

# **RULES OF THE ST. CLAIR 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

**October 2004**

**Fred Fuller  
St. Clair County Drain Commissioner**

Order of Adoption of Amendments  
To the Rules of the St. Clair 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 stormwater 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 St. Clair County Drain Commissioner were adopted and published by Drain Commissioner Thomas Donohue effective January 1, 1995, and amended July 14, 2000 effective upon re-publication; and

**Whereas**, it has become necessary to further amend and to clarify certain of those rules.

**Now, Therefore, It Is Hereby Ordered**, that the Rules of the St. Clair County Drain Commissioner are amended to read as follows and such amended rules and shall take effect immediately upon publication, October 1, 2004.

  
Fred Fuller, St. Clair County Drain Commissioner

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## **1.0 INTRODUCTION**

These Rules of the St. Clair County Drain Commissioner are adopted pursuant to 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, convenience, and welfare in regard to matters relating to drainage. These Rules are meant to assist in creating a sustainable, high quality way of life through stewardship of the County’s storm water drainage systems, waterways and watersheds, focusing on the legally established drainage districts and drains within St. Clair County. Specifically, these Rules are designed 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 St. Clair 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 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.

The following discussion outlines basic ideas and principals of storm water 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 immediately in response to site clearing and development of the natural landscape. A site’s existing storm water storage capacity is quickly 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 can no longer penetrate into the ground and runs off of the land. These modifications, along with the installation of drainage facilities, greatly 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 disrupt habitats and reduce the diversity of aquatic species regardless of water quality.

- If infiltration into the underlying water table is reduced, this in turn lowers the level of surface waterbodies that are dependent on groundwater to maintain base flows during dry periods.
- Channel widening and downcutting are the primary consequences of increased runoff rates and flow fluctuations.
- Streambank erosion is accelerated as channels are severely disturbed by undercutting, tree-falls and bank slumping.
- Sediment loads increase sharply due to 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 modify aquatic habitats. Pools and riffles are eliminated as the gradient of the stream adjusts to accommodate frequent floods. Sediment deposition destroys insect and benthic organism 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, the accompanying impervious surfaces 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 are carried by storm water and conveyed through creeks, ditches and storm drains into our rivers and lakes.

In short, the ecology of drains and waterways may be completely re-shaped by the extreme shifts in hydrology, morphology and water quality that can accompany the development process. The stresses that these changes place on the environment, although gradual and often not immediately visible, are profound: Michigan Department of Environmental Quality (MDEQ) 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 reevaluate the way that storm water and land development are managed. The following discussion provides a framework for this reevaluation, which must encompass 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 begin to 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 similar to that which occurred under natural conditions. 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 storm water, and include the following key practices:

- Preservation of existing natural features that perform storm water 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 storm water discharges to open grassed areas such as swales and lawns rather than allowing storm water to run off from impervious areas directly into the storm water 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 storm water 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 storm water 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 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.”

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.

## **2.0 TYPES OF DEVELOPMENTS REQUIRING REVIEW AND A DRAINAGE OR OTHER PERMIT FROM THE DRAIN COMMISSIONER**

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) will 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<sup>1</sup> applies:

### **Condition I**

The proposed development is located within an established drainage district.

### **Condition II**

The proposed development would contribute additional drainage to a legally established drain.

### **Condition III**

Stormwater runoff from the proposed development would potentially increase sediment or contaminant levels within an established drain from point or nonpoint sources of contamination.

### **Condition IV**

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

Outlined below are examples of types of developments and construction activities within the jurisdiction of the Drain Commissioner that are expressly addressed in the referenced subsections of this Section of the Rule and which generally may 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

<sup>1</sup> Minor development, or construction activities such as associated with a typical single-family residence that are not part of a larger common plan or development, may be exempted 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. 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 applies. 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. 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 met 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. 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. 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 applies. 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**

(Pursuant to the general authority of Drain Commissioners under the Drain Code and applicable county or local ordinances.)

### **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. 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 applies. 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. 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 the adequacy of the outlet drainage. 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 applies. 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. 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 manufactured housing developments to minimize potential liability issues associated with any negative impacts to established drains or other watercourses stemming from stormwater or wastewater discharges from such developments.

### **2.5 Commercial or Industrial Developments**

(Pursuant to the general authority of Drain Commissioners under the Drain Code; Drain Code, Sections 425 and 433; and local ordinances.)

Proposed commercial/industrial developments (ex: shopping malls, apartments, schools, general retail and whole sale 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 applies.

### **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. 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 applies. 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 towards and/or empty into an established drain or to any watercourse within an established drainage district, 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: “Permit Authorizing Development or Construction Activity Affecting Drainage.” Unrestricted discharge of stormwater from developments to an established drain or other watercourse within an established drainage district is not acceptable.

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. The proprietor shall also notify the Drain Commissioner at the completion of the project to provide for a final inspection by the Drain Commissioner. 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.

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

A Permit to Cross Drain 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 Permit to Cross Drain, 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 License to Occupy a Drain Right-of-Way 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 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/or 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**

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 Check List (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/developed. The plat/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 the Department of Health 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 detention or retention basins, 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 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
- 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 Check List (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 Environmental Quality, 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 of approval, in lieu of any disapprovals by the Commissioner.

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. Michigan Department of Environmental Quality (MDEQ) Compliance Analysis determination of adequacy, MDEQ Baseline Environmental Assessment determination of adequacy, MDEQ 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 storm water 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-builts" will be kept on file with Drain Commissioner for permanent public record.

### **3.4 Procedures for Appeal from 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 St. Clair County Drain Commissioner within 60 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 30 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 60 days of the appeal if no hearing is requested. If a hearing is

requested and held, the final decision shall be made within 60 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**

Other otherwise noted, the following design standards and requirements apply to construction plans submitted for review by the St. Clair County Drain Commissioner for all types of developments or drain-related construction activities.

### **4.1 General**

- A. 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.
- B. Plans shall include a grading plan showing existing and proposed topographic contour lines and proposed finish floor and basement floor elevations.
- C. 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. Note, MDEQ and/or the Army Corp. of Engineers may also require permits for changes made to such watercourses.
- D. No construction activities shall be allowed without approval of the Drain Commissioner in a 100-year floodplain as determined by the Drain Commissioner.
- E. 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.
- F. 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.”
- G. The engineer's seal shall be affixed to all sheets of 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:

1. Proposed open drains shall have a minimum right-of-way of 40 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 20 feet must be maintained from the top-of-bank to the edge of the right-of-way to allow for maintenance of the drain.
  2. Proposed enclosed drains shall have a minimum right-of-way of 40 feet centered on the centerline of the enclosure.
  3. 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. Prefomed 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 MDEQ.)
- F. Sodding, seeding, and mulching with a drain right-of-way shall be done in accordance with the requirements “Erosion and Sedimentation Control Program of the St. Clair 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 with 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. The calculations shall be consistent with the “Example Storm Sewer Design Table” in Appendix K.
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 Com-

missioner 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**

- A. The required discharge capacity for each reach of open channel 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 with normal design practice. Where a weighted coefficient is employed, the computations shall be submitted for review.
- B. The peak 10-year flow in each reach of open channel shall remain within the banks of the channel. Off-site tributary area shall be included in the design, or the off-site tributary runoff shall be rerouted around the channel.
- C. 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.
- D. 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.
- E. The minimum acceptable non-siltation velocity should be 1.5 ft/sec.
- F. 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 40 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 20 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.
- G. 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.
- H. 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 Environmental Quality. A copy of the permit obtained from the MDEQ must be submitted to the St. Clair County Drain Commissioner. Culverts with tributary areas of less than 2 square miles must be approved by the St. Clair County Drain Commissioner. Proposed or extended culverts may also require the approval of the St. Clair 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 foot below the road or driveway centerline elevation. 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. St. Clair County Road Commission, MDOT, MDEQ)
- 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 for all culverts in established drains or significant watercourses. The rip-rap provided for the protection of culvert ends shall:
1. extend at least one culvert diameter upstream of the culvert inlet and at least four 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 St. Clair County Road Commission standards.

