Larry Davis, Arenac County Drain Commissioner
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March 16, 2010

The Land Division Act (formerly the Subdivision Control Act of 1967) requires the County Drain Commissioner to publish rules governing the internal and external drainage of proposed subdivisions and the outlet for drainage. The rules are designated to assist land developers by providing uniform procedures to be followed in the processing of subdivision plats.

IT IS HERBY ORDERED that the "Rules of the County Drain Commissioner pursuant to Section 105 © of Act 288 of the Public Act of Michigan 1967, as amended" are hereby amended and shall be followed in the processing of all subdivision plats, the improvement of all drainage which is now or will come under the jurisdiction of the office of the Arenac County Drain Commissioner.

IT IS HEREBY FURTHER ORDERED that the effective date of the following rules shall be the 1st day of March 2010.

Sincerely,

Larry Davis
Arenac County Drain Commissioner
120 N. Grove, Courthouse
Standish, MI 48658
(989-846-2011)

I. INTRODUCTION

A. The Objective of the Storm Water Management Plan

Act 288 of the Public Acts of 1967 is known as the Land Division Act (formerly the Subdivision Control Act of 1967). The Drain Commissioner of Arenac County, through legislative enactment, has acquired jurisdiction over established county drains and may under the terms of this Act acquire jurisdiction of drainage systems within subdivided lands and drains external to the proposed development after January 1, 1968. In accordance with the provisions of the Act, the Drain /Commissioner has the right to require that County Drains, both within and outside the plat, be approved to the standards established by the Drain Commissioner. The Act also makes it possible for the Proprietor to record a plat before the required improvements are made, provided a satisfactory bond is deposited with the Drain Commissioner to insure performances. All plats to be recorded with the Register of Deeds must be in conformity with this Act.

This Storm Water Management Plan will establish the framework through which storm water detention measures and the design of storm water collection systems will be implemented. L This Plan will also ensure that the present storm water collection systems are able to manage the increased amounts of storm water resulting from development and redevelopment. The Plan requires storm water management design practices that will help to minimize the impacts of proposed development or redevelopment projects on the existing drainage systems.

The Plan explains the proactive approach to managing storm water and will detail the process that must be followed to gain approval for new developments or redevelopment projects.

In addition, the Plan will help to insure that adequate drainage systems are being constructed for future developments within Arenac County. Finally, this Plan is intended to aid developers in the design of their storm water runoff collection and detention systems.

The Storm Water Management Plan includes:

1. A summary of the administrative procedures including meeting Requirements, review procedures, inspection requirements, fee schedule, issuance of permits, enforcement, and penalties.

2. A description of design calculations, standards, and guidelines.

3. Application for permit to connect and discharge clean storm Water to an established county drain.

4. Application for permit to tile an established county drain.

5. Application for permit to cross or parallel an established County drain.

6. Application for a special temporary culvert permit.

7. Complete storm water design submittal summary.

8. Storm water management checklist.

Compliance with this Storm Water Management Plan does not preclude the applicant from obtaining any or all other State, Federal, or Local Permits and approvals which may be required.

B. Administration of the Storm Water Management Plan

The Storm Water Management Plan will be implemented and operated by the Arenac County Drain Commissioner and/or his/her designee. The Drain Commissioner will be responsible for the review of new development and redevelopment plans and for the installation and maintenance of measures within Arenac County to accomplish the plan. The Drain Commissioner will work in conjunction with the necessary regulatory agencies, as well as architectural and engineering consultants, landowners, and developers within Arenac County.

Storm Water Management - Post Construction Controls and Design Standards

for

Commercial, Industrial & Subdivision Site Development

Issued by
Larry Davis
Arenac County Drain Commissioner

The Storm Water Design Standards contained herein will apply to all Commercial, Industrial and Subdivision Site Developments proposed or constructed within Arenac County.

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I. INTRODUCTION

A. The Objective of the Storm Water Management Plan.

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The Storm Water Management Plan includes:

1. A summary of the administrative procedures including meeting requirements, review procedures, inspection requirements, fee schedule, issuance of the permit, enforcement, and penalties, and other agency requirements.

