)

- **Private Road or Land Split Development** (Pursuant to the general authority of Drain Commissioners under the Drain Code, including Michigan Drain Code Sections 425 and 433, and Local Ordinances)
  ___ Preliminary Plans
  ___ Construction Plans

Is a Drainage Permit required? _____ Yes _____ No (Check one)

- **Manufactured Housing Community / Mobile Home Park** (Pursuant to Mobile Home Commission Act, Act No. 96 of 1987, as amended, and the general authority of Drain Commissioners under the Drain Code, including Drain Code Sections 425 and 433)
  ___ Preliminary Plans
  ___ Construction Plans

Is a Drainage Permit required? _____ Yes _____ No (Check one)

- **Commercial or Industrial Development** (Pursuant to the general authority of Drain Commissioners under the Drain Code, including Drain Code Sections 425 and 433, and Local Ordinances)
  ___ Preliminary Plans
  ___ Construction Plans

Is a Drainage Permit required? _____ Yes _____ No (Check one)

- **Direct or Indirect Discharge to an Established Drain** (Pursuant to the general authority of Drain Commissioners under the Drain Code, including Drain Code Sections 425 and 433, and Local Ordinances)
  ___ Application for Drainage Permit

- **Drain Widening, Deepening, or Relocation** (Pursuant to the general authority of Drain Commissioners under the Drain Code, including Drain Code Sections 425 and 433, and Local Ordinances)
  ___ Application for Drainage Permit

- **Drain Crossings, Culverts, Tiling, and/or Enclosing an Established Drain** (Pursuant to the general authority of Drain Commissioners under the Drain Code, including Drain Code Sections 425 and 433, and Local Ordinances)
  ___ Application for Drainage Permit

- **Adding or Subtracting Land to/from a Drainage District and/or Construction of a Drain for Ascription as an Established Drain** (Pursuant to the general authority of Drain Commissioners under the Drain Code, including Drain Code Sections 425 and 433, and Local Ordinances)
  ___ Draft Section 433 Agreement

Attached are initial review fees in the amount of: _____
(See Review & Permit Fees Schedule)

I hereby grant permission to the Drain Commissioner, his employees, agents, or consultants, to enter and inspect the site under review. I am the owner of the property or the owner's agent and am authorized to grant this permission. ***I also understand and agree that I am obligated to and will reimburse the Tuscola County Drain Commissioner for all out-of-pocket consulting, engineering, site inspection, administration, and/or legal expenses incurred by the Commissioner in connection with review of this site and plans.***

_____ _____
Signature Date

_____ _____
Name printed Date

Send copies of reviews to:

_____ _____
Name Name

_____ _____
Address Address

_____ _____

_____ _____

APPENDIX B

REVIEW & PERMIT FEES

TUSCOLA COUNTY DRAIN COMMISSIONER

REVIEW & PERMIT FEES

Initial Fees Due with Application

Pre-preliminary Plat Review	$ 100
Preliminary Plat or Site Plan Review	$ 550
Construction Plan Review (Stormwater Facilities)	Hourly per Engineer Rate
Final Plat Inspection and Review:	$ 500
Re-submittal Review Fees:	50% of Initial Fees
Drainage Permit–Development/Construction Activities, Direct/Indirect Discharge, Widening/Deepening/Relocation, Residential, Agricultural, Utility Crossing	$500
Inspection Fees:	$ 180/hour

In addition to these fees, there may also be additional costs if engineering review is extended for resubmittals or the project requires the relocation, clean-out, tiling, enclosure, extension or establishment of a county drain, pursuant to Sections 425 or 433 of the Michigan Drain Code. The fee schedule should be reviewed by the Drain Commissioner and evaluated annually and adjusted for inflation.

APPENDIX C

DRAINAGE PERMIT:
APPLICATION DETAILS AND PERMIT AUTHORIZING DEVELOPMENT OR CONSTRUCTION ACTIVITIES AFFECTING DRAINGE PURSUANT TO SECTION 2.0 OF RULES OF THE TUSCOLA COUNTY DRAIN COMMISSIONER

Tuscola County Drain Commissioner
125 W. Lincoln Street
Caro, Michigan 48723
Phone: (989) 672-3820

Permit No.: _____

Fee Deposit: _____

DRAINAGE PERMIT
Application and Permit Authorizing Development or Construction Activities Affecting Drainage Pursuant to Section 2.0 Of the Rules of the Tuscola County Drain Commissioner

Pursuant to applicable provisions of the Rules of the Tuscola County Drain Commissioner and the Michigan Drain Code, Public Act No. 40 of 1956, as amended, the undersigned landowner(s) has petitioned the Drain Commissioner (or Drainage Board) for permission to undertake development or construction activities which will affect drainage conditions or drainage patterns within a legally established Drainage District, which would require additional drainage to an established Drain, or which would potentially increase contaminant levels within an established Drain. Such activities include, but are not limited to, tapping into, adding new or additional discharges to, or changing the magnitude, concentration, or frequency of runoff discharges to any established Drain, creek, river, ditch, or other natural watercourse in Tuscola County.

This permit is granted for _____ _____ in accordance with the plans labeled _____ _____ and dated _____, which have been approved by the Drain Commissioner and are hereby made a part of this permit. All underground lines must be buried a minimum of 10 (ten) feet below the bottom and side slopes of the drain unless a written agreement is reached between both parties stating otherwise.

The permitted activity will affect drainage to _____ (drain or watercourse) as part of the _____ Drainage District. The proposed drain is located in the municipality(s) of _____.

1. The undersigned landowner(s), their heirs and assigns, agree to construct and maintain the stormwater facilities so that they function as designed in the approved plans and as approved by the Drain Commissioner or Drainage Board on behalf of the Drainage District.

2. The landowner(s) certify that consent in writing has been obtained from all owners of land to be traversed by the proposed drain, and that they have supplied the Drain Commissioner with true copies of that consent.

3. The undersigned contractor agrees to perform construction in a good workman-like manner according to the approved plans and specifications. The county or inter-county drain shall be restored to the same or better condition as existed prior to construction. Drainage shall be maintained and left unobstructed during construction so as to prevent backing up of water which could cause flooding of other lands.

4. The undersigned contractor agrees to notify the Drain Commissioner at least 48 hours prior to the beginning of the construction performed under this permit so that the Drain Commissioner may have an inspector present during construction.

5. The landowner(s) or contractor agree to pay all costs to the Drain Commissioner for review of the plans and issuance of permit, including engineering fees, legal fees, and inspection fees. Inspection fees will be charged at the rate of _____ per hour. An estimate for fees and costs, based on the complexity of the project, shall be deposited with the Drain Commissioner in the amount noted at the top of this form. This deposit is non-refundable if the contractor fails to give notice prior to construction as required above.

6. The landowner(s) and contractor agree to repair any damage they might cause to the county or inter-county drain as a result of this construction. The Drainage District, Drainage Board, Drain Commissioner and Tuscola County shall be kept free and harmless by the landowner and contractor from all loss, cost, or damage sustained by any person or property as a result of operations performed under this permit.

7. This permit does not relieve the landowner(s) or contractor of responsibility to secure any additional local, state, or federal permits required and to meet any other permit requirements of law or other public bodies or agencies.

8. This permit is subject to additional terms and conditions as follows: _____

_____

_____

_____

Signed by:

_____	_____
Landowner or authorized agent signature	Contractor signature
_____	_____
Name printed	Name printed
_____	_____
Address	Address
_____	_____
City	City
_____	_____
Phone number	Phone number
_____	_____
Date	Date

Permit Issued by Tuscola County Drain Commissioner on: _____

_____

Signature

_____

Title

APPLICATION FEE: $ 350 PER LOCATION **A deposit of $2,500.00 shall be placed with the Drain Commissioner prior to the commencement of the Work. Additional inspection fees may be required. Any unused deposit will be returned to Permittee/Owner after fulfillment of all Permit requirements.**	Tuscola County Drain Commissioner 125 W. Lincoln Street, Suite 100 Caro, MI 48723 (989) 672-3820

APPLICATION FOR UTILITY WORK IN A COUNTY DRAIN AND/OR COUNTY DRAIN EASEMENT

PROJECT INFORMATION

PROJECT NAME:_____

PROJECT ADDRESS:_____

MAJOR CROSSROADS:_____

TOWNSHIP/CITY/VILLAGE:_____ PARCEL ID#(s):_____

DRAIN NAME:_____

PROJECT DESCRIPTION:_____

_____

The application must be accompanied by a parcel legal description and a set of site plans showing the drain, the drain easement, and the proposed crossing, encroachment or connection. The plans shall include a detailed, scaled plan, profile, and sectional view of the drain at the crossing, connection and/or encroachment and for the full width of the easement. Plans must be sealed by a professional engineer licensed in the State of Michigan.

APPLICANT INFORMATION

CONTACT NAME:_____ COMPANY NAME:_____

CONTACT ADDRESS:_____

PHONE:_____ CELL:_____ EMAIL:_____

ENGINEER INFORMATION

ENGINEER NAME:_____ COMPANY NAME:_____

CONTACT ADDRESS:_____

PHONE:_____ CELL:_____ EMAIL:_____

CONTRACTOR INFORMATION

CONTACT NAME:_____ COMPANY NAME:_____

CONTACT ADDRESS:_____

PHONE:_____ CELL:_____ EMAIL:_____

I, the undersigned, in applying for a permit for utility work in a county drain and/or county drain easement, agree to abide by the terms and conditions outlined in the Permit, and certify that I have legal authority to place the Utility in the proposed location for which the Permit will serve/or I am the Permittee's authorized agent.

Applicant/Owner Signature:_____ Date:_____

OFFICE OF THE TUSCOLA COUNTY DRAIN COMMISSIONER
125 W. Lincoln Street, Suite 100, Caro, MI 48723 (989) 672-3820

PERMIT FOR UTILITY WORK IN COUNTY DRAIN AND/OR COUNTY DRAIN EASEMENT

NAME OF DRAIN					
PERMIT NUMBER		DATE ISSUED		CONSTRUCTION EXPIRATION DATE	
TOWNSHIP/CITY/ VILLAGE		SECTION		PARCEL ID AFFECTED	
APPLICATION DATE		FEE AMOUNT		RECEIPT #	

AUTHORITY IS HEREBY GRANTED TO:

OWNER:		**Contractor Engineers**	

SCOPE OF WORK SUMMARY:

APPROVED PLAN REFERENCE:

WORK TO BE DONE UNDER AUTHORITY OF THIS PERMIT IS SUBJECT TO THE FOLLOWING CONDITIONS:

1. Permittee/Owner agrees that Work shall not commence on the Drain or in the Drain Easement without prior notice of at least three (3) business days to the Tuscola County Drain Commissioner's Office.
2. Permittee/Owner shall not commence the Work within the Drain without a Tuscola County Drain Office inspector present. Permittee/Owner is responsible for all costs incurred by the Drain Commissioner for the inspection.
3. Permittee/Owner shall post at the entrance of the work site, a copy of the issued Permit, which shall be available for inspection at all times during the course of the work on the Drain or within the Drain Easement.
4. Permittee/Owner agrees to provide the Drain Commissioner with one copy of *as-built drawings* of the Work performed on the Drain and in the Drain Easement within 30 days after the Work in this Permit is completed. The as-built drawings shall be sealed by a professional engineer licensed in the State of Michigan, and shall indicate location and elevations of any Drain crossings, show the Drain Easement, and all other relevant information for the authorized encroachment of the Drain Easement. The as-built drawings shall be submitted on paper and in digital format (CD/AutoCAD). If Permittee/Owner fails to provide the as-built drawings within the required time, the Drainage District is authorized to have the as-built drawings prepared, and the Permittee/Owner agrees to be responsible for all costs involved.
5. Permittee/Owner agrees to hold harmless, indemnify and pay the reasonable costs to defend the Drainage District, the Drain Commissioner and their agents, employees and/or contractors from any and all actual damages arising out of the Work and the existence of the Utility in within the Drain Easement and any and all actual damages or claims for damages to person or property arising from the Work on and/or use of the Utility in the Drain Easement.
6. Permittee/Owner shall be responsible for payment of any and all reasonable and necessary application fees, together with any and all reasonable and necessary costs incurred by the Drainage District arising from this Permit, including, but not limited to, engineering, inspection, legal, enforcement and administrative fees, incurred in the preparation of this Permit, and any services rendered attendant thereto. Payment shall be due upon receipt of invoices.
7. ***This Permit does not waive the necessity for obtaining all other required federal, state, or local permits, and specifically includes any Soil Erosion and Sedimentation Control permits issued by Tuscola County. A copy of all permits relating to activities in the Drain or Drain Easement shall be provided to the Drain Commissioner by Permittee/Owner.***

8. ***Specific conditions to the Permit include the following:***

   A. Permittee/Owner will install proposed utility 10' below the sideslope and hardpan bottom of an open drain and/or 10' below the bottom of a culvert or tile drain.

   B. All old lines need to be removed.

   C. All construction work and restoration shall meet the soil erosion and sedimentation requirements of the TCDC. All work shall be done in accordance with the Michigan Association of County Drain Commissioner's Soil Erosion and Sedimentation Control, Authorized Public Agency Procedures Manual.

   D. Restoration of open drains shall be done using non-woven filter fabric and plain stone rip-rap stone to protect the trench from erosion. Rip rap shall meet MDOT specifications.

   E. All overhead transmission lines shall have a minimum clearance of 14' from top of ground.

   F. As a general rule, no poles or guy wires are allowed within the Drain Easement. At the Drain Commissioner's discretion, if a pole or poles are allowed within the Drain Easement pursuant to this Permit, such pole(s) and any guy wires and guy wire anchors must be at least 25' from the top of the existing drain bank or at least 25' from the culvert or tile drain, and such dimensions shall be shown on the plans of the proposed Work.

9. Permittee/Owner shall contact Michigan MISS DIG SYSTEM prior to the commencement of Work. Permittee/Owner shall follow all MISS DIG SYSTEM requirements in performing the Work. The MISS DIG SYSTEM date of call and docket number shall be furnished to the Drain Commissioner's Office before any work commences.

10. There is to be no obstruction of flow of water in the Drain as defined in Sections 421 and 422 of the Drain Code, MCL 280.421 and 280.422, during performance of the Work unless specifically authorized by the Drainage District in writing consistent with the approvals granted under this Permit.

11. Permittee/Owner shall not make any other improvements, or perform any other activities, on the Drain or in the Drain Easements outside the Work that is specified in this Permit without the prior written consent of the Drain Commissioner.

12. Permittee/Owner shall furnish the Drainage District with evidence of liability insurance in the amount of at least One Million Dollars ($1,000,000.00) per occurrence covering the Work performed by Permittee/Owner under this Permit, which may be accomplished by way of excess or umbrella policies. The insurance shall be written by a company rated by A.M. Best Company requiring an "A-" or better rating. The Certificate of Insurance shall be provided to the Drain Commissioner before the commencement of any Work. The insurance policy shall provide for a ten (10) day "Prior Notice Termination" provision in favor of the Drainage District. The Drainage District, the Tuscola County Drain Commissioner, and Tuscola County shall be named as additional insureds on the policy. Such insurance may be only be terminated upon written approval of the Drain Commissioner as provided in this Agreement.

13. Permittee/Owner agrees that should the Drain require maintenance or improvement in the future that requires the relocation of the Utility within the Drain or the Drain Easement, the Utility shall be relocated in a timely manner upon the written request of the Drain Commissioner at the sole cost of Permittee/Owner, unless the Permittee/Owner and the Drain Commissioner otherwise agreed to in writing. The Permittee/Owner shall pay for all additional costs incurred by the Drainage District for the maintenance and improvement of the Drain as a result of the Utility's location within the Drain and/or Drain Easement.

14. This Permit is binding on Permittee/Owner, its heirs, assigns, and successors in interest. Written notification of any assignment of the authorizations provided in this Permit must be provided to the Drain Commissioner. This Permit is not assignable without the written consent of the Drain Commissioner, which consent shall not be unreasonably withheld.