## **4.6 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 St. Clair 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.
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 St. Clair 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 St. Clair 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 St. Clair 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.

#### **4.6.1 Detention Basins**

A detention basin is a form of detention storage where the stormwater is detained above ground as surface water. A design example for a typical detention basin is presented as Example 1 in Appendix I. An example of a typical detention basin cross section can be found in Appendix L.

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. and 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, including the first flush volume, bankfull flood volume, and 100-year flood volume. (See example Standpipe Details in Appendix L.)
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
 
$$V_{ff} (cf) = 1815 \times A(\text{acres}) \times C$$
, 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
 
$$V_{bf} (cf) = 8170 \times A(\text{acres}) \times C$$

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. (See Example 1: Detention Basin Design in Appendix I.)

3. Orifices should not be less than 1 inch in diameter nor 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 L.)
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 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,  $cf = V_{ff} = 1815 \times A \times C$ )
  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 St. Clair County Department of Public Works. 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.”

#### **4.6.2 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.

## 4.7 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 4.6 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 St. Clair 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 St. Clair County Department of Public Works for requirements regarding 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.

#### **4.8 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 Environmental Quality (MDEQ) through its wetland assessment program. Construction activities to be performed within a regulated wetland may require a permit from the MDEQ 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 4.6.1 Detention Basins or section 4.7 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 MDEQ and/or local municipalities may be required.

## 4.9 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.

## 4.10 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:

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

- 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.

APPENDIX A  
APPLICATION FOR DRAIN COMMISSIONER REVIEW

**Application for Drain Commissioner Review**

**ST. CLAIR COUNTY DRAIN COMMISSIONER  
21 Airport Drive, St. Clair, Michigan 48079**

The undersigned hereby requests the St. Clair County Drain Commissioner review plans for:

\_\_\_\_\_  
Name of project

\_\_\_\_\_  
Signature

**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

- **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 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 Permit to Cross Drain
- **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 License to Occupy a Drain Right-of-Way
- **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 Development Review 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 St. Clair 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  
DEVELOPMENT REVIEW FEES

**ST. CLAIR COUNTY DRAIN COMMISSIONER**

**DEVELOPMENT REVIEW FEES**

Site Plan Size:	Less than <u>5 Acres</u>	5-20 <u>Acres</u>	20-50 <u>Acres</u>	50-100 <u>Acres</u>	Over 100 <u>Acres</u>
Initial Submittal Fees:	\$325.00	\$400.00	\$500.00	\$600.00	\$600.00 + \$3/acre

Resubmittal fee: \$65 per hour. Additional costs for consultants and other expenses necessary in the review or approval will be billed to the applicant at the cost to the Drain Office. If an established county drain or drainage district is involved directly in the development, additional permit and inspection fees may be required for doing work in the drain easement or tapping an outlet into the drain.

APPENDIX C

DRAINAGE PERMIT:  
APPLICATION AND PERMIT AUTHORIZING DEVELOPMENT  
OR CONSTRUCTION ACITIVITIES AFFECTING DRAINGE  
PURSUANT TO SECTION 2.0 OF RULES OF THE ST. CLAIR COUNTY DRAIN  
COMMISSIONER

St. Clair County Drain Commissioner  
21 Airport Drive  
St. Clair, Michigan 48079

Permit No. \_\_\_\_\_

Fee Deposit: \_\_\_\_\_

**DRAINAGE PERMIT**  
**Application for and Permit Authorizing Development**  
**or Construction Activities Affecting Drainage Pursuant to Section 2.0**  
**of Rules of the St. Clair County Drain Commissioner**

Pursuant to applicable provisions of the Rules of the St. Clair County Drain Commissioner and the Drain Code of Michigan, 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 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 St. Clair County.

This permit is granted 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.

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 these 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. The notification may be sent by facsimile to this phone number: (810) 364-7240. Confirmation of the facsimile should be saved.

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, and Drain Commissioner 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 from meeting any other permit requirements of law or other public bodies or agencies. It is their responsibility to secure any additional local, state, or federal permits required.

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

**Permit Issued by St. Clair County Drain Commissioner on:** \_\_\_\_\_

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Title

APPENDIX D

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

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

\_\_\_\_\_ Drain Drainage District, St. Clair County

This instrument made and entered into this \_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_, by and between Fred Fuller, St. Clair County Drain Commissioner (herein "Drain Commissioner"), 2 Airport Drive, St. Clair, Michigan 48079, 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 St. Clair 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, storm water 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, St. Clair County, MI  
Acting in St. Clair County, Michigan  
My commission expires:

Witnessed:

\_\_\_\_\_ Drainage District  
Drain Commissioner

\_\_\_\_\_

By: Fred Fuller, St. Clair County  
Drain Commissioner

Subscribed and sworn to before me this  
\_\_\_\_\_ day of \_\_\_\_\_, \_\_\_\_\_.

\_\_\_\_\_

Notary Public, St. Clair County, MI  
Acting in St. Clair County, Michigan  
My commission expires:

Drafted by and return to:

Fred Fuller  
St. Clair County Drain Commissioner  
21 Airport Drive  
St. Clair, MI 48079

APPENDIX E

EXAMPLE PERMIT STATUS TABLE

### Example Permit Status Table

Permit	Agency	Reason for Permit	Application Date	Date Issued
Soil Erosion Control Permit	SCC Dept. of Public Works	Soil to be disturbed during construction activities	4/10/03	5/5/03
Road Commission Permit	SCC Road Commission	Public roads proposed	4/15/03	5/10/03
Inland Lakes and Streams Permit	MDEQ/Army Corp.	Proposed culvert has more than 2 square miles tributary area	5/25/03	6/15/03
Wetlands Permit	MDEQ/Army Corp.	Construction of parking lot will disturb existing wetlands	5/25/03	6/15/03
Drainage Permit	SCC Drain Commissioner	Proposed discharge of flow to established drain	4/20/03	
Permit to Cross Drain	SCC Drain Commissioner	Proposed culvert in established drain	4/20/03	
License to Occupy Drain Right-of-Way	SCC Drain Commissioner	Proposed relocation of drain reach	4/20/03	
NPDES Phase II Permit	MDEQ	More than 1 acre to be disturbed during construction	4/15/03	
MDOT Permit	MDOT	Proposed driveway construction in MDOT R.O.W.	4/30/03	

APPENDIX F

PRELIMINARY PLAT REQUIRED ITEM CHECK LIST

DEVELOPMENT NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

LOCATION: \_\_\_\_\_ REVIEWED BY: \_\_\_\_\_

### CHECK LIST FOR PRELIMINARY PLATS/PLANS

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

	<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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 St. Clair 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)	_____	_____	_____	_____