2. A description of design calculations, standards, and guidelines.

3. A storm water permit application and drainage design checklist.

B. Administration of the Storm Water Management Plan.

The Storm Water Management Plan will be implemented and operated by the Arenac County Drain Commissioner and/or his/her designee. The Drain Commissioner will be responsible for the review of new development and redevelopment plans and for the installation and maintenance of measures within Arenac County to accomplish the plan. The Drain Commissioner will work in conjunction with the necessary regulatory agencies, as well as, architectural and engineering consultants, land owners, and developers within Arenac County.

II. ADMINISTRATION

A. Definitions

For the purpose of this storm water management plan, the following definitions are adopted:

Allowable Discharge: The restricted discharge from a site after development or redevelopment as calculated in accordance with the Storm Water Management Plan.

Base Flood Elevation: The elevation delineating the flood level having a one-percent probability of being equaled or exceeded in any given year (also known as the 100-year flood elevation), as determined from Flood Insurance Rate Maps (FIRMs) or the best available information.

Bankfull Flood event: studies have shown that development and cause stream flow fluctuations that can precipitate erosive events. To help alleviate this condition storm water discharges from site developments into erosive areas may have to capture and slowly discharge this event, this is the volume of the 1.5 yr 24 hour storm event or 8170 x Contributing Area x Weighted Runoff Coefficient. **NOTE:** The release rate is between 28 and 48 hours.

Best Management Practices (BMPs): Structural, vegetative or managerial practices used to protect and improve the quality of surface water and groundwater.

Bio-filtration: is a soil filtration system. Principal components of the system (figures 1&2) include:

- a pretreatment grass filter strip,
- surface planting with woody and herbaceous plant species,
- a surface 2-3 inch thick mulch layer,
- a minimum 2 foot thick sandy loam or loamy sand soil-textured planting soil media (See specifications),
- a 6-inch thick sand layer, and
- Perforated PVC pipe under-drainage within a 15-inch thick gravel bed protected with geo-textiles.

Bio-swale: Drainage channels that divert runoff water from the storm sewer into a natural area where native wetland plants help absorb and recycle it. Plants like grasses, rushes, native plants, other water and drought tolerant flowers and bushes are commonly found in bioswales because they help to trap the water and force it to absorb, rather than flowing through the bio-swale to the other side. It should be noted that these systems are generally dry most of the time and do not have standing water

in them.

Commissioner: The Drain Commissioner of the County of Arenac, State of Michigan.

Conduit: Any channel, pipe, sewer or culvert used for the conveyance or movement of water whether open or closed.

Control Elevation: Contour lines and points of predetermined elevation used to denote a detention storm area on a plat or site drawing.

Complete Storm Water Discharge Permit Submittal: Includes a completed permit application (Appendix A), three sets of plans, three sets of calculations, a completed drainage checklist (Appendix A), deposit/fee for review and inspection in accordance with Arenac County Drain Commissioners requirements. The plans and calculations shall comply with the requirements of this Storm Water Management Plan.

Design Discharge Rate: Unit allowable discharge rate per acre of land proposed for development or redevelopment.

Design Imperviousness Factor (IMP): The actual proposed percentage of impervious surface for a proposed development or redevelopment. The IMP is used to calculate the design discharge (Qd). The design discharge is used to determine storm sewer sizes and required detention volumes. Minimum IMP's are 30% for residential, 60% for multi-family residential, 70% for commercial, 75% for industrial.

Detention Facility: A facility constructed or modified to restrict the flow of storm water to a prescribed maximum rate and to concurrently detain the excess waters that accumulate behind the outlet.

Detention Storage: The temporary detaining or storage of storm water in a storage basin, on rooftops, in streets, parking lots, school yards, parks, open space, or other areas under predetermined and controlled conditions, with the rate of drainage therefrom regulated by appropriately installed devices. These detention storage areas shall not be considered regulated wetlands.

Developer/Owner Engineer: The engineering person, firm or corporation formally designated by the Developer/Owner to act as its Engineer.

Development: The construction of a building, parking lot, structure, etc. on a piece of land or otherwise changing the use of a piece of land. Typically, development occurs to property, which is vacant of any significant infrastructure or building.