15. Violation of any of these specified terms and conditions shall constitute a breach of this Permit to which the Drainage District and/or the Drain Commissioner may direct the relocation or reconstruction of the Work within the Drain Easement to comply with the terms of this Permit, with all reasonable and necessary costs, including but not limited to construction, engineering, legal, inspection and enforcement, to be paid by Permittee/Owner.

16. The commencement of the Work under this Permit shall constitute an acceptance by Permittee/Owner of the terms and conditions set forth in this Permit.

Applicant/Owner signature:

DATE	DARA HOOD, DRAIN COMMISSIONER

APPENDIX D

SECTION 433 AGREEMENT APPLICATION: APPLICATION TO ADD/SUBTRACT LAND TO/FROM A DRAINAGE DISTRICT

AGREEMENT TO ADD LANDS TO THE DRAINAGE DISTRICT PURSUANT TO SECTION 433 OF THE MICHIGAN DRAIN CODE

_____ Drain Drainage District, Tuscola County

This instrument made and entered into this ____ day of _____, _____, by and between _____, Tuscola County Drain Commissioner (herein "Drain Commissioner"), 125 W. Lincoln Street Caro, Michigan 48723 acting for and on behalf of the _____ Drain Drainage District, a public body corporate (hereinafter "Drainage District") and _____, of _____, landowners and developers, (herein "Developer").

WITNESSETH:

WHEREAS, the Drainage District, pursuant to the Michigan Drain Code (Act 40 of the Public Acts of 1956, as amended), is an established body corporate under the jurisdiction of the Drain Commissioner, in the County of Tuscola and State of Michigan;

WHEREAS, the Developer, pursuant to Section 433 of the Michigan Drain Code wishes to add lands to the Drainage District as part of the _____;

WHEREAS, those lands are described as follows:

(See Exhibits _____ attached)

WHEREAS, stormwater drainage facilities have been constructed to service those lands as part of the _____;

WHEREAS, pursuant to Section 433, the Developer has obtained at his/her own expense a certificate from a registered professional engineer satisfactory to the first party, to the effect that the lands to be added naturally drain into the area served by the existing drain or that the existing drain is the only reasonably available outlet for the drainage from the lands to be added and that there is existing capacity in the existing drain to serve the lands to be added without detriment to or diminution of the drainage service provided or to be provided, in the foreseeable future, to the area in the existing drainage district.

NOW, THEREFORE, the parties agree as follows:

1. The lands described above shall be added to the drainage district and shall be from this date forward liable for their apportioned share of maintenance, inspection and repair assessments for the _____ Drain as well as assessments on any county or intercounty drain providing outlet benefits to the added lands.

2. The Developer shall pay or has paid the cost of the drainage facilities and the cost of engineering, inspection, administration, and legal expenses incurred by the drain commissioner, pursuant to Section 433.

3. This Agreement shall become effective upon its execution by the parties and shall be binding upon the successors and assigns of each party.

IN WITNESS WHEREOF, the parties hereto have caused this Agreement to be executed by their duly authorized officers.

Witnessed:

_____ _____
By:
_____ Its:

Subscribed and sworn to before me this
_____ day of _____, _____.

_____

Notary Public, Tuscola County, MI
Acting in Tuscola County, Michigan
My commission expires:

_____ Drainage District
Witnessed: Drain Commissioner

_____ _____
By: _____, Tuscola County
Drain Commissioner

_____

Subscribed and sworn to before me this
_____ day of _____, _____.

_____

Notary Public, Tuscola County, MI
Acting in Tuscola County, Michigan
My commission expires:

Drafted by and return to:

Tuscola County Drain Commissioner
125 W. Lincoln Street
Caro, MI 48723

Engineer's Certification

A sample certification letter is displaced below. This certification shall be recorded with the 433-agreement:

Date

Tuscola County Drain Commissioner 125 W. Lincoln St, Caro, MI 48723

RE: Plat Name

"I,_____ , a Licensed Professional Engineer in the State of Michigan, certify that:

1 The lands to be developed naturally drain into the area served by the existing drain, or that the existing drain is the only reasonably available outlet for the drainage from the lands to be developed.

2 There is adequate capacity in the existing drain to service lands to be developed without detriment or diminution of drainage service provided or to be provided in the foreseeable future to the area in the proposed district.

_____, P.E.

Registration No. _____

APPENDIX E

EXAMPLE PERMIT STATUS TABLE

Example Permit Status Table

Permit	Agency	Reason for Permit	Application Date	Date Issued
Soil Erosion Control Permit	SAFEBuilt, LLC	Soil to be disturbed during construction activities	4/10/25	5/5/25
Road Commission Permit	TUSCOLA Road Commission	Public roads proposed	4/15/25	5/10/25
Inland Lakes and Streams Permit	EGLE/Army Corp.	Proposed culvert has more than 2 square miles tributary area	5/25/25	6/15/25
Wetlands Permit	EGLE/Army Corp.	Construction of parking lot will disturb existing wetlands	5/25/25	6/15/25
Drainage Permit	TUSCOLA Drain Commissioner	Proposed discharge of flow to established drain	4/20/25	
Drainage Permit	TUSCOLA Drain Commissioner	Proposed culvert crossing on established drain	4/20/25	
NPDES Phase II Permit	EGLE	More than 1 acre to be disturbed during construction	4/15/25	
MDOT Permit	MDOT	Proposed driveway construction in MDOT R.O.W.	4/30/25	

APPENDIX F
PRELIMINARY PLAT/PLAN REQUIRED ITEM CHECKLIST

DEVELOPMENT NAME: _____ DATE: _____

LOCATION: _____ REVIEWED BY: _____

CHECKLIST FOR PRELIMINARY PLATS/PLANS

The following information shall be included on all Preliminary Plats and Plans submitted for approval by the Tuscola County Drain Commissioner.

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
1.	Plat Name (e.g. Preliminary Plat of "Residential Hills"	_____	_____	_____	_____
2.	Description of Location (Including Section and fractional portion thereof, Town and Range designation, Township or City of Tuscola County, Michigan)	_____	_____	_____	_____
3.	Location Map	_____	_____	_____	_____
4.	Name, Address and Telephone No. of proprietor	_____	_____	_____	_____
5.	Name, Address and Telephone No. of Engineer/Surveyor	_____	_____	_____	_____
6.	Scale not smaller than 1"=100'	_____	_____	_____	_____
7.	Engineer's Seal, all sheets	_____	_____	_____	_____
8.	Tentative approval of Governing Body	_____	_____	_____	_____
9.	North Arrow and Scale	_____	_____	_____	_____
10.	Bar Scale	_____	_____	_____	_____
11.	USGS Benchmark Description	_____	_____	_____	_____
12.	Legend	_____	_____	_____	_____
13.	Typical Road cross-section (Label road as "Public Road" or "Private Road")	_____	_____	_____	_____
14.	Lot Square Footage (Minimum)	_____	_____	_____	_____

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
15.	Proposed Improvements				
16.	Plat Boundary				
17.	Identification of all adjoining parcels (For subdivisions show Lot Number, Subdivision Name, Liber & Page Numbers. For acreage parcels, show Tax roll number & proprietor name.)				
18.	Existing Buildings (Label those under construction with address)				
19.	Existing Roads (w/Name, R.O.W. width and width and type of surface.)				
20.	Proposed Roads (with Names and R.O.W. widths)				
21.	Property Description Metes & Bounds (w/Ties to government corner.)				
22.	Lot Dimensions				
23.	Lot Numbers				
24.	Building Setback Lines				
25.	Typical Lot Grading Plan Detail or Statement				
26.	Minimum House Grade for Each Lot				
27.	Basement Elevations for Each Lot				
28.	Soil Boring Logs and Locations (to include ground elevation at each boring log and water table information.) Logs from site report prepared for Dept of Health are acceptable.				
29.	Existing Contours				
30.	Easements (w/dimensions, utility and existing drain easements.)				

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
31.	Identification of entity to assume ownership of drainage system (including detention facilities)				
32.	Off-site watershed areas and/or drainage district (w/boundaries and acreages to be shown on Location Map)				
33.	All existing drainage courses and structures (w/proper labeling as to type, size, and invert elevations.)				
34.	Flood Plain Contour (Existing or Proposed)				
35.	Boundaries and acreages of tributary areas of all proposed and existing inlets, catch basins and culverts.				
36.	Proposed drainage system (Clearly identify all open and enclosed portions.)				
37.	Proposed Drainage Easements				
38.	Intercepting Swales – Easements				
39.	Established Drains (permit required to tap)				
40.	Off-site Drain Easements/ ROWs				
41.	If established drain involved, note that "All work... in accordance with... Rules."				
42.	Wetlands delineated				
43.	Floodplains				
44.	Proposed stormwater detention/retention basins				
45.	Receiving watercourse(s) identified				

APPENDIX G

CONSTRUCTION PLAN REQUIRED ITEM CHECKLIST

DEVELOPMENT NAME: _____ DATE: _____

LOCATION: _____ REVIEWED BY: _____

CHECKLIST FOR CONSTRUCTION PLANS

The following information shall be included on/with all Construction Plans submitted for approval by the Tuscola County Drain Commissioner.

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
1.	Approved Preliminary Plat included OR plans also conform to Preliminary Plat Checklist (submit Preliminary Plat Checklist)	_____	_____	_____	_____
2.	Agreement re: maintenance of stormwater management facilities (including existing watercourses)	_____	_____	_____	_____
3.	Permit Status Table	_____	_____	_____	_____
4.	Engineer's Seal on all sheets	_____	_____	_____	_____
5.	Drainage systems for prior phases	_____	_____	_____	_____
6.	Delineated catchment areas for each catch basin/inlet	_____	_____	_____	_____
7.	Proposed and existing topographic contour lines	_____	_____	_____	_____
8.	Existing watercourses shown	_____	_____	_____	_____
9.	Proposed minimum finish floor or finish basement elevations	_____	_____	_____	_____
10.	Plans and profiles of established drain(s), including base flow profile and basin outlet(s)	_____	_____	_____	_____
11.	Existing and proposed drain easements with widths labeled	_____	_____	_____	_____
12.	Drain easement cut/fill volume table	_____	_____	_____	_____
13.	Note: "All work performed in the right-of-way of an established drain shall be in accordance with Drain Commissioner's rules."	_____	_____	_____	_____
14.	Drain re-stabilization	_____	_____	_____	_____

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
15.	Off-site tributary area included in design, or rerouted				
16.	Storm sewers designed per Rational Method				
17.	Storm sewers designed for 10-year peak flow				
18.	Storm sewers designed using standard intensity equation				
19.	Storm sewer design runoff coefficient reasonable				
20.	Sewer capacities based on Manning equation				
21.	Sewers designed using appropriate Manning n				
22.	Storm sewer capacities meet/exceed design flows				
23.	Sewer slopes meet/exceed minimum slopes				
24.	Storm sewer design velocities acceptable ($2.5 < V < 10$ fps)				
25.	Friction losses based on design flows, not pipe capacities				
26.	Manhole losses included				
27.	Hydraulic grade line assumes receiving water elevation (e.g. full detention basin)				
28.	Hydraulic grade line shown on storm sewer profile				
29.	Hydraulic grade line at least 1 foot below rim elevations				
30.	Manholes and CBs labeled.				
31.	Sewer lengths, diameters, slopes, pipe class identified				
32.	Manholes <400 ft apart (600 ft for sewers over 30-inches)				
33.	Catch basin/inlet spaced for <400 ft roadway or 1 cfs				
34.	Pipe, manholes, catch basins, inlets meet MDOT specs				
35.	No manhole drops over 2 feet				

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
36.	Joints pointed up with mortar for pipes over 30-inch				
37.	Outlets enter receiving watercourse at <90 degrees				
38.	Storm sewer easements shown, min. 40 ft width				
39.	Existing drainage easements shown				
40.	Locations of utilities shown, not in conflict w/ sewers				
41.	Open channels designed for peak flow per Rational Method				
42.	Open channels designed for 10-year peak flow				
43.	Open channels designed using standard intensity eqn.				
44.	Open channel design runoff coefficient reasonable				
45.	Open channel capacities based on Manning equation				
46.	Open channel designed using appropriate Manning n				
47.	Open channel capacities meet/exceed design flows				
48.	Open channel velocities acceptable (2.5 < V < 10 fps)				
49.	Open channel easements shown (50 ft + width)				
50.	Open channel side slopes not steeper than < 1:3				
51.	Culvert designed for appropriate design storm				
52.	Culvert design flow calculated w/ correct method				
53.	Inlet and outlet control nomographs/equations used				
54.	Culvert 10-yr headwater is 1/2 ft above crown elevation roadway/driveway or less				
55.	Culvert 100-yr headwater does not flood structures				
56.	Reasonable tailwater used				

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
57.	Culvert end sections / head-walls / wing walls acceptable				
58.	Culverts labeled "existing" or "proposed"				
59.	Culvert data provided				
60.	Culvert riprap acceptable				
61.	Culverts meet minimum sizes				
62.	Culverts meet MDOT specs				
63.	Detention volume designed for 100-year storm				
64.	Appropriate sizing eqns used				
65.	Detention max outflow <0.15 cfs/ac				
66.	Detention will not increase downstream peak flow				
67.	Detention facility discharges to valid right-of-way				
68.	Off-site acreage included in detention volume calc				
69.	Areas draining unrestricted contain only pervious surface				
70.	Disturbed areas draining unrestricted were deducted from basin outlet design				
71.	Standpipe outlet proposed				
72.	Outlet designed for 100-year flood, bankfull flood, and first flush controlled release				
73.	Standpipe at least 36 in diam with sediment sump				
74.	Standpipe overflow and spillway provided				
75.	Horizontal outlet pipe sized for 10-year peak flow				
76.	Concentrated discharge to valid R.O.W. – or -- agreement with downstream property owners				
77.	Multiple detention basins function independently				
78.	Detention basin bottom slope >1%, or permanent pool				

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
79.	Basin is neither "in-line" nor "back-up" configuration				
80.	Basin outlet is multi-stage for first flush, bankfull flood, and 100-year storm				
81.	If pumped outlet, system curve, pump curves, profile submitted				
82.	If pumped outlet, discharges first flush over 24 hours, bankfull flood over 24-48 hours, and 100-year storm at <0.15 cfs/ac (or pre-dev rate)				
83.	Acceptable maximum release rate?				
84.	Retention basin designed for runoff from appropriate number of 100-year storms				
85.	Basin access easement >12 ft				
86.	Drainage system / basin maintenance agreement				
87.	Basin has adequate freeboard				
88.	12-ft access easement provided around basin				
89.	Basin side slopes <1:6				
90.	Detention not in floodplain				
91.	Storage volume provided above orifices, receiving watercourse baseflow, and groundwater table				
92.	Emergency overflow berm and standpipe grate provided				
93.	Wetlands delineated, in conservation easement				
94.	Drainage into wetland will not raise water surface above structures				
95.	If wetlands to serve as detention/retention, sediment forebay provided				
96.	Oil separator for <1 acre				
97.	Oil separator bypasses 10-year peak flow				

		SHOWN	NOT SHOWN	APPROVED	NOT APPROVED
98.	Oil separator designed -- with 400 cf grit storage -- with >4 ft permanent pool -- with two 6-inch orifices and trash rack -- orifices >4 ft above floor -- with chamber manholes	_____	_____	_____	_____
99.	Oil separator outlet not submerged by receiving watercourse	_____	_____	_____	_____
100.	First flush basin or sediment collector (FFB/SC) has adequate storage volume	_____	_____	_____	_____
101.	FFB/SC will storage time 24-36 hours	_____	_____	_____	_____
102.	FFB/SC bypasses 10-year peak flow	_____	_____	_____	_____
103.	FFB/SC outlet not submerged by receiving watercourse	_____	_____	_____	_____

APPENDIX H

MODEL FORMS OF STORMWATER SYSTEM MAINTENANCE AGREEMENTS

DECLARATION OF DRAINAGE EASEMENT AND DRAINAGE MAINTENANCE AGREEMENT

This declaration made this _____ day of _____, 20__, by _____, whose address is _____ (hereinafter "Developer"), and on behalf of _____, a Homeowner's Association to be formed (hereinafter "Association").