		<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
15.	Proposed Improvements	_____	_____	_____	_____
16.	Plat Boundary	_____	_____	_____	_____
17.	Identification of all adjoining parcels (For subdivisions show Lot Number, Subdivision Name, Liber and 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 Department of Health are acceptable.	_____	_____	_____	_____
29.	Existing Contours	_____	_____	_____	_____
30.	Easements (w/dimensions, utility and existing drain easements.)	_____	_____	_____	_____

		<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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 CHECK LIST

DEVELOPMENT NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

LOCATION: \_\_\_\_\_ REVIEWED BY: \_\_\_\_\_

### CHECK LIST FOR CONSTRUCTION PLANS

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

	<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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	_____	_____	_____	_____

	<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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	_____	_____	_____	_____

		<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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. 50 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 (40 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 ft below roadway/driveway	_____	_____	_____	_____
55.	Culvert 100-yr headwater does not flood structures	_____	_____	_____	_____
56.	Reasonable tailwater used	_____	_____	_____	_____

		<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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	_____	_____	_____	_____

		<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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	_____	_____	_____	_____

	<u>SHOWN</u>	<u>NOT SHOWN</u>	<u>APPROVED</u>	<u>NOT APPROVED</u>
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 \_\_\_\_\_, 2004, 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 St. Clair, State of Michigan, (hereinafter "Development") described as:

See legal description attached hereto as Exhibit 1.

**WHEREAS**, the Developer has divided the Development into Lots for the purpose of residential home sites. The Development is known as \_\_\_\_\_;

**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 St. Clair 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 St. Clair 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 St. Clair 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 budget 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 be 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 to 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 St. Clair 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 St. Clair 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 fail 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 St. Clair 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 St. Clair 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 St. Clair County Drain Commissioner.

Dated this \_\_\_\_\_ day of \_\_\_\_\_, 2004.

DEVELOPER:

\_\_\_\_\_

State of Michigan            )  
  ) SS:  
County of St. Clair         )

On this \_\_\_\_\_ day of \_\_\_\_\_, 2004, 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.

\_\_\_\_\_

Clair County, MI  
County, MI  
Expires: \_\_\_\_\_

Notary Public, St.  
Acting in St. Clair  
My Commission

Drafted By:  
  
Timothy J. Lozen, Esq.  
901 Huron Ave., Ste. 4  
Port Huron, MI 48060

When Recorded Return To:  
  
[Developer]

### Example Maintenance Plan and Budget for Development X\*

<u>Component</u>	<u>Maintenance Activity</u>	<u>Frequency</u>	<u>Estimated Cost</u>	<u>Annual Budget</u>
Catch Basin Sumps	Inspect for sediment accumulation and debris	Annually	\$100	\$100
	Remove sediment accumulation and debris	Every 5-10 years	\$1000	\$200
Storm Sewers	Inspect for sediment accumulation	Annually	\$100	\$100
	Remove sediment accumulation	Every 5-10 years	\$1000	\$200
	Inspect structural elements and compare to as-built construction plans	Every 5 years	\$200	\$200
Detention Basin	Mow	At least 3 times/year	\$200	\$200
	Inspect for sediment accumulation and debris	Annually	\$100	\$100
	Remove debris	Annually	\$100	\$100
	Remove sediment accumulation	Every 5-10 years	\$2000	\$400
	Replace gravel jacket around outlet structure	Every 3-5 years	\$500	\$500
	Inspect emergency overflow for erosion	Annually	\$100	\$100
	Reestablish as-built overflow elevation	As needed	\$1000 / 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	\$200	\$200
	Inspect for sediment accumulation and debris	Annually	\$100	\$100
	Remove debris	Annually	\$100	\$100
	Remove sediment accumulation	Every 5-10 years	\$1000	\$200
	Inspect banks for erosion	Annually	\$100	\$100
	Reestablish vegetation on eroded slopes	As needed	\$500 / 5 years	\$100
	Record Keeping	Record all inspections and maintenance activities	As performed	\$100
Adjust estimated costs for maintenance activities		Every five years	\$100 / 5 years	\$20
			<hr/>	
			<b>Total Annual Budget:</b>	<b>\$3400</b>

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

## APPENDIX I

### EXAMPLE STORMWATER SYSTEM DESIGN PROBLEMS

### Example 1: Detention Basin Design

A 10-acre parcel is to be developed into a single-family residential subdivision. A detention basin will be provided to control the release of stormwater runoff to a nearby established drain. No off-site area drains onto or across the developing site.

A hydraulic analysis of the proposed storm sewer indicates that the design water elevation of the basin cannot exceed elevation 585.00 ft to maintain the hydraulic grade line in the storm sewer at least one foot below all catch basin and manhole rim elevations. The bottom of the detention volume in the basin must be at or above the invert of the storm sewer conveying the basin outflow to the receiving watercourse. It must also be above base flow elevation in the drain and above the groundwater table. The receiving watercourse in this case is an existing established drain, which maintains a dry weather base flow with a depth of approximately 6 inches. At the location where the detention basin outlet pipe will tap the drain, the drain bottom is at elevation 580.00 ft. The basin outlet will be located 400 feet away from the drain. The groundwater table was determined by soil borings to be at elevation 578.00 ft.

STEP 1. Size the storm sewer extending from the basin to the drain.

The 10-year peak flow to the basin =  $Q_{10} = C \times I \times A$

$C_{\text{weighted}} = 0.34$        $C_{\text{weighted}} = (20\% \text{ impervious})(0.9) + (80\% \text{ pervious})(0.2) = 0.34$

$T = 28$  minutes (determined by storm sewer design calculations)

$I = 175 / (T + 25) = 3.30$  in/hr

$A = 10$  acres

$Q_{10} = C \times I \times A = (0.34) \times (3.30 \text{ in/hr}) \times (10 \text{ acres}) = 11.2$  cfs

At slope of 0.16%, a 27-inch concrete storm sewer would have a capacity of 12.5 cfs.

Therefore, use 27-inch storm sewer at 0.16%.

STEP 2. Set basin floor (or permanent pool) elevation.

Sewer invert at basin outlet = Receiving watercourse bottom elevation + (length of  
outlet sewer) x (slope of outlet sewer)

Sewer invert at basin outlet =  $580.00 + 400 \text{ ft} \times 0.0016 = 580.64$  ft

Since the base flow in the drain is at elevation 580.50 ft, and the groundwater table is at elevation 578.00 ft, the sewer invert at the basin outlet (elev. 580.64 ft) will control the minimum elevation of the detention volume in the basin.

Set basin floor (or permanent pool) elevation to at or above 580.64 feet, say 581.00 feet.