Discharge: The release or outflow of water from any source.

Drainage Area (also Drainage District): The area from which storm water runoff is conveyed to a single outlet (i.e. a watershed or catchment area).

Easement: A parcel of land on which the owner has granted rights-of-way to make surveys, lay, construct, maintain, operate, alter, replace, repair, and remove at any time that part of the storm drainage system located within the easement. The landowner will not be allowed to construct buildings or other structures on said easement without the written consent of the easement grantee.

Engineer: The engineering person, firm or corporation formally designated by the Arenac County Drain Commissioner to act as its Engineer.

Excess Storm Water Runoff: The volume and rate of flow of storm water discharged from a drainage area, which is in excess of the allowable discharge.

Emergency Overflow: A hydraulic control structure used to control the location and flow direction of storm water which is either in excess of the required detention storage or is due to a failure in the site's storm water management system. The emergency overflow shall be directed to a public road right-of-way or to an available municipal storm drainage system.

Emergency Overflow Elevation: The elevation at which emergency overflow is activated.

First Flush: The first 0.5 inch of a rain or precipitation event from the entire site or contributing watershed. By capturing and treating the first 0.5 inch of runoff, pollutants that are washed off of the land can be removed from the storm water before it leaves the site. Required by MDEQ (DNRE) before discharge into any waters of the State. Calculated by: 1815 x Contributing Area x Weighted Runoff Coefficient **Note:** The release rate must be between 18 and 24 hours.

Floodplain: The special flood hazard lands adjoining a water-course, the surface elevation of which is lower than the Base Flood Elevation and is subject to periodic inundation determined from Flood Insurance Rate Maps (FIRMs) or the best available information. A parcel of land can be located within a floodplain without being shown on a FIRM map.

Impervious Surface: A surface, which does not easily allow the infiltration or penetration of water. During rainstorm events a large percentage of water will runoff. (i.e. rooftops, paved walks, roadways, driveways, sidewalks, gravel, etc.)

Low Impact Development (LID): Implementation of developmental strategies or best management practices in a manner that maintains predevelopment hydrology, or decreases runoff quantity, and improves runoff quality. These BMPs are recommended to be used whenever possible as they can improve water quality in our region.

NPDES Phase II General Permit: NPDES Phase II general permit to discharge storm water from a municipality, industrial site or a construction site disturbing one or

more acres. After March 10, 2003, the developer is required to obtain a NPDES permit to discharge storm water from site developments or soil disturbances of 5 acres or more. An area of disturbances of 1 to 5 acres comes under the permit by rule. These permits are a regulatory requirement to help in cleaning up waters of the nation.

Peak Flow: The maximum rate of flow of storm water runoff at a given location.

Percent Impervious: Percentage of total site area, which is, or is proposed to be, an impervious surface.

Pervious Surface: A surface, which allows infiltration or penetration of water. During rainstorm events a percentage of water will infiltrate into the surface with the remaining storm water running off. The percentage of runoff is dependent on the type, slope, percent saturation, etc. of the surface. (i.e. lawns, farm fields, parks, wooded areas, golf courses, etc.)

Proprietor: Any Person, Design Engineer employed by the Developer, Firm Association, Partnership, Corporation, or combination of any of them, who submits a plat for processing under the Land Division Act

Rain Gardens: A depressed area of a size that was determined by specified engineering guidelines with amended soils and specific plants, shrubs, and trees that has a specific volume to store storm water runoff.

Redevelopment: Construction which increases the impervious percentage of a site on which development has previously occurred upon or construction in which existing impervious surfaces are altered in any way.

Rear lot drainage: A storm water system designed to provide drainage in rear lot areas to prevent water from ponding for extended periods of time. It must be noted that these systems are not designed to convey storm water in a rapid manner. It is a deliberately designed system that can provide additional detention capabilities during severe runoff conditions. It is a system that in condo or subdivisions is the responsibility of the owner to maintain. Rear Lot systems are not the county's responsibility. The county may repair the system if necessary to prevent damage to neighboring properties, but all associated repair costs, plus a 20% administrative fee will be passed on to the owner of the property or home/condo owners association where the repair takes place.