WHEREAS, the Developer is the owner of all legal and equitable interest in the following property located in the Township of _____, County of Tuscola, State of Michigan, (hereinafter "Development") described as:

See legal description attached hereto as Exhibit 1.

WHEREAS, the Developer has divided the Development, known as _____ into Lots for the purpose of residential home sites;

WHEREAS, Developer is constructing a public road on the Development for the purpose of providing ingress and egress to the Lots and is also providing drainage for the Lots;

WHEREAS, the purpose of this declaration is to provide for the development and maintenance of easements and other drainage facilities to provide proper drainage for the Development;

NOW THEREFORE, in consideration of the mutual benefits to be derived by the Developer, its successors and assigns, and all purchasers and future owners of the various Lots comprising the Development, the Developer, for itself, its successors and assigns, does hereby publish, declare and make known to all intending purchasers and future Owners of the Lots comprising the Development, that all Lots in the Development will and shall be used, owned, held and/or sold expressly subject to the following covenants, conditions, restrictions, easements, obligations and special assessments for the development and maintenance of Drainage Easements and Facilities as described in this Agreement.

It is further declared that the Drainage Easements and Facilities described in Exhibit _____ attached hereto, together with the drainage maintenance provisions contained herein shall run with the land and be binding on the Developer and purchasers of all Lots in the Development and their heirs, personal representatives, successors and assigns.

1. **DEFINITION OF TERMS**. The words and phrases following used in this Agreement are defined as follows:

   a. "Agreement" shall mean and refer to this Declaration of Drainage Easement and Drainage Maintenance Agreement as recorded in the Office of the Tuscola County Register of Deeds, State of Michigan;

   b. "Association" shall mean and refer to _____ Homeowners' Association and its successors and assigns;

c. "Developer" shall mean and refer to _____ and its successors and assigns;

d. "Drain Commissioner" shall mean the Tuscola County Drain Commissioner;

e. "Drainage Easements and Facilities" shall mean those areas of land within the Development (including the improvements thereto) now or hereafter owned by the Association or used by the Association or Owners for the drainage purposes as referenced in this Agreement;

f. "Lot" shall mean and refer to any Lot or parcel of land within the Development;

g. "Member" shall mean and refer to those persons entitled to membership in the Association, as provided in this Agreement;

h. "Owner" shall mean and refer to the record owners, whether one or more persons or entities, of the fee simple title to any Lot which is a part of the Development. When more than one person or entity has an interest in the fee simple title to a Lot, the collective interest of all such persons or entities shall be considered to be that of a single Owner for purposes of this Agreement. If any Lot is sold on a land contract, the land contract purchaser shall be considered the Owner. Those persons having any interest in a Lot merely as security for the performance of an obligation are not considered to be Owners.

2. **DRAINAGE EASEMENTS AND FACILITIES.** The Drainage Easements and Facilities subject to this Agreement are shown and described in Exhibit _____, attached hereto. Each purchaser of the Lots in the Development acquires an indivisible property interest to all the above-described Drainage Easements and Facilities for the purpose of constructing, operating, inspecting, maintaining and repairing such Facilities. The financial responsibility for maintenance of the Drainage Easements and Facilities shall be the Association's and be shared by the Owners of all of the Lots in the Development pursuant to the terms of this Agreement, except that minor maintenance of the drainage areas (such as mowing and landscaping along and around the Drainage Easement and Facilities) shall be performed by the Owners of the Lots where the Drainage Easements and Facilities are located. All Owners are deemed to have consented to entry upon their property necessary to construct, inspect and maintain the Drainage Easements and Drainage Facilities. No buildings or permanent structures may be constructed or maintained over or on any easement area subject to this Agreement. This Agreement shall be perpetual and terminable only upon the occurrence of any one of the following events:

(1) The Drainage Easements and Facilities are no longer necessary to service the Development and are abandoned or replaced with the express written permission of the Association and the Drain Commissioner; or

(2) A Municipality or a Governmental Agency with taxing powers expressly assumes, in writing, the responsibility for the operation and maintenance of the Drainage Easements and Facilities; or

(3) A county or intercounty drainage district is established to operate and maintain the facilities and easements in accordance with Act 40 of the Public Acts of 1956, as amended, and the Rules of the Tuscola County Drain Commissioner.

3. **HOMEOWNERS ASSOCIATION.** There is hereby created an Association, which consists of all the Owners of Lots located within the Development and shall be known as the _____ Homeowner's Association. Membership in the Association is mandatory for each Owner. The Owners of each Lot shall have one (1) vote in the Association (i.e., one vote per Lot, regardless of the number of Owners of the Lot). The Association shall annually elect a president, secretary, and treasurer, which together shall constitute the Board of Directors of the Association (hereafter "the Board"). In the event that such officers are not elected, the existing officers may serve until the new elections take place. In the event that an officer dies, resigns, or is unable or unwilling to carry out his/her duties during the year, the remaining offices may appoint a replacement who shall serve until a new officer is elected. The presence of two (2) members of the Board at a meeting shall constitute a quorum. If only two (2) members of the Board are present at a meeting, the affirmative vote of both is required to take action. Upon majority vote of the Owners of all of the lots in the Development (one vote per lot), the Association may choose to convert the Association to a non-profit corporation or limited liability company which shall carry out the same functions as the Association.

a. **ASSOCIATION MEETINGS.** Each year, during the first week of _____ (or such other date as a majority of the Association member shall designate), the Association members shall meet for the purpose of electing a Board of Directors (the "Board") and officers and approving a maintenance program and budge for the coming year for the Drainage Easements and Facilities. An Owner may vote in person or by proxy authorized in writing signed by the lot Owners (or one of them). For purposes of the annual meeting and setting of the budget, it is not necessary that a majority of Owners be present in person or by proxy in order that a valid meeting is held. Owners or proxies representing at least fifty percent (50%) of the Lots in the Development shall constitute a quorum. Questions shall be approved or disapproved by a majority of Owners present in person or by proxy and voting at the annual meeting or any special meeting called for purposes of this Agreement. Written notice of the time and location of the annual meetings shall be provided to all Owners of record in the Development.

Special meetings may be called with ten (10) days prior written notice to all Owners by the President of the Board or upon request of any three (3) Owners representing (3) separate Lots.

Until such time as all of the Lots in the Development have been sold, by the Developer, or sooner if the Developer so chooses, the Developer shall exercise all the powers and duties of the Association and its Board. However, all Owners are entitled to attend the annual meeting and give input into the setting of the forthcoming budget. The Developer may from time tot time designate an agent for the purpose of maintaining and enforcing the Agreement. Appropriate written notice of such designation, or any other

written notice permitted or required by this Agreement, shall be addressed by ordinary mail to each Owner.

The Developer may at any time assign and convey all or part of his rights, powers, privileges and duties, which are reserved to it in this Agreement, to the Association, and upon the execution and filing of the appropriate instruments of assignment, the Association shall thereupon have the right and obligation to exercise all the rights, powers, privileges and duties so assigned by this document to the Developer.

b. **DUTIES: GENERALLY**. The purpose of the Homeowners Association is to manage the Drainage Easements and Facilities in the Development and matters incidental thereto for the benefit of all owners and to enforce these restrictions and any by-laws, rules or regulations the Association may adopt. Adoption of by-laws, rules or regulations shall require the affirmative vote of those owning a majority of the lots in the Development at an annual meeting or a special meeting called for that purpose.

c. **BUDGET**. The Board shall be responsible for drafting a proposed budget for maintenance and repair of Drainage Easements and Facilities for the coming year, if any.

d. **MAINTENANCE AND REPAIR WORK**. The President of the Board shall arrange for such maintenance and repair work as has been approved by the Association. All bills for approved work shall be paid by the treasurer after approval by the officer designated for this purpose by the officers. The budget may include a reserve for future capital expenditures. The Board may authorize above-budget expenditures for emergency maintenance and repairs where the failure to do so would result in a threat to health, human safety, or a risk of financial loss to the Association.

e. **ASSESSMENT**. Each landowner shall pay an annual assessment for the maintenance program required pursuant to Paragraph 3, Subparagraph d. of this Agreement.

f. **ASSESSMENT COLLECTION**. All assessment payments shall be made payable to the Association. Payment is due thirty (30) days after the assessment is mailed by first class ordinary mail. The treasurer shall place all funds collected in the Association account at a federally insured banking institution selected periodically by the Board.

g. **FAILURE TO PAY ASSESSMENT**. If any Owner is in default for any assessment payment of thirty (30) or more days, the Association may bring suit to collect the assessment, together with any costs of collection including reasonable attorney fees. Additionally, the Association may file a lien against the land in the public records and foreclose the lien in the same manner as the enforcement and foreclosure of mortgages in Michigan. For any Lot in the Development whose dues remain unpaid more than four (4) months after the

dues notices are mailed, the delinquent Lot owner shall lose their right to vote as a member of the Association and as a member of the Board until such time as the delinquent dues are paid.

h. **REMEDIES.** By acceptance of title, Owner vests in the Association and/or the Drain Commissioner the right and power to take any legal action which it may deem necessary or advisable to enforce this Agreement or any of its rules or regulations. Upon violation of any restriction or breach of any covenant, the Association and/or the Drain Commissioner may enforce it by a suit for money judgment, by foreclosing of the lien securing payment, or by an action in equity seeking a mandatory injunction. If an Owner is found to be in violation of any of these restrictions, covenants, or any duly adopted rules or regulations of the Associations, the violator agrees to pay the reasonable attorney fees and other costs incurred by the Association and/or the Tuscola County Drain Commissioner in such enforcement action and authorizes the court to enter an order requiring such payment.

In addition to all other remedies, the Association and/or Drain Commissioner may enter upon any land in the Development for purposes of carrying out the provisions of this Agreement and neither the Association nor the Drain Commissioner shall be liable for trespass and shall further be held harmless for any damage or liability occurred thereon as a result of enforcing this Agreement.

The Tuscola County Drain Commissioner shall have the right, but not the obligation, to enforce all provisions of this Agreement and to require appropriate maintenance of and/or improvements to the Drainage Easements and Drainage Facilities referenced in this Agreement if the Developer or the Association fails to adequately maintain the Drainage Easements and Facilities. All costs incurred by the Drain Commissioner, including but not limited to engineering and attorney fees, shall be paid by the Developer, Owners or Association as otherwise provided in this Agreement. Failure of the Drain Commissioner to enforce any covenant or restriction herein contained shall in no event be deemed an estoppel or a waiver of the right to do so thereafter.

4. **HOLD HARMLESS PROVISION.** In addition to the provisions contained above, the Owners of all Lots in the Development agree to hold the Tuscola County Drain Commissioner harmless from any loss, damages or injuries relating to the Drainage Easements and Drainage Facilities in the Development.

5. **SEVERABILITY.** If any section, paragraph, clause or phrase of this Agreement is for any reason held invalid by a court of competent jurisdiction, it is the intent of the undersigned that such decision should not affect the validity of the remaining provisions of the Agreement, which shall be enforced as if the invalid provision did not exist.

6. **RECORDING**. Upon signing, this Agreement shall be immediately recorded at the Tuscola County Register of Deeds office. A true copy of the Agreement, as recorded, shall be provided to the Drain Commissioner.

7. **AMENDMENT**. This Agreement may not be amended without the express written consent of the Tuscola County Drain Commissioner.

Dated this _____ day of _____, _____.

DEVELOPER:

_____

State of Michigan)
) SS:
County of Tuscola)

On this _____ day of _____, 20__, before me personally appeared _____, to me known to be the person described in and who executed the foregoing instrument and acknowledged that he / she / they had authority to execute the foregoing instrument and executed same as his/ her / their free act and deed.

_____

Notary Public, Tuscola County, MI
Acting in Tuscola County, MI
My Commission Expires: _____

Drafted By:

When Recorded Return To:

Example Maintenance Plan and Budget for Development X*

Component	Maintenance Activity	Frequency	Estimated Cost	Annual Budget
Catch Basin Sumps	Inspect for sediment accumulation and debris	Annually	$300	$300
	Remove sediment accumulation and debris	Every 5-10 years	$2,500	$500
Storm Sewers	Inspect for sediment accumulation	Annually	$600	$600
	Remove sediment accumulation	Every 5-10 years	$4,000	$800
	Inspect structural elements and compare to as-built construction plans	Every 5 years	$800	$150
Detention Basin	Mow	At least 3 times/year	$1,500	$1,500
	Inspect for sediment accumulation and debris	Annually	$200	$200
	Remove debris	Annually	$1,000	$1,000
	Remove sediment accumulation	Every 5-10 years	$4,000	$800
	Replace gravel jacket around outlet structure	Every 3-5 years	$1,000	$350
	Inspect emergency overflow for erosion	Annually	$100	$100
	Reestablish as-built overflow elevation	As needed	$1,000 / 5 years	$200
	Inspect banks for erosion	Annually	$100	$100
	Reestablish vegetation on eroded slopes	As needed	$500 / 5 years	$100

Open Channels	Mow	At least 3 times/year	$900	$900
	Inspect for sediment accumulation and debris	Annually	$400	$400
	Remove debris	Annually	$800	$800
	Remove sediment accumulation	Every 5-10 years	$6,000	$1,200
	Inspect banks for erosion	Annually	$100	$100
	Reestablish vegetation on eroded slopes	As needed	$1,500/ 5 years	$300
Record Keeping	Record all inspections and maintenance activities	As performed	$200	$200
	Adjust estimated costs for maintenance activities	Every five years	$100 / 5 years	$20
			Total Annual Budget:	**$10,620**

** Maintenance schedule and budget are for example only. Frequency of maintenance activities and costs will vary for each development.*

APPENDIX I

ENGINEERING STANDARDS

PART 1 – INSTALLATIONS INTO DRAINS

1A - Backfill Around Structures

All backfill placed within 3 feet of manholes, catch basins, inlets and other underground structures shall be of approved sand, placed in 1-foot layers and compacted.

Backfilling is defined as the placement of approved material, by an acceptable method, in the excavation from the top of the bedding or top of cradle, to the proposed ground surface grade.

1. All backfill material shall be free from refuse, vegetable or organic matter, boulders, rocks or stones, or other material which is unsuitable.

3. All excavation shall be backfilled to a point 1 foot above the top of the pipe immediately after installation.

4. Backfill density testing, when required, shall be at the expense of the developer.

Note: For backfill within the ROAD ROW see REQUIREMENTS OF THE TUSCOLA COUNTY ROAD COMMISSION.

1B - Disposal of Excavated Material

Excavated material not suitable for backfill or in excess of the quantity required for backfilling shall be disposed of by the Contractor at his own expense.

1C - Maintenance of Existing Drainage

If it is necessary in the performance of the work to interrupt existing drainage, temporary drainage facilities shall be provided until the existing drainage facilities are restored. Flows in County drains must be maintained at all times during construction.

1D - Manholes, Catch Basins, and Inlets

1. In-Line Manholes:

Diameters shall be as follows:

12-inch to 24-inch pipe	4-foot diameter manhole
30-inch to 42-inch pipe	5-foot diameter manhole
48-inch and Larger	Precast 'T' and Riser Section (Minimum Riser Diameter of 4 feet)

2. Junction Manholes or Manholes at turns:

Shall be 8 feet diameter maximum and have a minimum of 1 foot of wall area between incoming pipes inside the manhole. Structures will be required for Junction Manholes and

Manholes at turns requiring a diameter greater than 8 feet.