STEP 3. Determine the required basin volume for 100-year storm.

$$A = 10 \text{ acres}$$

$$Q_{\text{allowable}} = Q_a = 0.15 \text{ cfs/ac} \times 10 \text{ ac} = 1.5 \text{ cfs}$$

$$Q_o = Q_a / A C = 1.5 \text{ cfs} / (10 \text{ ac} \times 0.34) = 0.441 \text{ cfs/impervious acre}$$

$$\text{Storage Time} = T = -25 + \sqrt{10,312.5 / Q_o} = 127.9 \text{ minutes}$$

$$\text{Volume per impervious acre} = V_s = 16,500 T / (T + 25) - 40 Q_o T = 11,546 \text{ cf / imp-ac}$$

$$\text{Required Storage Volume} = V_s \times A \times C = (11,546) \times (10 \text{ ac}) \times (0.34) = 39,256 \text{ cf}$$

STEP 4. Design the basin outlet standpipe.

$$\text{Available basin depth} = 585.00 \text{ ft} - 581.00 \text{ ft} = 4.0 \text{ ft}$$

Stage-Storage Curve for proposed basin (assume 1:6 side slopes):

Elev (ft)	Area (sf)	Depth (ft)	Volume (cf)	Cumulative Volume (cf)
585.0	15,625	1	14,197	41,668
584.0	12,769	1	11,485	27,471
583.0	10,201	1	9,061	15,986
582.0	7921	1	6,925	6,925
581.0	5929	1	0	0

First Flush

$$\text{First Flush Storage Volume} = 0.5 \text{ in} \times 10 \text{ ac} \times 0.34 \times 43,560 \text{ sf/ac} \times 1 \text{ ft}/12 \text{ in} = 6171 \text{ cf}$$

Depth of First Flush Volume in proposed basin:

$$(6925 - 6171 \text{ cf}) / (6925 - 0 \text{ cf}) = (582.0 \text{ ft} - \text{FF Elev.}) / (582.0 - 581.0 \text{ ft})$$

$$\text{FF Elev.} = 581.89 \text{ ft}$$

Release First Flush Volume over 24 hours:

$$Q_{\text{average}} = 6171 \text{ cf} / 24 \text{ hrs} \times 1 \text{ hr}/3600 \text{ s} = 0.071 \text{ cfs}$$

Average head on orifice outlet:

$$H_{\text{average}} = 2/3 (581.89 - 581.0 \text{ ft}) = 0.593 \text{ ft}$$

Area of First Flush orifices:

$$A_{\text{ff}} = 0.071 \text{ cfs} / 0.62 \text{ sqrt}(2 \text{ g } H_{\text{average}}) = 0.019 \text{ sf}$$

Since a 1-inch orifice has an area of 0.00545 sf, use three 1-inch orifices in 36-inch standpipe at elev. 581.00 ft

### Bankfull Flood

$$\text{Bankfull Flood Vol.} = 2.25 \text{ in} \times 10 \text{ ac} \times 0.34 \times 43,560 \text{ sf/ac} \times 1 \text{ ft}/12 \text{ in} = 27,770 \text{ cf}$$

Depth of Bankfull Flood Volume in proposed basin:

$$(41,668 - 27,770 \text{ cf}) / (41,668 - 27,471) = (585.0 - \text{BF Elev.}) / (585.0 - 584.0 \text{ ft})$$

$$\text{BF Elev.} = 584.02 \text{ ft}$$

Release Bankfull Flood Volume over 24-48 hours.

Determine discharge rate of Bankfull Flood Volume through First Flush orifices:

$$H_{\text{average}} = 2/3 (584.02 - 581.0 \text{ ft}) = 2.01 \text{ ft}$$

$$Q_{\text{ff}} = 0.62 (3) (0.00545 \text{ sf}) \text{ sqrt}(2 \text{ g } H_{\text{average}}) = 0.115 \text{ cfs}$$

Check detention time for Bankfull Flood Volume:

$$27,770 \text{ cf} / 0.115 \text{ cfs} \times 1 \text{ hr}/3600 \text{ s} = 67 \text{ hrs}$$

Since this exceeds the desired 48-hour maximum detention time, additional orifices are required at Elev. 581.89 ft

$$\text{Bankfull Flood Volume above Elev. 581.89 ft} = 27,770 \text{ cf} - 6171 \text{ cf} = 21,599 \text{ cf}$$

Release Bankfull Flood Volume through Bankfull Flood orifices over 24 hours:

$$Q_{\text{average}} = 21,599 \text{ cf} / 24 \text{ hrs} \times 1 \text{ hr}/3600 \text{ s} = 0.250 \text{ cfs}$$

Average head on Bankfull Flood orifices:

$$H_{\text{average}} = 2/3 (584.02 - 581.89 \text{ ft}) = 1.42 \text{ ft}$$

Area of Bankfull Flood orifices:

$$A_{\text{bf}} = 0.250 \text{ cfs} / 0.62 \text{ sqrt}(2 \text{ g } H_{\text{avg}}) = 0.042 \text{ sf}$$

Use seven 1-inch orifices in 36-inch standpipe at elev. 581.89 ft

### 100-year Flood

Depth of 100-year Flood Volume in proposed basin:

$$(41,668 - 39,256 \text{ cf}) / (41,668 - 27,471) = (585.0 - \text{Elev.}) / (585.0 - 584.0 \text{ ft})$$

$$\text{Elev.} = 584.83 \text{ ft}$$

Determine discharge rate of 100-year Flood Volume through First Flush and Bankfull Flood orifices:

$$Q_{\text{bf}} = 0.62 (7) (0.00545 \text{ sf}) \sqrt{2 g (584.83 - 581.89 \text{ ft})} = 0.325 \text{ cfs}$$

$$Q_{\text{ff}} = 0.62 (3) (0.00545 \text{ sf}) \sqrt{2 g (584.83 - 581.00 \text{ ft})} = 0.159 \text{ cfs}$$

Determine discharge rate of 100-year Flood Volume through 100-year Flood orifices:

$$Q_a - Q_{\text{bf}} - Q_{\text{ff}} = 1.5 - 0.325 - 0.159 \text{ cfs} = 1.016 \text{ cfs}$$

Average head on 100-year Flood orifices:

$$H_{\text{average}} = 2/3 (584.83 - 584.02 \text{ ft}) = 0.54 \text{ ft}$$

Area of 100-year Flood orifices at Elev. 584.02 ft:

$$A = 1.016 \text{ cfs} / (0.62 \sqrt{2 g H_{\text{average}}}) = 0.278 \text{ sf}$$

Since a 2-inch orifice has an area of 0.022 sf, use twelve 2-inch orifices at Elev. 584.02 ft

STEP 5. Verify that at least one foot of freeboard is being provided.

Design water elevation = 584.83 ft

Detention basin banks and surrounding ground elevation = 587 ft +/-

Therefore, more than two feet of freeboard are being provided.

STEP 6. Design overflow spillway.

Peak 10-year flow into basin = 11.2 cfs

Since head over weir must be less than 2 feet so as not to exceed the available freeboard,

$$Q = C \times L \times H^{1.5}$$

$$L = Q / (C \times H^{1.5})$$

$$L = 11.2 \text{ cfs} / (3 \times 2^{1.5})$$

$$L = 1.32 \text{ ft, say } 2 \text{ ft}$$

Set length of overflow spillway to at least 2 feet.

## Example 2: Retention Basin Design

A 10-acre parcel is to be developed into a single-family residential subdivision. A retention basin will be provided to capture the stormwater runoff from the site. No off-site area drains onto or across the developing site.

A hydraulic analysis of the proposed storm sewer indicates that the design water elevation of the basin cannot exceed elevation 585.00 ft to maintain the hydraulic grade line in the storm sewer at least one foot below all catch basin and manhole rim elevations. The bottom of the retention volume in the basin must be at or above the groundwater table, which was determined by soil borings to be at elevation 578.00 ft.

STEP 1. Determine the soil types in the tributary area (from the United States Department of Agriculture Soil Survey for St. Clair County), and classify these soil types by Hydrologic Soil Group (per Michigan Department of Environmental Quality's "Computing Flood Discharges for Small Ungaged Watersheds" by Sorrell, July 2003).

50% Hydrologic soil group A

50% Hydrologic soil group B

The retention basin will be located in an area that (primarily) consists of soils from hydrologic soil group B.