Restrictor: A hydraulic control structure used to restrict the storm water discharge from the site to the allowable discharge of the site as determined by this plan. Simple restrictors such as the orifice or metering line are outlined in this plan. For more complex restrictors a stage/storage/discharge relation shall be required in the complete submittal and may alter the storage requirements for the site.

Retention Storage: The permanent retaining or storage of storm water in a storage basin, on rooftops, in streets, parking lots, school yards, parks, open space, or other areas under predetermined and controlled conditions. The only discharge of storm water from the retention storage area is by ground infiltration, evaporation, etc. An emergency overflow must be provided in the event the capacity of the retention facility is exceeded. These detention storage areas shall not be considered regulated wetlands.

Soil Erosion Permit: A soil erosion permit is required prior to final approval.

Storm Water Runoff: The water from a rainstorm or snowmelt, which flows over the surface of the ground or is collected in a drainage system.

Sub-Surface Detention Storage: Detention storage that is provided in underground storage facilities such as pipes, arch systems (Cultec, Stormtech or similar), or tanks. Detention storage within aggregate bedding or backfill will not be accepted.

Ten-Year Design Storm: A precipitation event with a duration equal to the time of concentration, having a ten percent probability of occurring in any given year or occurring once every 10 years on average (10% recurrence interval).

Time of Concentration: The elapsed time for storm water runoff to flow from the most distant point in a drainage area to the outlet or other predetermined point.

Unit Allowable Discharge: Unit allowable discharge rate per acre of land proposed for development or redevelopment. Design discharge rates will be 0.25 cfs per acre. Under certain conditions may be lower.

Upland Area: Land located in the upper portion of a watershed whose surface drainage flows toward the area being considered for development.

Urbanization: The development, change, or improvement of any parcel of land consisting of one or more lots for residential, commercial, industrial, institutional, recreational, or public utility purposes.

Watercourse: Any natural or artificial stream, river, creek, channel, ditch, canal, conduit, culvert, drain, waterway, gully, ravine, street, roadway, swale, or wash in which water flows in a definite direction, either continuously or intermittently.

Waters of the State: Means any of the following: The Great Lakes bordering the State and their connecting waters, all inland lakes, Rivers, Streams, Impoundments Open Drains, and other surface bodies of water within the jurisdiction of the state, including wetlands as defined by Part 303 of PA 451 of 1994. In Arenac County, that would include the Pine, Rifle and Au Gres Rivers, Saganing Creek and other streams that have a defined bed and bank, and established flow.

B. Review Procedure.

A site plan will be considered in compliance when a storm water permit has been issued. The Drain Commissioner will not accept runoff into drainage systems located within Arenac County from newly developed or redeveloped sites unless they are in compliance with the Storm Water Management Plan.

If the development or redevelopment is a subdivision or condominium the Subdivision Control Procedures Pursuant to Act 288 of 1967, as Amended in Appendix D must be followed. All other developments or redevelopments must complete the following steps to comply with the Storm Water Management Plan:

1. Preliminary Layout

A meeting can be requested with the Drain Commissioner to review preliminary or conceptual development plans. Conceptual storm water management alternatives can be discussed and potential problems addressed prior to the design phase of the project. The goal is to eliminate potential problems up front and reduce the time and costs needed for the design and review of the project.

The owner/developer's engineer and/or the Drain Commissioner should have in his possession or have an understanding of the following information prior submitting or discussing the conceptual layouts.

a. A location map of the site and the applicable drainage district map(s).

b. Location and description of activities that may impact or be impacted by the proposed development or redevelopment both on and off the site.

c. Acreage of the total site, acreage of the lands currently draining overland the site, and acreage of land upstream of the site which contributes runoff to the existing storm drain outlet.

d. The size and location of the existing storm drain outlets for the proposed site.

e. A conceptual layout of the proposed storm drainage system for the development or redevelopment.

f. Knowledge of whether the proposed drainage system is going to be owned and maintained privately or publicly.