3. **Materials for Manholes, Catch Basins, and Inlets**

   a. Water for concrete and mortar shall be clean and fresh, free from oil, acids, and organic matter.

   b. Mortar for laying brick and/or block, for pointing of joints, and for plastering outside of structures shall be composed of 1 part Portland Cement and 2-1/2 parts masonry sand.

1E - Laying of Pipe and Connections

Pipe shall be laid from the lower end of sewer upstream, with the bell end up grade. The use of brick, lumps of clay, wood, etc., to level the pipe will not be permitted. Pipe shall be rammed "home" and if joints do not remain tightly closed or construction is in saturated sand, a cable and winch, or other approved means, shall be used to maintain a tight joint.

All pipe shall be laid to line and grade as called for on the plans using a laser beam and target. Each pipe as laid shall be excavated to provide equal clearance on both sides of the pipe. After the pipe is set, care shall be taken in backfilling so as not to disturb its line or grade. As work progresses, the interior of the pipe shall be thoroughly cleaned.

1. **Outer Diameter Minimum clearance** - A minimum clearance of eighteen (18) inches for an enclosed County drain shall be maintained between the outside diameter of the drain and proposed underground utilities or other underground crossing. Additional clearance may be required.

2. **GPS locations** - (sub-meter accuracy) of all constructed crossings to the County drain must be submitted in an acceptable electronic format.

1F - PIPE REQUIREMENTS

Contractor must supply TUSCOLA COUNTY DRAIN COMMISSIONER with copies of pipe certification slips matching pipe required for contract prior to installing. Refer to TUSCOLA COUNTY DRAIN COMMISSIONER Standard Detail Sheets for additional details.

Reinforced Concrete Pipe (RCP)

a. **All RCP shall be premium joint (rubber gasket)** unless otherwise indicated on the set of drawings approved by TUSCOLA COUNTY DRAIN COMMISSIONER.

b. **All joints in RCP** having a diameter of 36 inches and larger shall be pointed up on the inside with mortar after backfilling and/or grouting has been completed.

c. **Class of the RCP** shall be that indicated on the set of drawings approved by TUSCOLA COUNTY DRAIN COMMISSIONER.

Alternative Pipe Materials -All taps shall be reinforced concrete pipe to ist manhole. All other alternative materials require approval.

1G - Open Drain Taps

a. **Tap invert and orientation:** All taps shall be constructed at the drain invert and perpendicular to the County drain.

b. **Pipe Location:** Pipe shall not extend beyond the intersection of top of pipe and drain bank. (i.e. Pipe shall not be exposed.)

c. **Riprap** shall be placed around the open end section is accordance with TUSCOLA COUNTY DRAIN COMMISSIONER standards.

d. **A manhole is required inside the drain easement line.** No sump allowed

e. **Minimum pipe slope** shall be used for all Taps as defined above.

f. **GPS locations** (sub-meter accuracy) of all constructed taps to the County drain must be submitted in an acceptable electronic format.

1L - Sump Pump Leads to Pipes

a. **Blind taps for sump pump leads** will only be allowed to connect to a County drain pipe section when a manhole, catch basin or inlet does not exist for the area to which the lead will service. Blind taps for sump leads will not be allowed in new developments. Sump pump leads must exit the structure above grade before being buried and continuing on towards its connection with a downstream stormwater feature.

b. **GPS locations** (sub-meter accuracy) of all constructed taps to the County drain must be submitted in an acceptable electronic format.

1M - Crossing a County Drain

1. **Utility Invert Minimum clearance-A minimum clearance of TEN (10) feet must be maintained between the invert of an open County drain and any proposed underground utility or other underground crossing. Additional depth may be required. Crossing Detail.**

PART 2 - DRAIN CONSTRUCTION

2A - Connections to County Drains (Taps)

All taps to a county drain must conform to the TUSCOLA COUNTY DRAIN COMMISSIONER standards and requirements. It is desired that all connections be tapped into a manhole or catch basin. If this is not possible and connection must be made in the main line sewer, a blind tap may be permitted. The following tap requirements include, but are not limited to, the following:

2A1 - Blind Taps

All taps to county drains must be connected with reinforced concrete pipe, unless an alternative pipe material is approved by the TUSCOLA COUNTY DRAIN COMMISSIONER.

a. **No tap is allowed at a pipe joint.**

b. **No jackhammer or sledge hammer** shall be used for the tap until a diameter has been established with a star drill or concrete saw.

c. **All connections must be properly sealed** to prevent leakage and/or infiltration into the storm system.

d. **Global Positioning System (GPS) locations** (sub-meter accuracy) of all constructed taps to the County drain must be submitted in an acceptable electronic format.

2A2 - Manhole Taps

a. **All taps shall be made so that a 1 foot (minimum) wall area exists** between the proposed tap and any existing pipe inside the manhole.

b. **Class B concrete collar and bedding** shall be a minimum of 12 inches and shall be placed on undisturbed soil and extend to the first joint of the proposed tap.

c. **Taps to manholes** must be pointed in the inside.

d. **All taps shall be cut flush** with the inside wall of the manhole.

e. **All debris in manhole,** as a result of the tap construction, shall be removed after construction is complete.

f. **GPS locations** (sub-meter accuracy) of all constructed taps to the County drain must be submitted in an acceptable electronic format.

2C - Dry Detention Basin Specific Guidelines

1. **A forebay must be included.** The majority of the site runoff volume and drainage area must outlet to the forebay.

2. **Dry detention basins must be planted to prevent erosion as suspension of solids.**

2D - Wet/Permanent Pool Detention Basins Specific Guidelines

1. **A forebay must be included.**
2. **Permanent pool depth** must be a minimum of 4 feet
3. **Permanent pool volume** must be at least 25% of the 100-year flood control volume.

VI.3.A.1 *Pumped Outlet Systems*

1. **Pumped outlet systems are discouraged** due to their increase expense, increased risk, and increased maintenance needs. Pumped outlet system should only be used if a gravity drained outlet is impractical.
2. **Pumped outlet systems shall utilize a traditional outlet control structure** upstream of the outlet pump. The flow capacity of the pump itself may not act as the outflow rate control for the system.

2E - Retention Basins

Retention basins will not be permitted unless the following minimum site characteristics are demonstrated via geotechnical investigations:

- Minimum design infiltration capacity of existing soils (below the proposed bottom elevation of the retention basin) is a design infiltration rate of 1.0 in/hr (this ensures a maximum drawdown time of 72 hours for a maximum storage depth of six feet)

- Prevailing groundwater level is at least four feet below the proposed bottom elevation of the retention basin

A "no-outlet" retention basin is only permissible when there is no other available positive outlet for the stormwater runoff from the property. Tuscola County Drain Office discourages the use of retention basins and will permit their use only in cases where the applicant has clearly demonstrated that constructing a functional outlet (gravity or pumped) is infeasible and where adequate soil infiltration rates have been demonstrated via geotechnical investigations.

The retention storage is calculated as volume provided in the basin above the existing groundwater elevation.

- An overflow facility from the retention basin must be provided. Elevations of surrounding buildings, development, or other features that would be impacted by a basin overflow must be indicated. The overflow route may not endanger any existing structures or features. Downstream drainage easements are required for the off-site overflow route.

- Pre-treatment (TSS controls) must be installed upstream of every proposed inlet to the retention basin. This reduces sediment loading to the retention basin and helps to ensure the long-term functionality of the retention basin.

- One (1) foot of freeboard must be provided above the proposed storage elevation.
- The maximum storage depth of a retention basin is five (5) feet

The proposed storage volume of the retention basin is calculated on the basis of total contributing acreage, including the basin area and all off-site areas that flow onto the property. Sufficient storage and dewatering capacity must be provided for two consecutive (back-to-back) 24hr, 100-year storm events over a period of 48 hours.

a. **Water Quality** Control (WQC) design criteria should be incorporated into the design to minimize clogging of the system either by TSS pre-treatment and/or anti-clogging strategies at the outlet control structure.

b. **The discharge shall outlet** within the drainage basin where flows originate and may not be diverted to another drainage basin, unless by approval of the Drain Commissioner. A Certification Form for Adding Lands to a Drainage District (see **Appendix J**) must be submitted to the Drain Commissioner.

c. **Conduct a site evaluation.** Identify unique or sensitive natural areas. Locate any springs near the proposed basin site and re-locate the basin if necessary to prevent instability of the detention berms and structures.

d. **Collect soil samples** from the site if a wet pond is proposed. Determine soil permeability and the ability to inhibit seepage and maintain a permanent pool. Determine the soil's ability to support loads and maintain its shape.

e. **Try to integrate the basin into the site** as a natural site amenity.

f. **Flooding potential** must be minimized upstream and downstream of the proposed site by the designer.

g. **All utility lines and sanitary sewers should be located outside of the basin** footprint. Verify that no local private wells will be affected by the proposed basin.

h. **Basin Location:** Determine if the selected basin location will accommodate all of the required storage volumes.

i. **Vegetate all open channels** discharging to the basin to minimize erosion.

j. **Verify local requirements concerning basin safety and long-term maintenance.**

k. **If the basin is used to control sediment during development,** then the design pool depth and design grade shall be restored prior to installing permanent landscaping and stabilization measures. **As-Built plans shall be submitted for all detention systems.**

l. **Sediment pretreatment,** (e.g. A forebay, manufactured treatment device, or BMPs) is required for all detention and retention basins to facilitate cost effective sediment removal.

m. **The shape and configuration of retention basins** may vary, depending on storage requirements, local topography, land availability, hydraulic considerations, and

n. other site- specific constraints.

o. **Restricted conveyance systems** designed to create backflow into stormwater storage facilities are not permitted. A storm sewer line shall not be used as both an inlet and outlet line to a stormwater storage facility.

2F - Open Detention, Retention, and Underground Detention Design

Detention basins store stormwater runoff temporarily before discharging into a waterway. Conventional dry detention basins are typically designed strictly for flood control and may not provide adequate water quality treatment.

2G - Dry & Wet Detention Basin General Guidelines

Stormwater management planning should be addressed before the design stage:

a. **Wet detention basins are generally preferable** to dry detention basins, since they allow more particulates to settle out, and remove some soluble pollutants.

b. **No Conveyance Pipe Storage:** Pipes used for conveyance may not be used as storage volume.

c. **The developer has an obligation to contact local municipalities** to determine how the proposed development will impact the subwatershed and whether the proposed stormwater management approach is consistent with the watershed management plan and/or community master plan.

d. Forbays are required.

2H - Detention Volume Calculation

When calculating the required detention volume, all contributing drainage areas, including the area of the detention basin itself, shall be used in the calculation. Off-site drainage areas should be made to bypass the detention basin if possible. Volume stored within the forebay and detention area may be applied towards the required detention volume. Show detailed stormwater design calculations. The required detention volume can be calculated using the following series of equations presented in TR55.

Downstream Receiving Capacity

In no event shall the maximum design rate or design volume of discharge exceed the maximum capacity of the downstream land, channel, pipe or watercourse to accommodate the flow. It is the proprietor's obligation to meet this standard. Should a stormwater system, as-built, fail to comply, it is the proprietor's responsibility to design and construct, or have constructed at his/her expense, any necessary additional and/or alternative stormwater management facilities. Such additional facilities will be subject to the TUSCOLA COUNTY DRAIN COMMISSIONER's review and approval.

If downstream capacity is insufficient for the proposed development, the developer may be

required to make improvements that may include construction of additional off-site conveyance capacity, improvements to the existing drain, acquisition of easements from downstream property owners, etc. The developer is responsible for securing all necessary easements and/or permits, from downstream property owners and is responsible for all improvement costs.

If no adequate watercourse exists to effectively receive a concentrated flow of water from the proposed development, the discharge shall be reduced to sheet flow at pre-settlement rates prior to exiting the site. Further, if the proposed stormwater management system cannot achieve pre-settlement conditions with respect to both rate and volume of stormwater runoff, it is the responsibility of the developer to secure necessary easements from downstream property owners and must still comply with the design standards provided herein.

All stormwater discharges from the proposed development site shall outlet within the watershed where flows originated; unless approval is obtained from TUSCOLA COUNTY DRAIN COMMISSIONER. Offsite runoff shall bypass the proposed site's stormwater system. If this cannot be achieved, detailed hydrologic and hydraulic calculations shall be provided to TUSCOLA COUNTY DRAIN COMMISSIONER to demonstrate no adverse impacts downstream for the 10-year and 100-year storms.

A flood impact analysis may be required at the TUSCOLA COUNTY DRAIN COMMISSIONER's discretion to verify that there will be no adverse impacts on peak flow or total discharge volume during the 10-yr 24-hr storm, 100-yr 24-hr storm, or other flow events upstream or downstream of the property. The analysis shall be as determined by HEC-RAS, EPA SWMM, or other acceptable methods. The TUSCOLA COUNTY DRAIN COMMISSIONER may require more restrictive DFC Criteria based on the flood impact analysis or where existing buildings or infrastructure are located within the 100-yr floodplain. When another authorized agency requires a model, then a copy of the approved model must be provided to the TUSCOLA COUNTY DRAIN COMMISSIONER for their records.

Release Rate

The allowable 100-year post-development peak flow rate (0100ALL) shall be approved by the TUSCOLA COUNTY DRAIN COMMISSIONER on a case-by-case basis and typically will not be allowed to exceed **the smallest of the of the applicable scenarios presented in Table VI-10. Please note:** The TUSCOLA COUNTY DRAIN COMMISSIONER detention basin sizing method and calculations assume that water from the basin will be released at a rate near to and less than the allowable maximum. Releasing water significantly slower than the allowable maximum may result in an undersized detention basin.

Allowable 100-Year Post-Development Peak Flow Rate

Item	Scenario Description	Allowable 100-year post-development peak flow rate (Q_{100ALL})
The C_{100ALL} shall be the lesser of the following scenarios if applicable to the project:		
1	**Site-specific restricted flow rates**	Due to downstream capacity limitations, or flooding. Please note enclosed drain systems are more likely to be unable to accept discharges greater than 0.15 cfs/acre. Contact TUSCOLA COUNTY DRAIN COMMISSIONER by e-mail to confirm if any known downstream capacity limitations exist.
2	**Projects draining to a system managed by the Tuscola County Road Commission**	These projects will be restricted to a 4" outlet maximum. In these cases, the 4" connection may control the maximum Allowable 100-Year Post- Development Peak Flow Rate (Q_{100ALL}). Flow velocities from the 4" outlet may not cause erosion at the outlet.
3	**Local municipality or other reviewing agencies release rate**	In some cases, another review agency may require a smaller release rate then the TUSCOLA COUNTY DRAIN COMMISSIONER. In these cases, the smallest allowable release rate shall be use as Q_{100ALL} for the remainder of the detention basin calculation method.
5	**Release rate is based on the size of the development**	Calculate the Variable Release Rate (VRR) based on the development sizes provided below:

Development Size	Release Rate
2 acres or less	1.0 cfs/acre
Greater than 2 acres but less than 100 acres	Use **Eq. Below**
Greater than 100 acres	0.15 cfs/acre

Development size is considered to be sum of all on-site and off-site contributing drainage areas less detention or as otherwise specified by TUSCOLA COUNTY DRAIN COMMISSIONER.

$$QVRR = 1.1055 * LN(A)$$

WHERE QVRR = VARIABLE 100-YEAR RELEASE RATE (CFS/ACRE)

A = CONTRIBUTING SITE AREA (ACRE

Safe conveyance of the 100-year, 24-hr storm must be provided from the site or through the detention basin with 1 foot of freeboard. No permanent structures shall be allowed within the limits of the established 100-year floodplain for tributaries with a drainage area of two square miles or greater. **No fill shall be allowed within the floodplain without an appropriate compensatory cut.**

The stormwater conveyance systems under the jurisdiction of the TUSCOLA COUNTY DRAIN COMMISSIONER shall have the minimum capacity of the 10-year storm, with overflow capacity of the 100-year storm. Review of proposed projects by other local, county, state, or federal agencies may have additional capacity requirements such as at road crossings. The TUSCOLA COUNTY DRAIN COMMISSIONER may waive or reduce the Detention and Flood Control (DFC) requirements for certain developments that pose no or minimal threat to overbank flooding.