STEP 2. Determine the weighted Runoff Curve Number for the site (per SCS Method).

For this example, assume initially that the retention basin area will be 10% of the area of the site.

<u>Hydrologic Soil Group</u>	<u>Percent of Total Drainage Area</u>	<u>Land Use</u>	<u>Percent of Soil Group</u>	<u>RCN</u>	<u>Partial RCN</u>
A	59	Single-fam. Res. (1/4-ac)	100	61	36.0
B	41	Single-fam. Res. (1/4-ac)	76	75	23.4
		Retention basin	24	100	9.9
Composite RCN =					69.3

STEP 3. Determine the 100-year, 24-hour precipitation total for the area, P

Per Huff and Angel (1992), the 100-year, 24-hour storm consists of 4.5 inches of rainfall (P = 4.36).

STEP 4. Calculate the storage, S (per SCS Method).

$$S = 1000 / \text{RCN} - 10 = 1000 / 69.3 - 10 = 4.43 \text{ in}$$

STEP 5. Calculate the stormwater runoff for a 100-year, 24-hour storm, SRO (per SCS Method).  
 $SRO = (P - 0.2S)^2 / (P + 0.8S) = (4.36 - 0.2 \times 4.43)^2 / (4.36 + 0.8 \times 4.43) = 1.53$  in

STEP 6. Determine the runoff volume for a 100-year, 24-hour storm from the site.

$$\text{Runoff Volume} = 1.53 \text{ in} \times 10 \text{ acres} \times 1 \text{ ft}/12 \text{ in} \times 43,560 \text{ sf}/1 \text{ ac} = 55,500 \text{ cf}$$

STEP 7. Determine stage-storage curve for proposed retention basin.

The available storage must equal or exceed twice the runoff volume for a 100-year, 24-hour storm:  $2 \times 55,500 = 110,000$

Stage-Storage Curve (assume 1:6 side slopes):

Elev (ft)	Area (sf)	Depth (ft)	Volume (cf)	Cumulative Volume (cf)
585.0	39,200	1	35,984	127,456
584.0	32,768	1	29,840	88,256
583.0	26,912	1	24,272	58,416
582.0	21,632	1	19,280	34,144
581.0	16,928	1	14,864	14,864
580.0	12,800	1	0	0

STEP 8. Determine the design water elevation (DWE) in the retention basin.

$$(127,456 - 110,000 \text{ cf}) / (127,456 - 88,256) = (585.0 - \text{DWE}) / (585.0 - 584.0 \text{ ft})$$

$$\text{DWE} = 584.58 \text{ ft}$$

STEP 9. Check assumption that retention basin area is approximately 10% of total site area.

Design water elevation is 584.58 ft, say 585 ft

Area of basin at elevation 585 feet is 39,200 sf

Basin area is approximately  $39,200 \text{ sf} / 435,600 \text{ sf} = 9.0\%$  of total area

Assumption that basin area is about 10% of total area is valid.

STEP 10. Verify that at least one foot of freeboard is being provided.

Design water elevation = 584.58 ft

Retention basin banks and surrounding ground elevation = 587 ft +/-

More than two feet of freeboard are being provided.

STEP 11. Design overflow spillway.

Peak 10-year flow into basin,  $Q = C \times I \times A$

$$Q = 0.35 \times 175 / (T + 25) \times 10 \text{ ac, where } T \text{ is estimated to be 20 minutes}$$

$$Q = 13.6 \text{ cfs}$$

Since head over weir must be less than 2 feet so as not to exceed the available freeboard,

$$Q = C \times L \times H^{1.5}$$

$$L = Q / (C \times H^{1.5})$$

$$L = 13.6 \text{ cfs} / (3 \times 2^{1.5})$$

$$L = 1.6 \text{ ft, say 2 ft}$$

Set length of overflow spillway to at least 2 feet.

### Example 3: Culvert Design Calculation

A 12-acre parcel is to be developed into an apartment complex. The entrance driveway to the development will cross an established drain that flows west along the roadside. A 60-ft. culvert is proposed to allow the flow in the drain to cross the entrance driveway. The proposed development drains via overland flow south into the drain. Nine acres of undeveloped land just north of the proposed subdivision drains across the site to the drain. Further upstream in the watershed, another ten acres of single-family residential subdivision and eight acres of undeveloped area also drains into drain. (See figure below.)

STEP 1. Determine the peak design flow to the proposed culvert.

A USGS map indicates that the proposed site and upstream off-site area are tributary to the proposed culvert, as well as a 10-acre residential subdivision and an 8-acre undeveloped parcel. Since less than 2 square miles of area are tributary to the culvert, the culvert will be designed for the 10-year peak flow per county standards, rather than for the 100-year peak flow per state standards.

All the area except the 10-acre undeveloped parcel will pass through detention, so assume a peak flow from this tributary area of 0.2 cfs/acre.

$$Q_{\text{detention}} = (12 + 9 + 10 \text{ acres}) \times 0.2 \text{ cfs/acre} = 6.2 \text{ cfs}$$

Assume that the future use of the undeveloped area is multiple-family residential, but without detention. Use Rational Method to estimate the 10-year peak flow from this area.

$$Q_{\text{future multiple-family residential}} = C I A$$

$$Q_{\text{future multiple-family residential}} = 0.5 \times (175 / T + 25) \times 8 \text{ acres} \quad \text{Estimate } T = 20 \text{ min}$$

$$Q_{\text{future multiple-family residential}} = 0.5 \times 3.89 \text{ in/hr} \times 8 \text{ acres}$$

$$Q_{\text{future multiple-family residential}} = 15.6 \text{ cfs}$$

Add peak flows:

$$Q_{\text{total}} = 15.6 + 6.2 = 21.8 \text{ cfs}$$

STEP 2. Estimate tailwater elevation for proposed culvert.

The typical cross-section of the drain is 4 feet deep, with a 1-ft bottom width and 1:3 side slopes. The typical drain slope downstream of the proposed culvert is 0.002 (0.2%). Using Manning's equation, the normal depth of flow for 21.8 cfs in this drain would be

$$Q = 1.49 R_h^{0.67} S^{0.5} A / n \quad \text{where } R_h = \text{hydraulic radius of flow}$$

$$= \text{area} / \text{wetted perimeter}$$

$$S = \text{slope of drain}$$

$$A = \text{area of flow}$$

n = channel roughness (assume 0.04)

Solving for the normal depth of flow yields:

$$y_n = 1.94 \text{ feet} = \text{tailwater elevation for culvert}$$

STEP 3. Through successive iterations, size culvert so that the headwater remains at least one foot below driveway and roadway elevations, and the backwater does not extend beyond the limits of the site.

Use Federal Highway Administration standard inlet and outlet control nomographs. (See following pages for culvert design calculations and nomographs.) Assume the proposed culvert is a round, corrugated metal pipe (CMP).

Propose two parallel 24-inch CMP culverts at a slope of 0.2% with upstream and downstream invert elevations: 800.12 ft and 800.00 ft, respectively.

Per FHA nomographs, Inlet control headwater elev. = 801.88 ft  
Outlet control headwater elev. = 802.74 ft

Therefore, the culverts will be under outlet control with a headwater elev. = 802.74 ft

Since the proposed driveway centerline elevation is 804.0 ft, the headwater elevation is more than one foot below the banks.

The elevation of the normal depth of flow at the upstream property line is greater than 804.0 ft. The backwater would not extend onto upstream off-site property.