After review of preliminary information and conceptual layout of the storm drainage system, the owner/developer will provide a complete storm water discharge permit submittal to the Drain Commissioner. This action will initiate the request for a formal review process.

2. **Formal Review.**

   a. The owner/developer or his/her representative shall submit a complete storm water discharge permit submittal.

   b. An incomplete submittal will be returned to the owner/developer and the review process will not begin until a complete storm water discharge permit submittal is provided.

   c. The Drain Commissioner and/or his/her Engineer will review the submittal for compliance with the Arenac County Storm Water Management Plan. All materials will be reviewed for completeness. Calculations will be checked. The minimum design calculations and design standards outlined in this document will be used for review. The drainage plan checklist will be reviewed. The proposed drainage system will be either approved or rejected with comments and returned to the owner/developer.

   d. If the proposed drainage system is rejected, a revised storm water discharge permit request will need to be re-submitted with the corrected revisions.

C. Plan Approval/Issuance of Storm Water Permit.

When the storm water permit submittal fulfills the requirements of the Arenac County Storm Water Management Plan, the Drain Commissioner's Engineer will stamp three copies of the plans as approved. One set will be sent to the applicant, one set to the Drain Commissioner, and one set will be kept on file with the Drain Commissioner's Engineer. A Storm Water Discharge Permit will be issued to the applicant and copies will be forwarded to the Drain Commissioner. The permit will include inspection requirements, compliance requirements, date of issuance, date of expiration, etc. A copy of a sample permit has been included in Appendix A.

If a storm water permit has not been issued, then no plan or part of any plan has been approved by the Drain Commissioner. Furthermore, any proposed construction has not been authorized.

D. Changes to Plan after Approval.

1. Any changes made to the approved plan after issuance of the storm water permit shall require the submittal of three sets of plans to the Drain Commissioner for review and approval.

2. Upon receipt of this information, it will be determined if additional information, such as calculations, revised checklist, etc. will be required.

3. The fee for review of any changes to the plan, after approval, will be billed on an hourly basis. An occupancy permit will not be issued until all changes have been approved and the Drain Commissioner has received all review fees.

E. Inspection Requirements.

The Drain Commissioner's Engineer will complete inspection. General inspection requirements are outlined below and specific inspection requirements will be outlined on the storm water management permit.

1. **Small Developments/Redevelopments (Less than 3 acres).**

   a. The Drain Commissioner's Engineer must be informed three (3) working days in advance of required inspections as outlined on the storm water discharge permit. Also, two (2) working days will be required by the Drain Commissioners Engineer to analyze the survey inspection results.

   b. The Drain Commissioner's Engineer will complete a detailed elevation and location survey of all storm water detention facilities upon completion of construction. This includes verification of the constructed storm water detention capacity, the elevation of the emergency overflow, the location of storm water detention top of storage contour lines, and the restrictor size and location. Inspection reports will be completed and kept on file.

   c. The Owner/Developer's Engineer must provide a letter of certification indicating that construction was completed in accordance with the storm water discharge permit.

2. **Large Developments/Redevelopments (3 acres and greater).**

   a. Items E(1)(a) through E(1)(c) above, as stated under small developments/redevelopments, shall also apply for large developments or redevelopments of three (3) acres and greater.

   b. The Drain Commissioner's Engineer will complete periodic site inspections during construction to verify site compliance with the storm water permit. Inspection reports will be completed and kept on file. Site inspections that indicate non-compliance with the storm water permit must be addressed immediately. Corrective measures may be necessary to insure compliance with the storm water permit.

3. **Platted Developments and Condominium Projects.**

   a. Items E(1)(a) through E(1)(c) above, as stated under small developments/redevelopments, shall also apply to platted developments and condominium projects.

   b. The Drain Commissioner's Engineer will complete periodic site inspections during construction to verify site compliance with the storm water permit. Inspection reports will be completed and kept on file. Site inspections that

indicate non-compliance with the storm water permit must be addressed immediately. Corrective measures may be necessary to insure compliance with the storm water permit. The Drain Commissioner may require that their engineer complete full-time construction inspection reports or may require that daily construction inspection reports be provided for review and approval. This would only apply for the installation of storm drainage systems located within rights-of-way or for systems that are to be maintained by the Drain Commissioner. The decision to require full-time inspection will be made based on the results of the initial periodic site inspections and observed construction procedures.