Vegetated Swales Design Guidance

Swales are broad, shallow channels that primarily remove pollutants through sedimentation. Swales provide some control of runoff quantity and timing through infiltration and an increase in time of concentration. If the use of swales has been approved by TUSCOLA COUNTY DRAIN COMMISSIONER and the local municipality to meet WQ Criteria or for stormwater BMPs, the swales should be vegetated predominantly with sod-forming grasses for cool humid regions such as:

- Bentgrasses *(Agrostis spp.)*
- Blue-Grasses *(Paa spp.)*
- Fescues *(Festuca rubra and F. ovina)*
- Perennial Ryegrass *(Lolium perenee)*.

Wet Swales- Seed mixes for wet swales should also contain at least four (4) forb, grass, and/or sedge plant species (no trees or shrubs).

Dry Swales - Seed mixes for dry swales should also contain at least four (4) forb, grass, and/or sedge plant species (no trees or shrubs).

The design of traditional swales can be enhanced to provide pollutant removal. The design of water quality swales is a flow rate-based design that uses Manning's equation to determine the velocity and depth based on channel slope and dimensions. The design of wet and dry swales is based on conveying a 10-year flow with negligible erosion.

Swales shall be designed to safely convey the 2-yr storm at non-erosive conditions and have adequate capacity for the 10-yr, 24-hr storm with at least 0.5ft of freeboard.

3. **Structural infiltration devices** such as basins and, to a lesser degree, trenches may suffer

   high failure rates due to clogging. Therefore, an aggressive maintenance program and upstream pre-treatment measures (such as sumps, swirl concentrators,

sedimentation basins and grass filter strips) shall be incorporated into any stormwater management system that employs infiltration devices (except dry wells receiving rooftop runoff). In general, pre-treatment is more important for a structural infiltration device that has a tributary impervious area that exceeds 10 times the footprint of the infiltration device (e.g., a 1,000 square foot bioretention cell treating a drainage area 10,000 square feet or larger should have an upstream pre-treatment measure (an oversized sump structure at the bioretention inlet is a common practice).

4. **The seasonal high water table** The bottom of infiltration facilities shall be a minimum of 2 feet above the bottom of an infiltration BMP where stormwater would infiltrate into native sub-soil.
5. **Stormwater "hotspot" sites:** Infiltration practices shall not be used at stormwater "hotspot" sites including areas with documented subsurface contamination.

   If the proposed use of the site does would not qualify as a stormwater hotspot but existing/previous land use may be considered a stormwater hotspot; then an Environmental Site Assessment is required to demonstrate if on-site infiltration would be potentially hazardous.
6. **Heavy equipment** shall not be allowed in contact with the bottom of infiltration practices during construction and must be noted thus on the grading plan.

Bioretention Unit Design Guidelines

Bioretention areas are landscaped depressions that accept sheet flow from a grass filter strip and remove pollutants with mechanisms similar to a forested area. Design guidance is provided in USEPA, 2004 **(Appendix B).** Additional TUSCOLA COUNTY DRAIN COMMISSIONER bioretention requirements are provided in the following list:

- **Surface ponding depth** shall not exceed 24 inches
- **Setbacks from a bioretention unit** shall be as follows:
  - Adjacent property line: 10 feet
  - Building foundation: 10 feet
  - Private well: 50 feet
  - Public well: 200 feet from Type I or Type Ila wells, 75 feet from Type lib or Type Ill wells (Safe Drinking Water Act, Act 399, PA 1976)
  - Septic system drain field: 50 feet
- **Clean outs:** All underground pipes shall have clean-outs accessible from the surface

Infiltration BMPs / Facilities

Infiltration facilities such as infiltration basins, infiltration trenches, dry wells, and permeable pavements may be considered where site conditions allow. Infiltration facilities temporarily store and infiltrate the water quality volume within 72 hours and bypass larger flows. Design guidance for infiltration facilities and other stormwater BMPs is provided in the Detroit Water and Sewerage Department (DWSD) Stormwater Management Design Manual and the Southeast Michigan Council of Government (SEMCOG) Low Impact Development (LID) Manual for Michigan (SEMCOG LID Manual) and SEMCOG, 2008 as referenced in **Section 4.13).** The following requirements apply:

1. **Initial USDA-NRCS soil classifications (from Web Soil Survey)** can be used as an initial planning tool to assess the feasibility of infiltration practices and to eliminate unsuitable areas, although geotechnical investigations must be performed before final design. The TUSCOLA COUNTY DRAIN COMMISSIONER minimum measured infiltration rate recommended to facilitate the proper functioning of infiltration practices is 0.24 in/hr. The measured infiltration rate must be verified by field infiltration testing.
2. **Maximum Allowable Design Infiltration Rate:** A maximum design infiltration rate of 4 inches per hour can be used in stormwater system and/or BMP design.
3. **Site suitability for infiltration BMPs** is ultimately determined by geotechnical investigations & infiltration testing. Soil and groundwater characteristics must be verified using geotechnical investigations. USDA/NRCS soil maps (Web Soil Survey) should be evaluated as an initial site planning tool to predict the location of the best drain soils on site, however, USDA/NRCS soil maps will not be adequate to establish soil infiltration capacity.
   a. **When in-situ measured infiltration rates are at or <u>below 0.24 in/hr.</u>,** infiltration may not be a practical alternative for volume control, and the CPVC requirement should then be implemented to the Maximum Extent Practicable as determined by TUSCOLA COUNTY DRAIN COMMISSIONER. Alternatively, the project design may provide other improvements (structural and non-structural BMPs) to the site and/or downstream waterways that improve and support the hydrologic, hydraulic, and/or water quality goals of Tuscola County.

   b. **When in-situ measured infiltration rates are <u>between 0.24 in/hr. and 0.5 in/hr.</u>,** soils are marginally suitable for infiltration BMPs, and supplemental measures are required. <u>Supplemental measures</u> may include subsoil amendment, or an underdrain located at the top of the aggregate storage bed layer to maximize infiltration.

   c. **When the in-situ measured infiltration rate is at or <u>above 0.5 in/hr.</u>,** supplemental measures are not required. Unless extraordinary site conditions

exist; projects with measured soil infiltration rates equal to or above 0.5 in/hr will be required to infiltrate the full CPVC volume.

d. **If full infiltration of the CPVC requirement is not practical,** the volume shall always be provided to the Maximum Extent Practicable. Other beneficial LID practices must be implemented to the Maximum Extent Practicable. If the project intends to claim that the full calculated CPVC cannot be addressed, then the stormwater narrative must explain the associated site constraints, that limit CPVC to the Maximum Extent Practicable.

e. **Measured Infiltration Rate Vs Design Infiltration Rate:** The above listed items refer to the measured infiltration rate obtained during infiltration testing. The design infiltration rate shall have an applied factor of safety as described in this Section.

f. **BMP Drain Time:** Infiltration BMPs shall completely dewater in less than 72 hours. The combined storage volume of the surface water and the effective soil layer void space must be drained in 48-hours. Soil layers shall be considered to have 20% effective void space. Stone layers shall be considered to have 30% void space.

g. **Maximum Allowable Design Infiltration Rate:** A maximum design infiltration rate of 4 inches per hour can be used in stormwater system and/or BMP design.

Applying Measured Infiltration Test Results

1. **The CPVC is commonly achieved by providing adequate infiltration and/or storage/reuse BMPs.** This may include (but is not limited to) bioretention, rain gardens, bio-swales, pervious pavement, cisterns, green roofs, infiltration trenches, and/or infiltrating underground detention systems. Non-structural BMPs, such as impervious area reduction, natural vegetation (as opposed to turf grass), and disconnected impervious surfaces (roofs and pavement areas that drain onto vegetated surfaces) are good design alternatives to reduce runoff volume, with thereby reduces the required size of any structural BMP.
2. **Geotechnical investigations** to demonstrate whether infiltration can be achieved on a given site is a required component of a site permit/review submittal. **As part of the stormwater narrative, the applicant must submit a written explanation of the project site's ability or inability to meet the full CPVC goals** along with a detailed discussion of the CPVC features used. **Any site plan submittal that does not include a geotechnical investigation is considered incomplete and will be returned without a full technical review.**
    - The depth of the test must correspond to the facility depth. If a confining layer, or soil with a greater percentage of fines, is observed during the subsurface investigation to be within 2 feet of the bottom of the planned infiltration system, the testing should be conducted within that confining layer.
    - Based on EGLE requirements and conformance with any required Depth
    - Groundwater Investigation Requirements, the boring log must be continued to a

- depth adequate to show separation between the bottom of the infiltration facility and the seasonal high groundwater level. The boring depth will vary, based on facility depth.
- Tests must be performed in the immediate vicinity of the proposed facility. Exceptions can be made to the test location provided the qualified professional can support that the strata are consistent from the proposed facility to the test location. **The test must be conducted in the twenty-four months prior to the TUSCOLA COUNTY DRAIN COMMISSIONER plan review submission.**
- Infiltration testing **should not** be conducted in engineered or undocumented fill.

EGLE industrial stormwater permit warning: Please Note - Stormwater hotspots may also require an EGLE industrial permit. These permits are intended to regulate various industrial activities to ensure they comply with environmental laws and protect air, water, and land resources. The specific activities that require an EGLE industrial permit may vary depending on the type of industry and the potential environmental impact. TUSCOLA COUNTY DRAIN COMMISSIONER may require the applicant to provide confirmation from EGLE that an industrial permit has been received or in not required.

Soil Infiltration Testing

TUSCOLA COUNTY DRAIN COMMISSIONER accepts the results of 3 different infiltration testing procedures. A qualified professional must exercise judgment in the selection of the infiltration test method. The three infiltration testing methods used to determine a design infiltration rate are:

- Open pit falling head.
- Encased falling head.
- Double-ring infiltrometer.

Factors of Safety

To account for the unpredictable and uncertain nature of infiltration testing; **field 'measured infiltration rates' shall be divided by a minimum of 2. The result shall be referred to as the 'design infiltration rate'.** TUSCOLA COUNTY DRAIN COMMISSIONER will accept a maximum design infiltration of 4 inches per hour even if measured infiltration rates report higher values.

See **"Appendix Q- Infiltration Testing Methodology"** for testing procedure details.

Minimum Number of Required Tests

The number of required infiltration tests may vary by type of development proposal or by design approach. The following list describes how many tests are required for a typical project.

- **When infiltration testing is required by TUSCOLA COUNTY DRAIN COMMISSIONER, a minimum of two infiltration tests** are required for a site. The ultimate number of tests will depend on the anticipated soil conditions across the site and the size of the site. For larger sites with variable soils, contact TUSCOLA COUNTY DRAIN COMMISSIONER to review the infiltration testing plan.
- **Infiltration tests shall be located** within 25 ft or less of a BMP footprint in order to be considered representative of the BMP area. Each individual BMP needs to have documented infiltration rates.

- **TUSCOLA COUNTY DRAIN COMMISSIONER may require additional testing for any reason.**

General Testing Criteria

- Testing must be conducted or overseen by a qualified professional. This professional must be a Professional Engineer (PE) licensed in the State of Michigan.

Infiltration Site Constraints Stormwater Hotspots

Infiltration BMPs are prohibited in areas containing contaminated soils/groundwater, wellhead protection areas, high groundwater (less than 2 feet from bottom of infiltration bed to the seasonally high groundwater table) and in areas with hotspot activities and setback restrictions (foundations, property lines, drinking wells, septic fields, pavement, etc.) as defined in the standards. Design in these areas shall include the use of non-infiltrating runoff volume reducing BMPs to the Maximum Extent Practicable. An Environmental Site Assessment is required to demonstrate the presence of contaminated soils.

Sites under TUSCOLA COUNTY DRAIN COMMISSIONER review that are determined to be stormwater "hotspots" may require a greater level of stormwater treatment. Storm water filtration systems combined with pre- treatment practices may be required, at the TUSCOLA COUNTY DRAIN COMMISSIONER's discretion, to treat heavy metals, nutrients, dissolved pollutants, and total petroleum hydrocarbons.

A stormwater hotspot is a land use or activity that generates higher than average concentrations of pollutants and may include, but is not limited to, the following:

1. Vehicle salvage yards and recycling facilities
2. Vehicle fueling stations
3. Vehicle service and maintenance facilities
4. Vehicle and equipment cleaning facilities
5. Fleet storage areas
6. Industrial sites (based on SIC codes)
7. Marinas with service and maintenance
8. Outdoor liquid container storage
9. Outdoor loading/unloading facilities
10. Public works storage areas
11. Facilities that generate or store hazardous materials
12. Commercial nursery
13. Auto dealer lots
14. DOT storage areas
15. On-site sewage disposal systems (OSDS)

Open detention basins and underground detention basins also represent a potential to introduce hotspot contaminates into the groundwater. With this in mind, **underground detention systems constructed on hotspots shall be fully enclosed.** Open detention systems constructed on hotspots with measured soil infiltration rates equal

to or faster than 0.24 inches per hour will require the installation of an impermeable liner. **When soil infiltration rates are less than 0.24 inches per hour, an impermeable liner is not required if a professional engineer specializing in geotechnical engineering certifies that existing soils do not present a potential for introducing contaminates to the groundwater.**

Channel Protection Volume Control (CPVC)

As a result of increased imperviousness and runoff rates associated with development, the stability, flooding potential, and ecological health of natural watercourses are negatively impacted by increased erosion, increased sedimentation, and overall alteration of the magnitude, frequency, and intensities of flows. These issues can be improved by incorporating a combination of stormwater best management practices that reducing the total site runoff volume, primarily via infiltration.

To address these issues TUSCOLA COUNTY DRAIN COMMISSIONER will require projects to incorporate Channel Protection Volume Control (CPVC or Vvc). The Channel Protection Volume Control is the targeted volume of water the development must manage by reducing the overall volume stormwater runoff, primarily via infiltration, which promotes groundwater recharge and stabilizing flow rates and baseflow in our natural watercourses. The TUSCOLA COUNTY DRAIN COMMISSIONER may waive or reduce the CPVC requirements for certain developments that pose no or minimal threat to channel stability such as those directly discharging to continuous enclosed drains that outlet to lakes or rivers.

The Channel Protection Volume Control Volume (CPVC or Vvc) is the post-development site runoff volume from a 1.20-inch rainfall. The table below provides a summary of the CPVC implementation process.

Summary of CPVC Design Process

Item
Consider if the site is eligible for infiltration and is not "a stormwater hotspot"
Preliminary Review of Soil Infiltration
Determine Channel Protection Volume Control (CPVC)
Consider likely locations and design depths of infiltration BMPs
Conduct infiltration testing at locations and appropriate depths relative to the bottom of proposed infiltration BMPs
Consider a pre-application meeting with TUSCOLA COUNTY DRAIN COMMISSIONER to discuss questions regarding testing and design alternatives.
If testing supports infiltration; finalize BMP design to provide the full CPVC
If infiltration tests show low infiltration rate and/or capacity provide the CPVC to the Maximum Extent Practicable
Summarize the CPVC design process or Maximum Extent Practicable process in stormwater narrative. Submit geotechnical and/or infiltration testing reports to TUSCOLA COUNTY DRAIN COMMISSIONER for review.

Media Filtering Systems

Filtering systems include sand filters, compost or peat/sand filters, and manufactured filtering devices. Filtering systems should be designed off-line to treat the water quality discharge for sites less than 5 acres and to bypass larger flows from treatment. Pre-treatment of filtering systems must be provided. Stormwater filtering systems are recommended to treat the runoff from stormwater "hotspot" sites.