STEP 4. Verify that 100-year peak flow headwater elevation will remain below adjacent proposed and existing structures.

All the area except the 10-acre undeveloped parcel will pass through detention, so assume a peak flow from this tributary area of 0.2 cfs/acre.

$$Q_{\text{detention}} = (12 + 9 + 10 \text{ acres}) \times 0.2 \text{ cfs/acre} = 6.2 \text{ cfs}$$

Assume that the future use of the undeveloped area is multiple-family residential, but without detention. Use Rational Method to estimate the 100-year peak flow from this area.

$$Q_{\text{undeveloped}} = C I A$$

$$Q_{\text{undeveloped}} = 0.5 \times (275 / T + 25) \times 8 \text{ acres} \quad \text{Estimate } T = 20 \text{ minutes}$$

$$Q_{\text{undeveloped}} = 0.5 \times 6.11 \text{ in/hr} \times 8 \text{ acres}$$

$$Q_{\text{undeveloped}} = 24.4 \text{ cfs}$$

Add peak flows:

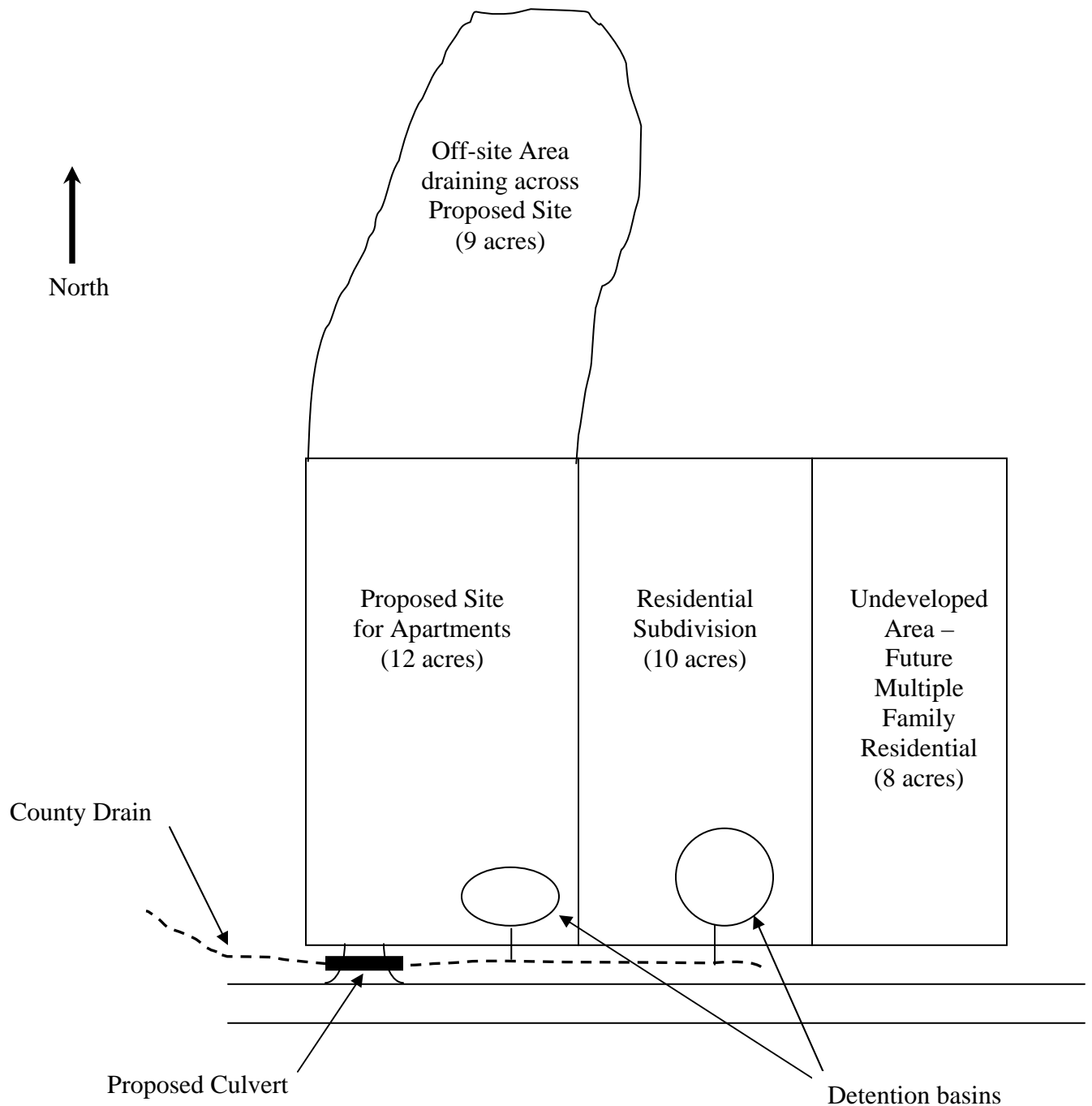
$$Q_{\text{total}} = 24.4 + 6.2 = 30.6 \text{ cfs}$$

Using Manning's equation to find the tailwater on the culvert yields

$$y_n = 2.22 \text{ feet} = \text{tailwater elevation for culvert}$$

The culvert nomographs indicate that the culvert would be under outlet control with a headwater elevation of 803.77 feet.

The lowest nearby structure has a finished floor elevation of 805.0 feet. Therefore, all nearby structures would be above the 100-year headwater elevation for the culvert.



[Insert Culvert Design Form here]

[Insert Chart 2 here]

[Insert Chart 6 here]

[Insert Figure 5.23 here]

APPENDIX J  
REFERENCE TABLES

Table J-1. Rational Method Runoff Coefficients

<u>Surface</u>	<u>Runoff Coefficient (C)</u>
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

<u>Sewer Diameter (in)</u>	<u>Minimum Slope (%)</u>
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

<u>Sewer Material</u>	<u>Typical Manning “n” Roughness Values</u>	<u>Conservative Manning “n” Roughness Values</u>
Concrete, Clay	0.013	0.014
Corrugated metal	0.024	0.026
Plastic (smooth lined)	0.010	0.011

APPENDIX K

EXAMPLE STORM SEWER DESIGN TABLE

## EXAMPLE STORM SEWER DESIGN TABLE

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14	Col. 15	Col. 16	Col. 17	Col. 18	Col. 19	Col. 20	Col. 21	Col. 22	Col. 23	Col. 24
From MH/CB	To MH/CB	A (acres)	C	CA	+CA	T (min)	I (in/hr)	Q=CIA (cfs)	pipe diam. (in)	pipe slope (%)	length (ft)	Veloc. full (fps)	Time flow (min)	Capacity (cfs)	EGL (ft) Up	EGL (ft) Down	HGL (ft) Up	HGL (ft) Down	Friction Loss (ft)	Minor Loss K	Minor Loss (ft)	Ground Elev. (ft) Up	Ground Elev. (ft) Down
CB1	CB2	0.42	0.5	0.21	0.21	15.00	4.38	0.92	12	0.33	112	2.61	0.71	2.05	602.95	602.88	602.85	602.77	0.07	0.3	0.03	606.00	605.57
CB2	CB3	0.45	0.5	0.23	0.44	15.71	4.30	1.87	12	0.33	30	2.61	0.19	2.05	602.85	602.77	602.74	602.66	0.08	0.3	0.03	605.57	605.39
CB3	MH4	0.30	0.5	0.15	0.59	15.91	4.28	2.50	15	0.25	120	2.64	0.76	3.24	602.73	602.56	602.63	602.45	0.18	0.3	0.03	605.39	605.20
MH4	CB5	0.00	0.5	0.00	0.59	16.66	4.20	2.46	15	0.25	79	2.64	0.50	3.24	602.52	602.41	602.42	602.30	0.11	0.3	0.03	605.20	605.00
CB5	CB6	0.25	0.5	0.13	0.71	17.16	4.15	2.95	15	0.25	60	2.64	0.38	3.24	602.38	602.25	602.27	602.14	0.12	0.3	0.03	605.00	604.10
CB6A	CB6	0.40	0.5	0.20	0.20	15.00	4.38	0.88	12	0.33	63	2.61	0.40	2.05	602.29	602.25	602.18	602.15	0.04	0.3	0.03	604.30	604.10
CB6	BASIN	0.25	0.5	0.13	1.04	17.54	4.11	4.26	18	0.22	135	2.80	0.80	4.94	602.22	<b>602.00</b>	602.10	601.88	0.22	0.3	0.04	604.10	604.00