c. An occupancy permit will not be issued until a letter of certification has been received by the Drain Commissioner and until a final inspection which verifies that the constructed storm water detention facilities strictly comply with the storm water discharge permit. Several inspections may be completed if requirements are not met in the initial inspection.

d. Sites that cause drainage problems on neighboring parcels after construction must meet with the Drain Commissioner and the engineer to resolve the situation. Corrections to drainage problems will be the responsibility of the property owner and must be completed within the time frame agreed upon at the meeting.

F. Fee Schedule.

A cash deposit is required when the owner/developer presents the Complete Storm Water Discharge Permit Submittal to the Drain Commissioner. The amount of deposit will be established upon receiving the permit.

A fee for review of the submittal, the issuance of the storm water permit, and the inspection of the storm water drainage systems will be deducted from the cash deposit. The fee amount will be based on the actual hours required by the Drain Commissioner's Engineer to complete the review and inspection process. Developments which require multiple reviews or additional inspection requirements due to non-compliance with the storm water permit will result in larger fees. It should be noted that larger developments will require larger fees.

The owner/developer will receive a refund or be billed the difference between the deposit and the actual fee for completing the review.

G. Penalties/Enforcement.

The County Building Inspector will not issue an Occupancy Certificate nor will the Drain Commissioner accept storm water into their drainage system without complete compliance with the storm water permit, Storm Water Management Plan and Construction Standards.

H. Development Exemptions.

Construction may be exempt from obtaining a storm water permit if the proposed impervious surface (new or replacement of existing) is less than 5% of the surface area of the existing site impervious surfaces. This will include cumulative improvements over time. Any proposed impervious surface (new or replacement of existing) which exceeds 5,000 square feet must obtain a storm water permit.

Example 1: An existing 1 acre site with 0.75 acres of impervious surface proposes to repave 3,000 square feet of an existing parking lot. Five percent of 0.75 acres is 1633.5 square feet. Since the proposed impervious surface exceeds 5% of existing, a storm water permit is required.

Example 2: An existing site is developed one year at a 2% increase. Two years later, it is redeveloped with a 2% increase of impervious. Four years later, it is redeveloped and the percent of impervious is increased by 3%. The last redevelopment has a 7% increase in impervious and requires a storm water management plan.

An exemption from a storm water permit will be coordinated with the Drain Commissioner.

I. Appeals Process.

If the owner/developer has a conflict with any of the reviews or inspections made by the Drain Commissioner and/or the Drain Commissioners Engineer, an appeal can be made to the Arenac County Drain Commissioner's office within 30 days of the review and/or inspection.

III. STORM DRAINAGE SYSTEMS JURISDICTIONS

Arenac County Drain Commissioner. The Arenac County Drain Commissioner has jurisdiction over established county drains. Proposed developments which outlet directly to an established county drain, and sites needing plat approval, must have storm water management plans submitted, reviewed and approved by the Arenac County Drain Commissioner.

The Arenac County Soil Erosion Officer issues soil erosion and sedimentation control permits. A soil erosion and sedimentation control permit is required for any developments disturbing more than one acre of land or within 500 feet of waters of the state (see definition).

Arenac County Road Commission. The Arenac County Road Commission has or shares the jurisdiction over drainage along county roads and county rights-of-way. Sites located along county road rights-of-way and discharging to Road Commission drainage systems must obtain a permit from the Road Commission. When a crossing is installed over a county roadside drain, a permit must be obtained from the Road Commission.

Michigan Department of Transportation (M.D.O.T.). The Michigan Department of Transportation has or shares jurisdiction over drainage along state highways and state rights-of-way. Sites located along M.D.O.T. rights-of-way and discharging to M.D.O.T. drainage systems must obtain a permit from M.D.O.T.