Sediment Forebays

The primary purpose of a sediment forebay is to capture and settle out sediment and other particulate matter from stormwater runoff or other water sources before it enters a downstream water body. By allowing sediment to settle out within the forebay, the water that continues downstream is cleaner and less likely to cause environmental harm. Forebays are traditionally separated from the rest of the basin by an earthen berm. A forebay control structure is required to release water from the forebay into the main body of the basin. An overflow weir must be provided to allow high flow events to access the rest of the basin.

Erosion control measures must be taken to prevent flows from scouring the forebay berm.

Runoff Site Controls

Site controls are used after the implementation of source controls to convey, pre-treat, and treat (i.e., detain, retain or infiltrate) the stormwater runoff generated by development. The engineering and design techniques available to achieve these objectives is dictated by site configuration, soil type, and the receiving waterway, but some universal guidelines for controlling stormwater quality and quantity can be stated. The following four categories of site controls are listed in order of consideration.

a. **Infiltration** - The most effective stormwater quality controls are infiltration practices, which reduce both the peak runoff rate and volume. Infiltration devices are most applicable to small drainage areas and sites with suitable soils and no potential for groundwater contamination.

b. **Conveyance** - Excess runoff must be discharged into conveyance systems once other methods of reducing and treating stormwater on-site have been implemented and carried off-site to a suitable outlet. For this purpose, vegetated swales are generally preferred to curb and gutter systems and enclosed storm drains. Enhanced swale designs can increase the time of concentration, reduce volumetric requirements, and provide water quality benefits.

c. **Basins** - The next most effective stormwater site controls are detention basins which reduce peak runoff rates.

d. **Filtering Systems and Manufactured Treatment Devices (MTDs)** - Filtering practices and MTDs are allowed, but adequate source controls that have been integrated into the design are preferred. TUSCOLA COUNTY DRAIN COMMISSIONER can provide a list or pre-approved MTD devices upon request. Devices that have not been pre-approved must submit laboratory testing data/results from review by TUSCOLA COUNTY DRAIN COMMISSIONER as part of the permit process.

The preferred hierarchy of structural site controls provides a comprehensive framework for evaluating the place and function of individual practices within a stormwater management system. The most important practices are source controls that preserve and protect the natural environment. The use of source control measures is preferred and will minimize required detention pond sizing on site.

VI.1 - Stormwater Management Approach

Thoughtful site planning reduces the negative impacts associated with development. Communities, regulatory agencies, and designers must evaluate the impact of each individual development project over the long-term and on a subwatershed scale. Stormwater Best Management Practices (BMPs) should be used that function together as a system to insure that the volume, rate, timing, and pollutant load of runoff remains similar to that which occurred under natural, pre-development conditions. This can be achieved through a coordinated network of structural and nonstructural methods designed to provide both source and site control.

VI.LA - Runoff Source Controls

Source controls reduce the volume of runoff generated on-site, and eliminate initial opportunities for pollutants to enter the drainage system. They are the best option for controlling stormwater and include the following key actions:

a. **Preserve existing natural features** that perform stormwater management functions, such as natural depressions, wetlands, forests/trees, and vegetation along streambanks.

b. **Reduce the area of impervious surfaces** through site planning. Minimize enclosed storm sewer systems and directly connected imperviousness by conveying stormwater through vegetated swales, or other MBP methods where possible.

c. **Careful design, installation, and maintenance of erosion control mechanisms** throughout the construction period is imperative. Effective erosion control measures include minimizing the area and length of time that a site is disturbed by construction phasing, installing, and maintaining effective erosion control measures, and promptly stabilizing disturbed/earth change areas.

Design Criteria for Open Drains

The following considerations must be made during the design of an open County drain:

1. **Minimize water quality impacts** from construction and nonpoint source pollution need to be minimized to the maximum extent practicable.
2. **When a County asset is the proposed outlet** for a site's storm drainage system, the standards regarding stormwater detention shall apply.
3. **Permanent structures and detention basins** may not be constructed within the permanent County drain easement. Unless approved by TUSCOLA COUNTY DRAIN COMMISSIONER.
4. **Limited downstream hydraulic conditions** may affect receiving flow capacity of a drainage system. In this situation, the discharge from the site shall be limited to conform to the governing downstream conditions or an increase in the downstream capacity may be required.
5. **The allowable outflow from the proposed site** will be limited to the pro-rata share of the capacity of the drain. The site's pro-rata equitable share of the outlet capacity should be calculated and shown on the construction plans. In cases where the drain outlet has already reached capacity, the burden is on the proprietor to design and construct, at his expense, any necessary improvements to the capacity of the Drain or downstream outlet.

The following applies to the design of an enclosed drainage feature including storm sewer and culverts:

1. **Provide all calculations** in a format similar to the Storm Drain Design Chart in **Appendix 0.** When using a stormwater software program (e.g., HEC-RAS, SWMM, HY-8) the computer files must also be submitted.
2. **Starting Hydraulic Grade/ Downstream Hydraulic Grade:** the downstream hydraulic grade for a closed conduit should follow the guidelines presented in **Table V-8.**
3. **Calculate and show in profile, the hydraulic grade line** (either 10-year or 100-year) for the entire system. The hydraulic gradient for the design event should be designed to be within the pipe, but in adverse conditions should be no higher than one (1) foot below the rim elevation of any drainage structure unless pre-approved by TUSCOLA COUNTY DRAIN COMMISSIONER.
4. **Pipe surcharging-** Where site conditions allow, closed conduits should be designed to flow without surcharging the upstream end of the conduit, however, surcharging may be allowed for situations with problematic site conditions.
5. **Minimum pipe size:** The minimum pipe size for storm drains accepting surface runoff 12-inches in diameter (concrete). Rear yard pipes are allowed a minimum size of 8" Sch 40 PVC, but must be used in conjunction with a drainage swale that directs runoff to a minimum 12-inch diameter pipe (concrete).
6. **Premium pipe joints** must be used to prevent infiltration.
7. **Max/Min Flow Velocities** - Storm drains shall be designed to have a minimum velocity flowing full of 2.5 ft/sec and a maximum velocity of 10 ft/sec. The velocity at a pipe outfall into an enclosed or open drainage network should be less than 5.0 ft/sec to prevent scouring at the outlet. If higher velocities at a pipe outfall cannot be avoided, additional scour protection measures **will** be required.
8. **The Manning's 'n' value** for concrete pipes is 0.013 and 0.024 for corrugated metal pipe.
9. **Energy dissipaters** shall be installed at all outlets according to the requirements of the Tuscola County Drain Commissioner. Energy dissipaters shall be designed in accordance with FHWA standards (HEC14 or HY8Energy) and shall be submitted to the TUSCOLA COUNTY DRAIN COMMISSIONER.
10. **Riprap** may consist of fragmented limestone or other suitable rock underlain with geotextile fabric. **Broken concrete is not allowed.** Riprap sizing shall be based on acceptable calculations methods based on estimated flow velocities or shear stress.

Rainfall Intensity Calculation

The average rainfall intensity (I) shall be determined from the local IDF curve equations. For drainage areas with a Tc> 60 minutes, consult the NOAA Atlas 14 Point Precipitation Frequency Estimates for the location of the project

Design Criteria for Enclosed Drains

An enclosed storm drain system must be designed to accommodate the stormwater runoff from a 10- year, 24-hr storm from the entire contributing watershed. If located within a regulated 100-yr floodplain, then the enclosed storm drain system must be designed to accommodate the stormwater runoff from a 100-yr, 24-hr storm from the entire contributing watershed. The "Manning" formula will be used to check the pipe size. Calculations should consider potential backwater conditions and adjust starting hydraulic grade elevation accordingly.

Time of Concentration

Unless additional calculations are provided, an initial time of concentration of 20 minutes may be used for developments that contain <40% impervious area (e.g. single-family residential subdivisions) or a minimum of 15 minutes for developments that contain > 40% impervious area (e.g. medium density residential, commercial, institutions, and industrial sites).

It is important to realize that rational method calculations are highly impacted by changes in time of concentration. In general, expanses of vegetated lawn or open field have much longer times of concentration than paved areas. There are scenarios in which a smaller impervious area (with a short Tc) can generate peak runoff rates larger than the full site area while using a longer Tc. The designer should consider this possibility during the design process.

The design engineer may also use a calculated time of concentration, if desired. The methodology and computations used to determine time of concentration must be submitted for review. The time of concentration for unimproved, pre-development lands will be checked in review.

When more than one type of flow exists, the individual flows should be summed up to find the total time of concentration. The maximum allowable length for sheet flow is 300 feet. Any change or breaks in slope should be considered a new segment and velocity for that segment computed.

Runoff Coefficients

The runoff coefficient is based upon the potential for runoff of the contributing acreage. The runoff coefficient and supporting calculations must be included with the plan submittal.

Hydrology Calculation Methods

The Rational Method is more ideal for smaller drainage areas; assumes a uniform rainfall intensity, and is ideally used for areas less than 100 acres. Although TUSCOLA COUNTY DRAIN COMMISSIONER staff may approve the use of the Rational Method for drainage areas larger than 100 acres, in no case can the Rational Method be used to calculate peak flows for a drainage area larger than 200 acres.
Additional pre-approved hydrology calculation methods include (note: modifications may be necessary to override the default regional rainfall depths to match current local rainfall statistics):

- Curve Number Method (a/k/a SCS/NRCS Curve Number Method);
- WinTR-55,
- WinTR-20,
- HEC-HMS
- EPA-SWMM

If these programs are used, estimated return internal event flows, pipe capacities, hydraulic grade lines, and other design properties shall be provided on the plan set to facilitate understanding of the intended design without consulting the hydrology/hydraulic model.

Proprietary hydrology/hydraulics software programs must be pre-approved with TUSCOLA COUNTY DRAIN COMMISSIONER before each project submittal.

PART V – DESIGN CRITERIA AND ENGINEERING STANDARDS FOR COUNTY DRAINS

The following section outlines the design criteria that shall be used on projects that require TUSCOLA COUNTY DRAIN COMMISSIONER review and/or permit. The requirements reflect the TUSCOLA COUNTY DRAIN COMMISSIONER's need to protect public health, convenience, and welfare per the Michigan Drain Code, as well as meet its NPDES Phase 2 permit requirements.

Determination of Culvert or Pipe Size

All culvert & pipe design calculations must be submitted to the TUSCOLA COUNTY DRAIN COMMISSIONER for review. **Calculations must be signed and sealed by a Professional Engineer and must include:**

1. **Delineation on a contour map derived from 2015 or later LiDar** of the area contributing to the culvert or pipe.
2. **Hydrologic calculations** to determine the amount of low from surface runoff.
3. **Hydraulic calculations** used to determine the size of the culvert or pipe.
4. **Calculations for height of cover, gauge size, and expected loads.** The designer should consider if pipe/structure buoyancy calculations are necessary.
5. **Backwater calculations** - When an existing culvert or pipe is proposed to be modified, backwater calculations and/ or downstream calculations shall be considered. Backwater calculations and/ or downstream calculations must be submitted upon TUSCOLA COUNTY DRAIN COMMISSIONER request see **Table V-8** for guidance.
    a. This office will use the "Rational Method", the SCS (NRCS) Method, or other prior approved method, to determine the flow contributing to the culvert or pipe. Culverts or pipes shall be sized to pass a design flow event specified by TUSCOLA COUNTY DRAIN COMMISSIONER (typically the 10-year or 100-year storm event) or the governing design storm of the watercourse, which may be higher.
    b. The flow velocity within the culvert or pipe when flowing full shall be neither siltative nor erosive. Therefore, flow velocity shall not exceed 5 fps when outletting to an open drain, and shall not exceed 10 fps within an enclosed pipe. In addition, flow velocities must be greater then 2.5 fps.
    c. For culverts, the FHWA's HY8 Culvert Analysis will be used to check the culvert design Other methods may be acceptable if pre-approved with TUSCOLA COUNTY DRAIN COMMISSIONER before permit application submittal.

All plan sets will include the following required stormwater management information (See Review Checklist as well):

1. **Calculations Shown** - All calculations used to design components of stormwater management systems.
2. **Show Overall System** - The overall stormwater management system for the proposed development, indicating how stormwater management will be provided and where the drainage will outlet.
3. **Stormwater Facilities & Easements** - The location of any on-site and/or off-site stormwater management facilities and appropriate easements (typical 10' minimum) that will be dedicated to the entity responsible forfuture maintenance. Easement information will be consistent with Section **111.5.** Provided liber and page number for easement if known.
4. **Downstream Receiving Outlet Feature & Capacity** - A description of the off-site outlet and evidence of its adequacy. Estimation of the water surface elevation within receiving waterway/storm sewer system for various design events should be considered. Additional/adequate off-site easement may be required.
5. **Site Drainage Boundaries** - A map, at the USGS scale, showing the drainage area boundaries of the proposed development and its relationship with existing drainage patterns.
6. **Natural Watercourse or Drain Drainage Area** - Show and label any natural watercourses and/or county drains (including: natural and artificial watercourses, regulated wetlands, and wetland boundaries, floodplains, lakes and lagoons) passing through or alongside the proposed development along with area of upstream watershed and current zoning.
7. **Natural Watercourse or Drain Hydrology Calculations**- For any natural watercourses and/or county drains passing through or alongside the proposed development provide calculations of runoff from upstream areas for storm events including but not limited to the 100-year {24- hour) and 10-year {24-hour) design storms. Calculations shall consider future developed conditions according to the current land use plan for the area.

8. **Natural Watercourse or County Drain Cross-sections and Profiles** - Provide cross-sections and profiles, drawn to scale, of the existing drain with existing and proposed elevations. Drain elevations should be field verified.

9. **Special Conditions and Floodplains** - If development is proposed in an area where special drainage problems exist or are anticipated at the site, on adjacent properties, or downstream, more stringent design requirements than those contained in these Procedures and Design Standards for Stormwater Management may be required. If any part of the site lies within a floodplain, then it shall satisfy local, state, and federal requirements for the appropriate project type within a floodplain.

10. **Add the following note to the plan set and Master Deed:** "NOTE: THE CHANGING OF GRADE, PLACEMENT OF FILL OR PERMANENT STRUCTURES {I.E. POOLS, FENCES, SHEDS, ETC.) IN THE 'DRAIN NAME' DRAINAGE EASEMENT IS PROHIBITED."