Column 1: Catch basin, inlet, or manhole at upstream end of storm sewer reach.

Column 2: Catch basin, inlet, or manhole at downstream end of storm sewer reach.

Column 3: Area directly tributary to catch basin or inlet at upstream end of storm sewer reach.

Column 4: Imperviousness coefficient for area directly tributary to catch basin or inlet at upstream end of storm sewer reach.

Column 5: Area X imperviousness coefficient for area directly tributary to catch basin or inlet at upstream end of storm sewer reach.

Column 6: Cumulative (Area X imperviousness coefficient) for all area tributary to storm sewer reach.

Column 7: Travel time for runoff to arrive at upstream end of storm sewer reach.

Column 8: Rainfall intensity for 10-year storm,  $I = 175 / (T + 25)$ .

Column 9: Peak flow in sewer reach for 10-year design storm,  $Q = C I A$ .

Column 10: Diameter of storm sewer reach.

Column 11: Slope of storm sewer reach. (Must meet or exceed minimum slope for sewer diameter specified in Column 10. See Table J-2 for minimum storm sewer slopes.)

Column 12: Length of storm sewer reach from catch basins/manholes in Columns 1 and 2.

Column 13: Velocity of peak flow from Column 9 assuming full pipe. (Not velocity of Manning capacity flow.) Should be above 2.5 fps to prevent siltation.

Column 14: Travel time along sewer reach.

Column 15: Sewer capacity per Manning Equation. Must be greater than peak flow in Column 9.

Column 16: Energy grade line elevation at upstream end of sewer reach for peak flow in Column 9.  $EGL\ Up = EGL\ Down + friction\ loss\ along\ sewer$ .

Column 17: Energy grade line elevation at downstream end of sewer reach for peak flow in Column 9.  $EGL\ Down = EGL\ Up\ for\ downstream\ sewer + Minor\ loss\ at\ manhole$ . (or critical depth plus velocity head if free outfall into downstream manhole). Value in lowest row of table represents receiving water energy grade line elevation (usually full detention basin water elevation).

Column 18: Hydraulic grade line elevation at upstream end of sewer reach for peak flow in Column 9.  $HGL\ Up = EGL\ Up - Velocity\ head$

Column 19: Hydraulic grade line elevation at downstream end of sewer reach for peak flow in Column 9.  $HGL\ Down = EGL\ Down - Velocity\ head$  (or critical depth if free outfall into downstream manhole).

Column 20: Friction loss along storm sewer reach for peak flow in Column 9.

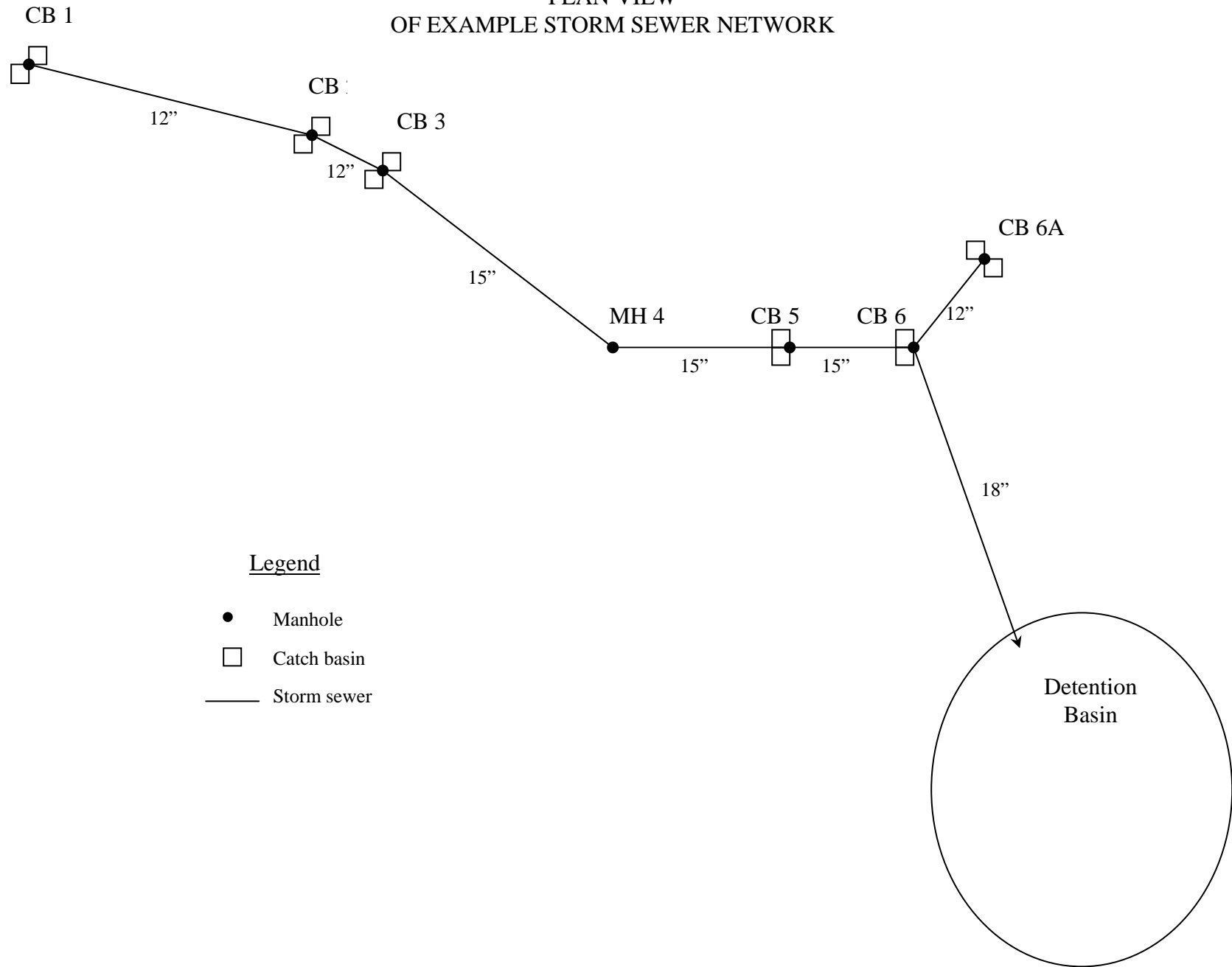
Column 21: Minor loss coefficient for manhole loss at upstream end of sewer reach. May be neglected if conservative Manning "n" assumed for pipe roughness. (See Table J-3 for normal Manning "n" values or conservative Manning "n" values.)