Michigan Department of Environmental Quality (M.D.E.Q.). The Michigan Department of Environmental Quality has jurisdiction over proposed work within the 100-year floodplain, inland lake and stream areas, and wetland areas. A permit must be obtained for work proposed in these areas. NOTE: the Michigan Department of Environmental Quality may change its name to the Department of Natural Resources and Environment (DNRE)

In addition, the M.D.E.Q. (DNRE) is responsible for implementing the National Pollution Discharge Elimination System (NPDES) Storm Water Permitting Program for municipal, industrial and construction activities.

IV. DESIGN CALCULATIONS

It must be shown that proposed property development will not significantly alter storm water flows from existing conditions upstream or downstream of the property.

A. Allowable Discharge Rate (Qa)

The storm water discharge rate from any proposed development or redevelopment site shall be restricted to an allowable discharge (Qa). The allowable discharge required by the Arenac County Drain Commissioner shall be 0.25 cfs/acre. NOTE: if the discharge is to a drain with restricted flow or other conditions that deem the drain is in poor condition this rate may be lowered to 0.15 cfs/acre

Calculate the allowable discharge (Qa) in cubic feet per second (cfs):

$Qa = (qa)(A_{site})$

Qa - Allowable Discharge Rate (cfs).

qa - Unit Allowable Discharge (cfs).

Asite - Proposed site area in acres

B. Discharge Restrictor Requirements

A restrictor regulates the discharge of storm water to the allowable discharge rate (Qa) established for a site. Restrictors may be an in-line plate restrictor or a metering line of 20 feet in length or less.

Calculate the maximum area of circular in-line plate restrictor (amax) in square feet based on the orifice formula:

amax = Qa/[0.62 (64.4 h)^1/2]

amax = maximum area of orifice (sq. ft.).

h = head differential (ft) between the 8/10 line of outlet pipe and maximum water surface elevations.

Calculate the metering line based on Manning's formula:

Q_a = (1.49/n)(amax)(R^2/3)(S^1/2)

R = Hydraulic Radius (ft)

S = Hydraulic Slope (ft/ft) which is (h)/(Length of metering line).

n = Manning's Roughness Coefficient

C. Storm Water Detention Requirements

The storm water detention storage required for a site is calculated as follows:

Verify that the actual discharge rate is equal to or less than the allowable discharge rate.

$$Qr = (0.62)(ar)[(64.4h)^{1/2}]$$

Qr = Actual discharge rate.

ar = Designed restrictor area.

Calculate the maximum flow rate per acre of impervious surfaces (Qo):

$$Qo = Qr / (A \times Cw)$$

A = total acres of proposed site.

Cw = Weighted runoff coefficient (see table in Section G)

Calculate the time (T) in minutes at which the maximum volume of storage will occur on site for the 100-year design storm (1% recurrence interval):

$$T = [(8925/Qo)^{1/2}] - 20$$

Calculate the maximum volume (Vs) of storage in cubic feet per acre of impervious surface:

$$Vs = [(14280)(T) / (T + 25)] - (40)(Qo)(T)$$

Calculate the total volume of storage (Vt) in cubic feet required for the site (Vt):

$$Vt = (Vs)(A)(Cw)$$

D. Storm Water Conveyance Requirements (10-year)

The 10-year design discharge (Qd10) for the proposed subwatershed in which the development or redevelopment is located in will be used to size the storm sewer. Land use assumptions will be in accordance with current zoning requirements.

Calculate the 10-year design discharge (Qd10) in cubic feet per second for a site using the Modified Rational Method in the following form:

$Qd10 = (Ci)(A)[(I)(IMP)/100] + (Cp)(A)[(I)(100-IMP)/100]$

A = Total catchment acreage (including offsite drainage)

Ci = Impervious runoff coefficient (0.8)

Cp = Pervious runoff coefficient (0.2)

I = Design Rainfall Intensity (in/hr)

When the time of concentration (tc) is found to be greater 30 minutes, Calculate rainfall intensities (I) according to the following equation:

$I_{10} = 175 / (25 + tc)$

When the time of concentration (tc) is found to be less than 30 minutes, Calculate the rainfall intensities (I) according to the following equation. If tc is calculated to be less than 15 minutes, use tc equal to 15 minutes:

$I_{10} = 136 / (20 + tc)$

E. Storm Water Conveyance Requirements

The 25-year design discharge (Qd25) for the proposed subwatershed in which the development or redevelopment is located in will be used to size the storm sewer. Land use assumptions will be in accordance with current zoning requirements.