APPENDIX J

REFERENCE TABLES

Table J-1. Rational Method Runoff Coefficients

Surface	Runoff Coefficient (C)
Impervious (roof, pavement)	0.90
Typical ¼-acre lot subdivision	0.35
Mowed grass	0.25
Undeveloped farmland/meadow	0.20
Forested	0.15

Table J-2. Storm Sewer Minimum Slopes

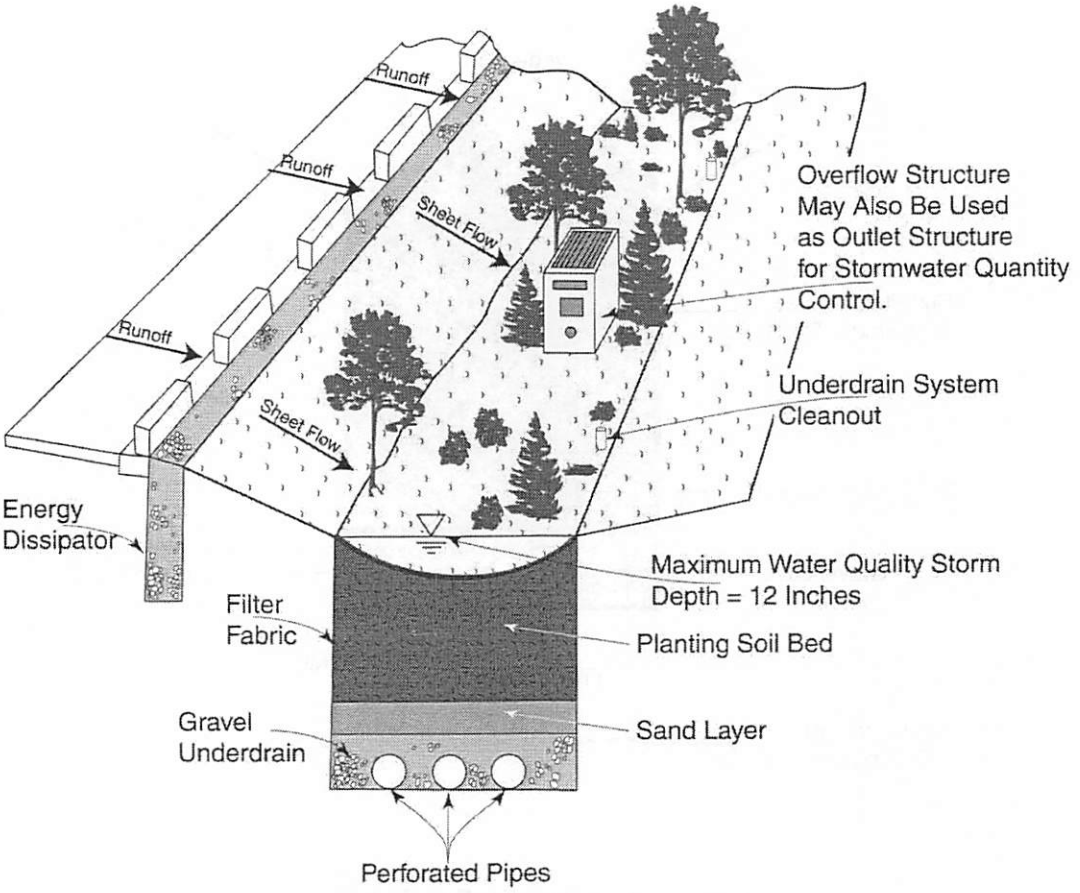
Sewer Diameter (in)	Minimum Slope (%)
8	0.50
10	0.40
12	0.33
15	0.25
18	0.22
20	0.20
24	0.17
27	0.16
30	0.15
36	0.13
42	0.11
48	0.10
54	0.09
60	0.09

Table J-3. Manning "n" Roughness Values

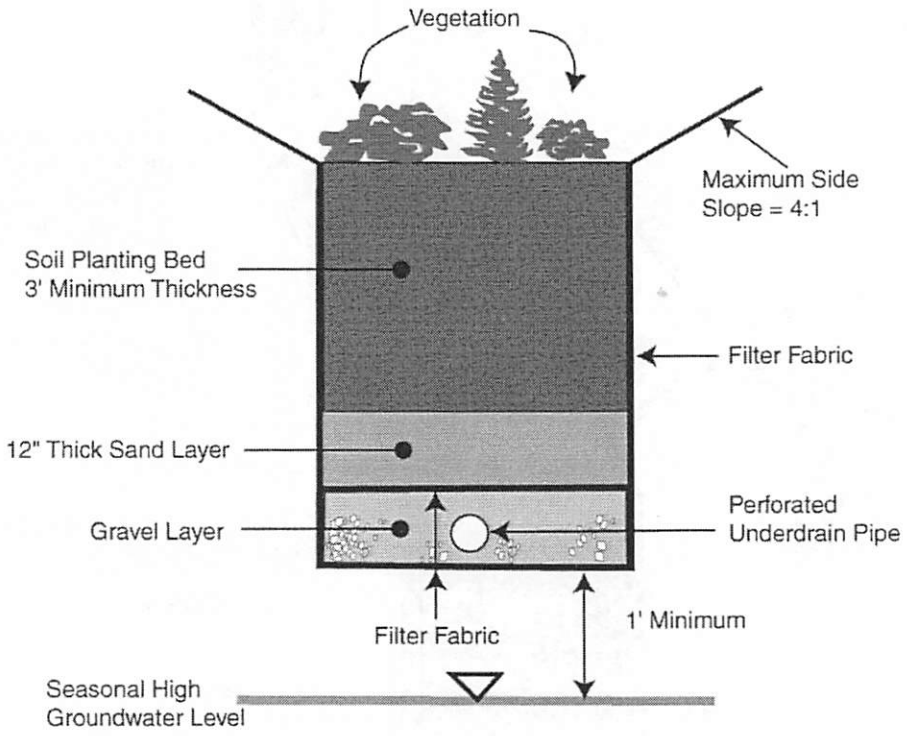
Sewer Material	Typical Manning "n" Roughness Values	Conservative Manning "n" Roughness Values
Concrete, Clay	0.013	0.014
Corrugated metal	0.024	0.026
Plastic (smooth lined)	0.010	0.011

APPENDIX K

EXAMPLE BIORETENTION DETAILS



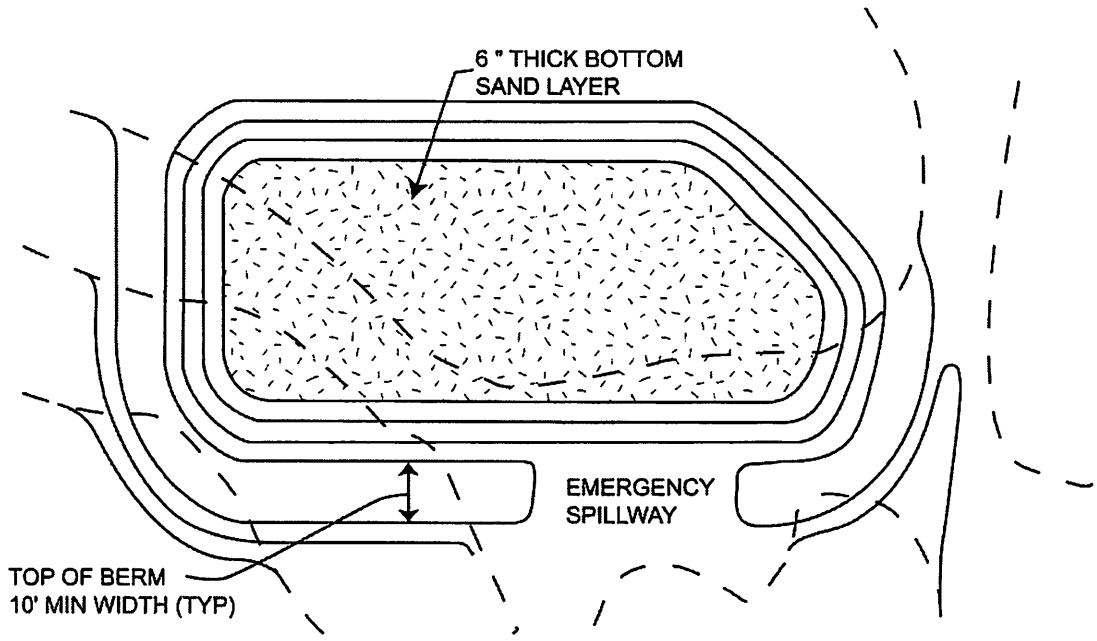
Typical Bioretention System



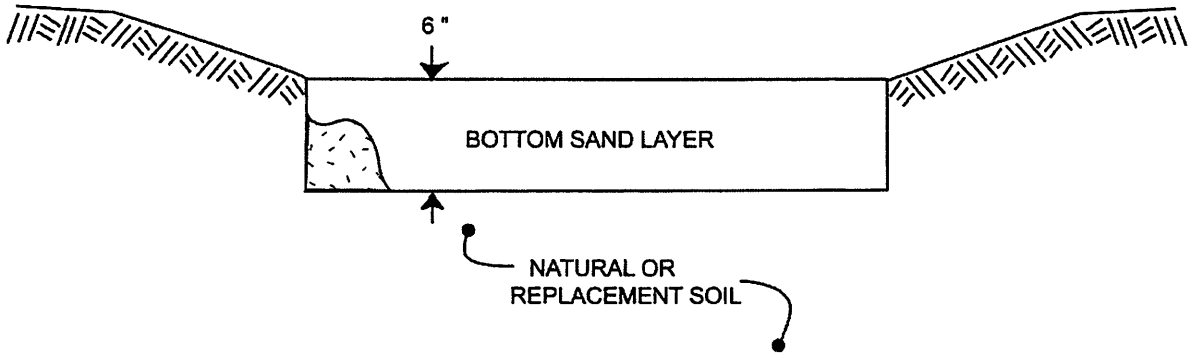
Typical Bioretention Section Detail

APPENDIX L

EXAMPLE INFILTRATION DETAILS



Typical Infiltration Basin



Typical Infiltration Section Detail

APPENDIX M

EXAMPLE DETENTION BASIN DETAILS

Dry Detention Basin Specific Guidelines

3. A forebay must be included to enhance TSS removal rate.
4. The majority of the site runoff volume and drainage area must outlet to the forebay in order to achieve satisfactory TSS removal rate.
5. Have a staged outlet structure to provide extended detention of a Channel Protection Rate Control (CPRC) volume
6. Dry detention basins must be planted with robust maintainable vegetation to prevent erosion as suspension of solids.

Wet/Permanent Pool Detention Basins Specific Guidelines

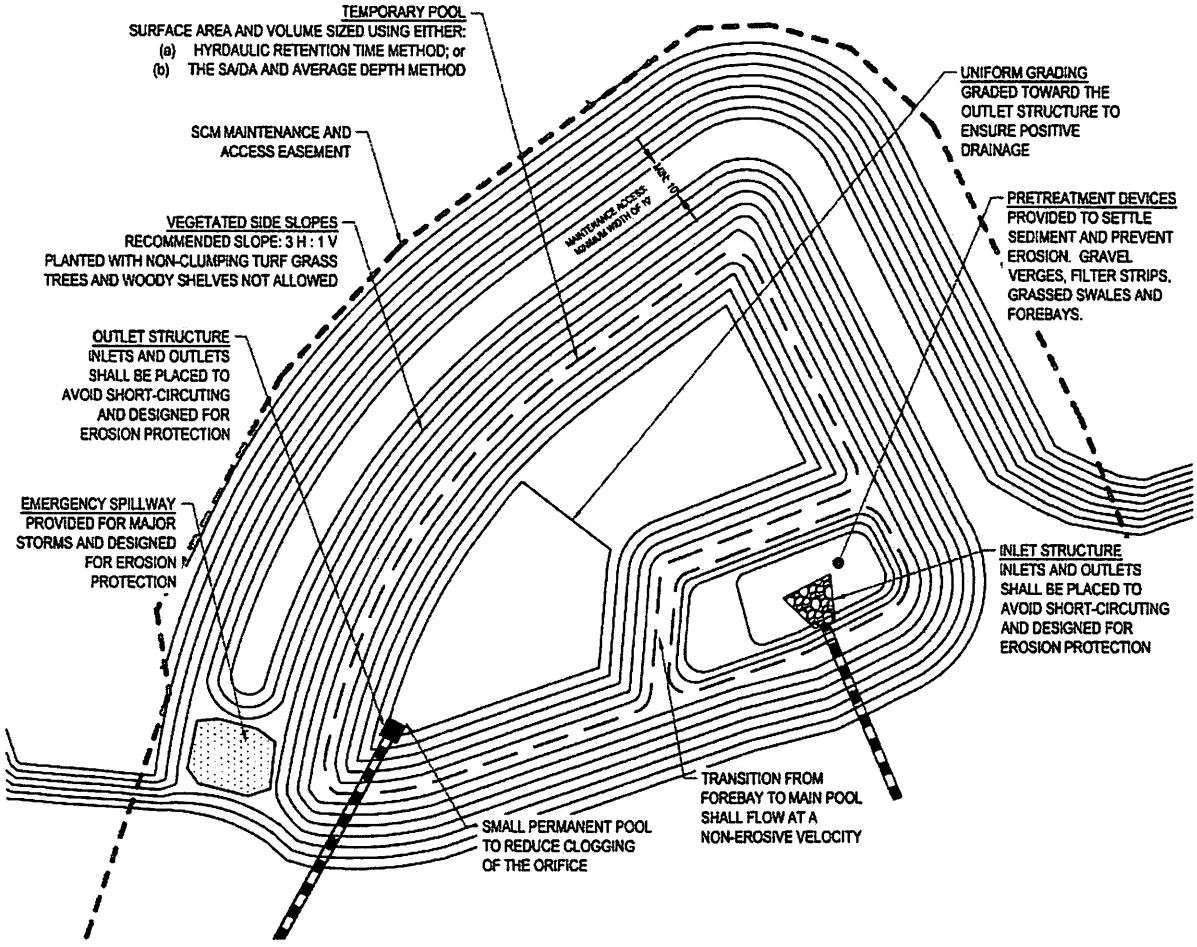
7. A forebay must be included to enhance TSS removal rate.
8. The majority of the site runoff volume and drainage area must outlet to the forebay in order to achieve a satisfactory TSS removal rate.
9. Permanent pool depth must be a minimum of 4 feet
10. Permanent pool volume must be at least 25% of the 100-year flood control volume.

Pumped Outlet Systems

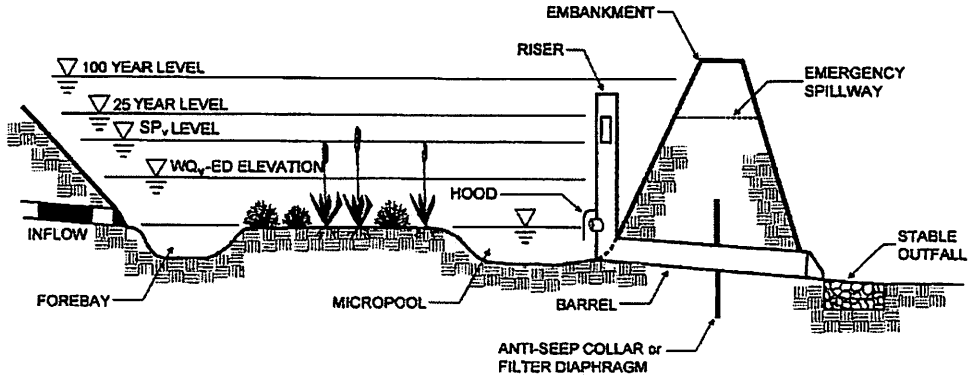
11. Pumped outlet systems are discouraged due to their increase expense, increased risk, and increased maintenance needs. Pumped outlet system should only be used if a gravity drained outlet is impractical.
12. Pumped outlet systems shall utilize a traditional outlet control structure upstream of the outlet pump. The flow capacity of the pump itself may not act as the outflow rate control for the system.