Column 22: Minor loss at manhole at upstream end of storm sewer reach. May be neglected if conservative Manning "n" assumed for pipe roughness. (See Table J-3 for normal or conservative Manning "n" values.)

Column 23: Rim elevation of upstream catch basin or manhole. Hydraulic grade line elevation in Column 18 must be at least one foot below this elevation per Drain Commissioner's standards.

Column 24: Rim elevation of downstream catch basin or manhole. Hydraulic grade line elevation in Column 19 must be at least one foot below this elevation per Drain Commissioner's standards.

PLAN VIEW  
OF EXAMPLE STORM SEWER NETWORK



Legend

- Manhole
- Catch basin
- Storm sewer

## STORM SEWER DESIGN FORM

Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7	Col. 8	Col. 9	Col. 10	Col. 11	Col. 12	Col. 13	Col. 14	Col. 15	Col. 16	Col. 17	Col. 18	Col. 19	Col. 20	Col. 21	Col. 22	Col. 23	Col. 24
From MH/CB	To MH/CB	A (acres)	C	CA	+CA	T (min)	I (in/hr)	Q=CIA (cfs)	pipe diam. (in)	pipe slope (%)	length (ft)	Veloc. full (fps)	Time flow (min)	Capacit y (cfs)	EGL (ft) Up	EGL (ft) Down	HGL (ft) Up	HGL (ft) Down	Friction Loss (ft)	Minor Loss K	Minor Loss (ft)	Ground Elev. (ft) Up	Ground Elev. (ft) Down

Column 1: Catch basin, inlet, or manhole at upstream end of storm sewer reach.

Column 2: Catch basin, inlet, or manhole at downstream end of storm sewer reach.

Column 3: Area directly tributary to catch basin or inlet at upstream end of storm sewer reach.

Column 4: Imperviousness coefficient for area directly tributary to catch basin or inlet at upstream end of storm sewer reach.

Column 5: Area X imperviousness coefficient for area directly tributary to catch basin or inlet at upstream end of storm sewer reach.

Column 6: Cumulative (Area X imperviousness coefficient) for all area tributary to storm sewer reach.

Column 7: Travel time for runoff to arrive at upstream end of storm sewer reach.

Column 8: Rainfall intensity for 10-year storm,  $I = 175 / (T + 25)$ .

Column 9: Peak flow in sewer reach for 10-year design storm,  $Q = C I A$ .

Column 10: Diameter of storm sewer reach.

Column 11: Slope of storm sewer reach. (Must meet or exceed minimum slope for sewer diameter specified in Column 10. See Table J-2 for minimum storm sewer slopes.)

Column 12: Length of storm sewer reach from catch basins/manholes in Columns 1 and 2.

Column 13: Velocity of peak flow from Column 9 assuming full pipe. (Not velocity of Manning capacity flow.) Should be above 2.5 fps to prevent siltation.

Column 14: Travel time along sewer reach.

Column 15: Sewer capacity per Manning Equation. Must be greater than peak flow in Column 9.

Column 16: Energy grade line elevation at upstream end of sewer reach for peak flow in Column 9.  $EGL\ Up = EGL\ Down + friction\ loss\ along\ sewer$ .

Column 17: Energy grade line elevation at downstream end of sewer reach for peak flow in Column 9.  $EGL\ Down = EGL\ Up\ for\ downstream\ sewer + Minor\ loss\ at\ manhole$ . (or critical depth plus velocity head if free outfall into downstream manhole). Value in lowest row of table represents receiving water energy grade line elevation (usually full detention basin water elevation).

Column 18: Hydraulic grade line elevation at upstream end of sewer reach for peak flow in Column 9.  $HGL\ Up = EGL\ Up - Velocity\ head$

Column 19: Hydraulic grade line elevation at downstream end of sewer reach for peak flow in Column 9.  $HGL\ Down = EGL\ Down - Velocity\ head$  (or critical depth if free outfall into downstream manhole).

Column 20: Friction loss along storm sewer reach for peak flow in Column 9.

Column 21: Minor loss coefficient for manhole loss at upstream end of sewer reach. May be neglected if conservative Manning "n" assumed for pipe roughness. (See Table J-3 for normal Manning "n" values or conservative Manning "n" values.)

Column 22: Minor loss at manhole at upstream end of storm sewer reach. May be neglected if conservative Manning "n" assumed for pipe roughness. (See Table J-3 for normal or conservative Manning "n" values.)

Column 23: Rim elevation of upstream catch basin or manhole. Hydraulic grade line elevation in Column 18 must be at least one foot below this elevation per Drain Commissioner's standards.

Column 24: Rim elevation of downstream catch basin or manhole. Hydraulic grade line elevation in Column 19 must be at least one foot below this elevation per Drain Commissioner's standards.

APPENDIX L

EXAMPLE DETENTION BASIN DETAILS

[Insert Figure 1 here – Detention Basin Cross-Section]

[Insert Figure 2 here – Standpipe Details]

[Insert Figure 3 – Double Standpipe Details]

APPENDIX M

EXAMPLE BEST MANAGEMENT PRACTICES (BMPS) FOR OIL REMOVAL

### Oil Removal BMP – Low Oil Application

For low oil applications, a typical detention basin outlet may be equipped with an oil skimmer, consisting of a non-leaching absorbent material, connected to the rim of the standpipe with a non-degradable line or rope. A typical standpipe would require one 13-inch x 13-inch packet of absorbent material that converts liquid petroleum hydrocarbons into a manageable solid waste (i.e. not a hazardous waste). An acceptable product would be the “Smart Sponge® Passive Skimmer” or equal. The length of the connecting line should be such that the skimmer, when hanging freely, rests above the crown of the outlet pipe extending from the standpipe. The skimmer shall not cause an obstruction to the flow exiting the standpipe. Additional information on the “Smart Sponge® Passive Skimmer” can be found on the following page.

### Oil Removal BMP – High Oil Application

For high oil applications, one or more prefabricated oil/grit separator units may be required. The following design standards shall apply to such units:

- Each oil separator shall serve no more than one acre of (impervious) area.
- The separator shall be designed to pass the ten-year design storm without hydraulic interference.
- Oil separators shall consist of at least three chambers: a sediment chamber, an oil chamber, and a discharge chamber.
- The first two chambers shall provide at least 400 cubic feet of grit storage, with permanent pool depth of at least 4 feet.
- The first and second chambers (sediment chamber and oil chamber) shall be hydraulically connected by two 6-inch orifices protected by a trash rack. The orifices shall be located at least 4 feet above the separator floor.
- The second and third chambers (oil chamber and discharge chamber) shall be hydraulically connected by an inverted elbow at least 18 inches in diameter, 3 feet in length and at least one foot above the oil chamber floor.
- A manhole shall be provided to each chamber for maintenance.
- The outlet from the oil separator shall not be submerged by the receiving watercourse during a 10-year design storm.

[Insert Passive Skimmer Spec Sheet here]

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 <i>Guidebook of Best Management Practices for Michigan Watersheds</i> .
Construction Plans	Detailed plans showing the existing and proposed features of a proposed development and engineering calculations supporting the design of the proposed features.
County Drain	A drain which has been designated as an Established Drain wholly within St. Clair 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 St. Clair, 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 St. Clair 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 1967, 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.