Flood Control Notes

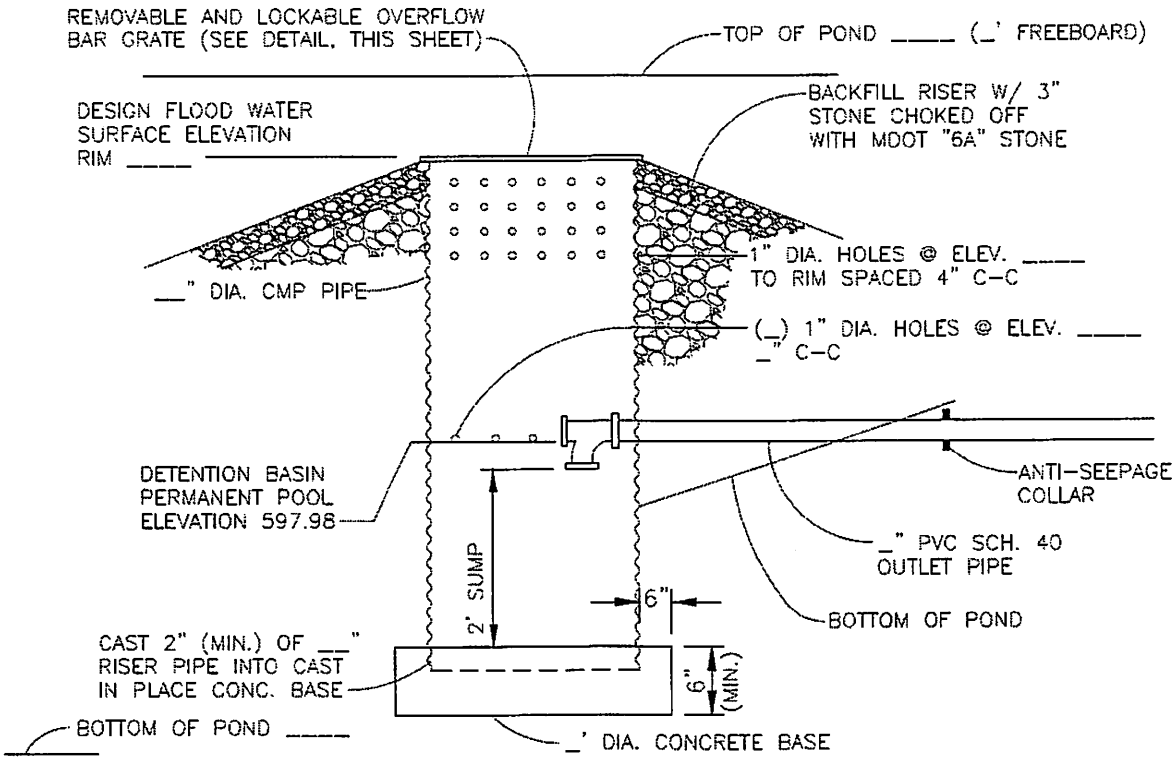
13. Safe conveyance of the 100-year, 24-hr storm must be provided from the site or through the detention basin with 1 foot of freeboard. No permanent structures shall be allowed within the limits of the established 100-year floodplain for tributaries with a drainage area of two square miles or greater. No fill shall be allowed within the floodplain without an appropriate compensatory cut.
14. The stormwater conveyance systems shall have the minimum capacity of the 10-year storm, with overflow capacity of the 100-year storm. Review of proposed projects by other local, county, state, or federal agencies may have additional capacity requirements such as at road crossings. Tuscola County Drain Commissioner may waive or reduce the Detention and Flood Control (DFC) requirements for certain developments that pose no or minimal threat to overbank flooding such as those directly discharging drains that outlet to major lakes.



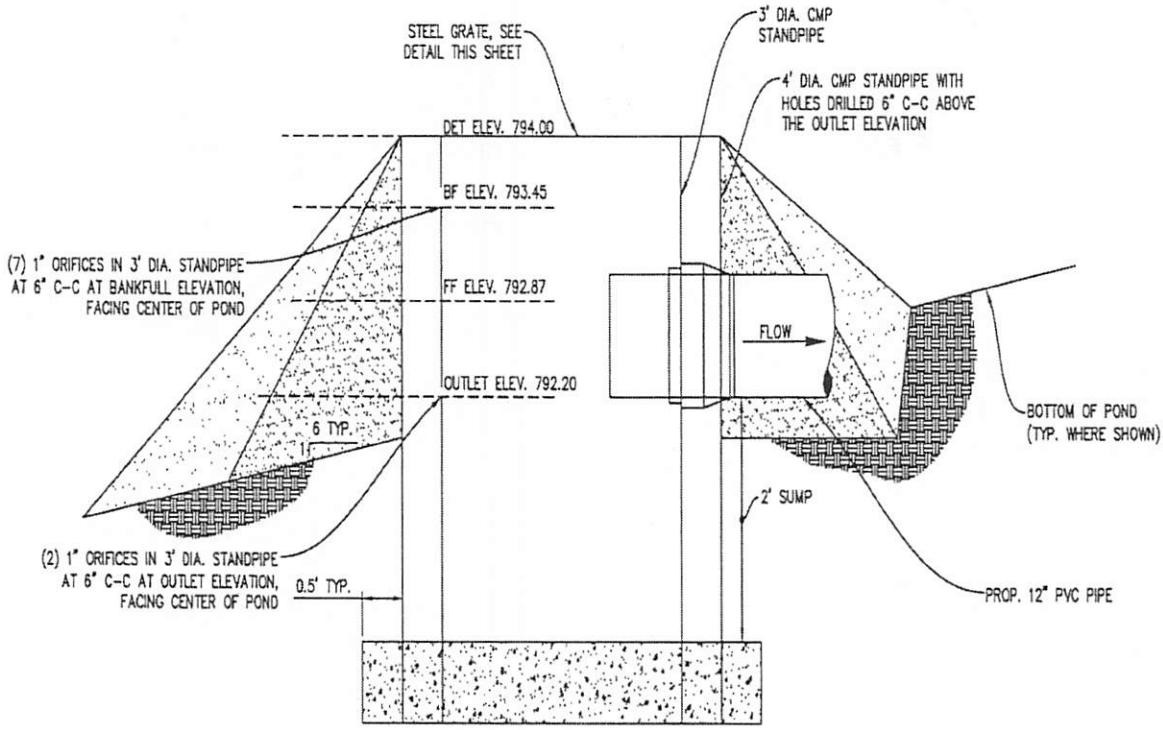
Dry Detention Basin Plan View Illustration



Dry Detention Basin Section View Illustration



Single Standpipe Section Illustration

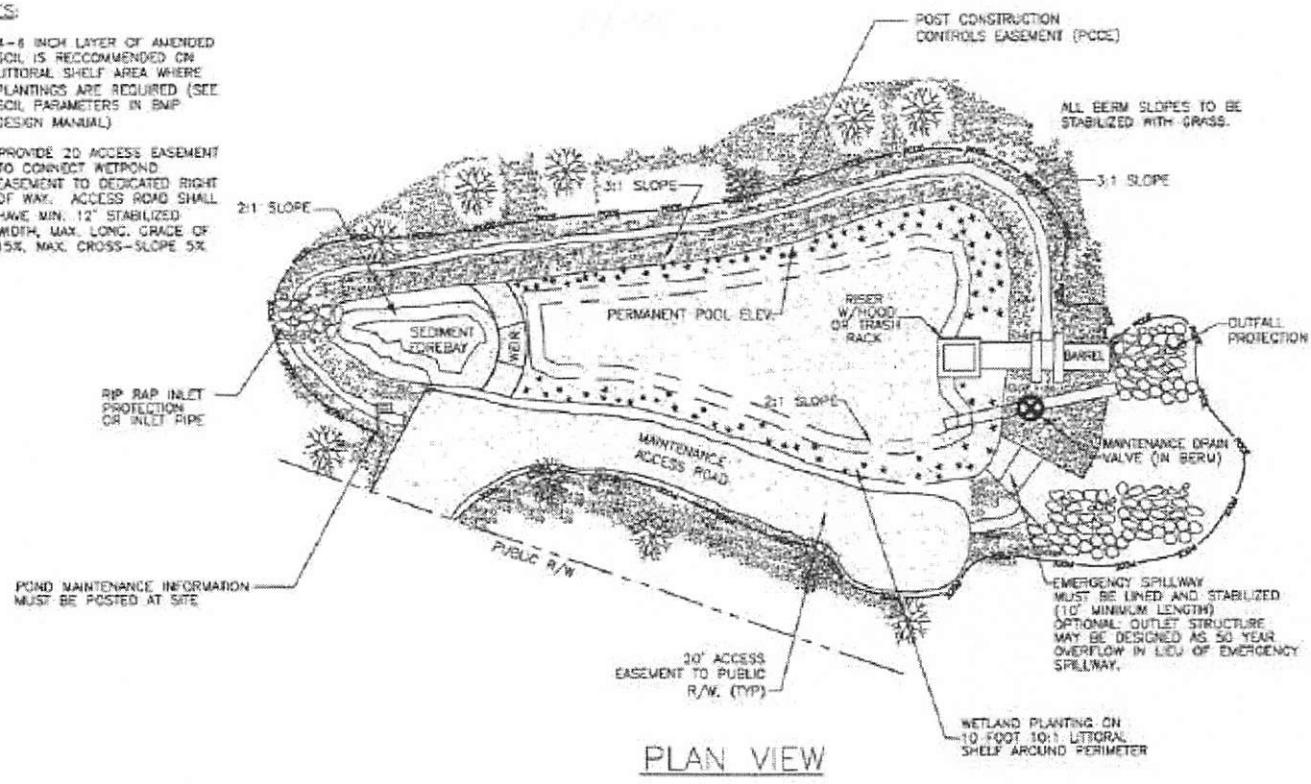


Double Standpipe Section Illustration

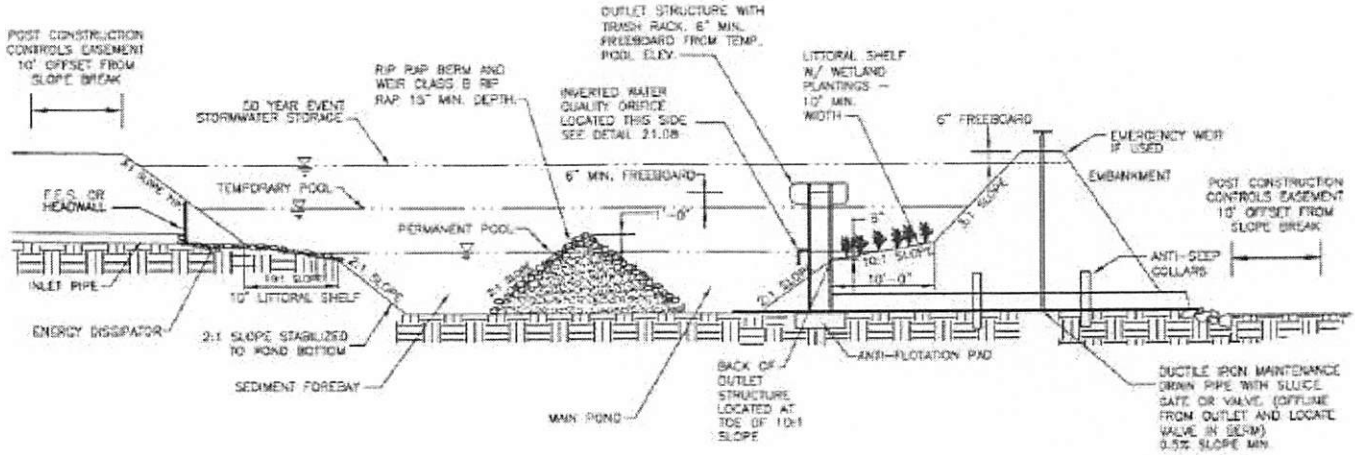
Wet Detention Pond Plan and Section Illustration

NOTES:

1. 4-6 INCH LAYER OF AMENDED SOIL IS RECOMMENDED ON LITTORAL SHELF AREA WHERE PLANTINGS ARE REQUIRED (SEE SOIL PARAMETERS IN BMP DESIGN MANUAL)
2. PROVIDE 20 ACCESS EASEMENT TO CONNECT WETPOND EASEMENT TO DEDICATED RIGHT OF WAY. ACCESS ROAD SHALL HAVE MIN. 12' STABILIZED WIDTH, MAX. LONG. GRADE OF 15%, MAX. CROSS-SLOPE 5%



PLAN VIEW



APPENDIX N

GLOSSARY

Glossary

Best Management Practice	Also "BMP". A practice or combination of practices based on current, accepted engineering standards that prevent or reduce stormwater runoff and/or associated pollutants. For example, the *Guidebook of Best Management Practices for Michigan Watersheds*.
Construction Plans	Detailed plans showing the existing and proposed features of a proposed development and engineering calculations supporting the design of the proposed features.
Channel Protection Volume	The Channel Protection Volume is the targeted volume of water a development must manage by reducing the overall volume stormwater runoff, primarily via infiltration, which promotes groundwater recharge and stabilizing flow rates and baseflow in natural watercourses.
County Drain	A drain which has been designated as an Established Drain wholly within Tuscola County.
Design Storm	A rainfall event of specified return frequency and duration (e.g. a 100-year, 24-hour storm) that is used to calculate peak flows and /or runoff volumes.
Detention Basin	A stormwater management practice that captures stormwater runoff temporarily and releases the stormwater to a surface water body or watercourse
Development	A residential, industrial, municipal, commercial, or other project involving the construction of structures and/or paved surfaces on natural or previously developed land.
Drain	The term "drain" as used in these Rules shall have the meaning as proscribed in Drain Code Section 3 as follows: The word "drain", whenever used in this act, shall include the main stream or trunk and all tributaries or branches of any creek or river, any watercourse or ditch, either open or closed, any covered drain, any sanitary or any combined sanitary and storm sewer or storm sewer or conduit composed of tile, brick, concrete, or other material, any structures or mechanical devices, that will properly purify the flow of such drains, any pumping equipment necessary to assist or relieve the flow of such drains and any levee, dike, barrier, or a combination of any or all of same constructed, or proposed to be constructed, for the purpose of drainage or for the purification of the flow of such drains,

	but shall not include any dam and flowage rights used in connection therewith which is used for the generation of power by a public utility subject to regulation by the public service commission.
Drain Commissioner	The Drain Commissioner of the County of Tuscola, Michigan.
Drainage District	The term "drainage district" as used in these Rules shall have the meaning as proscribed in Drain Code Section 5 as follows: A Drainage District is any county or inter-county drainage district legally established pursuant to applicable provisions of the Drain Code. Drain Code Section 5 provides that each such drainage district is a body corporate with the power to contract, to sue and be sued, and to hold, manage and dispose of real property, in addition to any other powers conferred by law. Generally, a drainage district is comprised of all lands which drain to a legally established drain.
Easement	Also "Right-of-way". A legal right granted by a property owner to another entity, allowing that entity to make limited use of the property for a specific purpose. The Drain Commissioner secures easements along established drains, detention and retention basins, and other stormwater conveyance systems for the purpose of maintenance access.
Established Drain	An open or enclosed stormwater conveyance system that has been legally established as a county or inter-county drain within Tuscola County pursuant to applicable provisions of the Drain Code.
Final Plat	A map of all or part of a subdivision prepared and certified by the proprietor's Engineer or Land Surveyor in accordance with the requirements of the Subdivision Control Act of 167, Act 288 of the Public Acts of 1967, as amended.
First Flush	During the early stages of a storm, stormwater with a highly concentrated pollutant load, due to the runoff washing away the pollutants that have accumulated on the land.
Freeboard	The vertical distance from the top of an embankment to the design water elevation of a detention basin or retention basin, required as a safety margin.
Headwater	The depth of water at the upstream end of a culvert.
Infiltration	The absorption of water into the ground, often expressed in terms of inches per hour.

Inter-county Drain	A drain traversing two or more counties that has been legally established as an established drain.
Invert	The interior surface of the bottom of a pipe.
Pre-Preliminary Plans	A sketch plan or informal plan drawn to scale and showing the existing features of a site and its surroundings and the general layout of the proposed development.
Pre-Preliminary Plat	A sketch plan or informal plan drawn to scale and showing the existing features of a site and its surroundings and the general layout of the proposed subdivision.
Preliminary Plans	A plan showing the preliminary layout of a development in sufficient detail to allow review by interested agencies.
Preliminary Plat	A plan showing the preliminary layout of a subdivision development in sufficient detail to allow review by interested agencies.
Proprietor	A person, firm, association, partnership, corporation or combination of any of them which may hold ownership in land whether recorded or not. "Proprietor" shall be synonymous with "Developer" or "Land owner".
Retention Basin	A stormwater management practice that captures stormwater runoff and does not discharge to a surface water body or watercourse, but allows the water to evaporate or infiltrate into the ground.
Redevelopment	Additions and/or modifications to an existing development.
Riprap	A combination of large stone, cobbles, and boulders used to line channels, stabilize banks, reduce runoff velocities, or filter out sediment.
Runoff	The excess portion of precipitation that does not infiltration into the ground or is not captured by vegetation, but flows overland to a stream, storm sewer, or water body.
Spillway	A depression in the embankment of a detention basin used to allow overflow of stormwater during storm events in excess of the design storm.
Tailwater	The depth of water at the downstream end of a culvert.
Time of Concentration	The time it takes for surface runoff to travel from the hydraulically farthest portion of a watershed to the design point.