Calculate the 25-year design discharge (Qd25) in cubic feet per second for a site using the Modified Rational Method in the following form:

$$Qd25 = (Ci)(A)[(I)(IMP)/100] + (Cp)(A)[(I)(100-IMP)/100]$$

A = Total catchment acreage (including offsite drainage)

Ci = Impervious runoff coefficient (0.8)

Cp = Pervious runoff coefficient (0.2)

I = Design Rainfall Intensity (in/hr)

Calculate rainfall intensitities (I) according to the following equation:

$$I = 215 / (25 + tc)$$

F. Time of Concentration

The time of concentration (tc) is the time it will take for runoff from the most hydraulically distance point (i.e. high elevation) to reach the design point (i.e. low elevation such as a catch basin or an outlet sewer).

Calculate the time of concentration (tc) in minutes:

tc = [L / (v)(60)] + lag

L = Overland Flow Length (ft)

v = Overland Flow Velocity (1 - 2.5 ft/s)

lag = Lag Time (15 - 20 minutes)

The average velocity for overland drainage for the Arenac County Drain Commissioner will range between 1.0 fps and 2.5 fps based on overland slope and land use. Lag time will range between 15 min and 20 min. When calculating time of concentration (tc), include all assumptions with calculations.

NOTE: If a State of Michigan Regulatory agency (MDEQ / DNRE) requires a first flush or bankfull calculation for volumes the formula is in the Definitions area of this manual. Contact the Drain Commissioner's engineer for calculation of release rates.

G. RUNOFF COEFFICIENT:

The runoff coefficient must be determined on the basis of the projected development using the following:

TYPICAL C COEFFICIENTS FOR 5- TO 10-YR FREQUENCY DESIGN

DESCRIPTION OF AREA	RUNOFF COEFFICIENTS
Business	
Downtown areas	0.70 – 0.95
Neighborhood areas	0.50 – 0.70
Residential	
Single-family areas	0.30 – 0.50
Multiunits – detached	0.40 – 0.60
Multiunits – atttached	0.60 – 0.75
Residential (suburban)	0.25 – 0.40
Apartment dwelling areas	0.50 – 0.70
Industrial	
Light areas	0.50 – 0.80
Heavy areas	0.60 – 0.90
Parks, cemeteries	0.10 – 0.25
Playgrounds	0.20 – 0.35
Railroad yard areas	0.20 – 040
Unimproved areas	0.10 – 0.30
Streets	
Asphalt	0.70 – 0.95
Concrete	0.80 – 0.95
Brick	0.70 – 0.85
Drives and walks	0.75 – 0.85
Roofs	0.75 – 0.95
Lawns, sandy soil	
Flat, 2%	0.05 – 0.10
Average, 2 – 7%	0.10 – 0.15
Steep, 7%	0.15 – 0.20
Lawns, heavy soil	
Flat, 2%	0.13 – 0.17
Average, 2 – 7%	0.18 – 0.22
Steep, 7%	0.25 – 0.35

V. DESIGN STANDARDS

A. Requirements

1. General

a. Design projects shall be developed in accordance with the following flood frequencies:

100-year storm for (obtain flow rates from MDEQ):

- Culverts or bridges crossing state highways where the upstream drainage area is in excess of two square miles.
- Detention ponds.
- Drainage enclosures in excess of 100 feet where the upstream drainage area is in excess of two square miles.

25-year storm for:

- County road cross culverts and bridges.
- Open channel development or improvement (flow to be contained within the channel).
- Drain enclosures where drainage area is greater than 300 acres but less than two square miles.

For improvements in this category, the Proprietor's engineer shall design the structure without appreciably altering the flood stage of the channel. The effect of the 100-year flood flow must also be shown.

10-year storm for:

- Open channels, culverts or drain enclosures where the drainage area is not in excess of 300 acres.

b. Storm water detention requirements for any new construction development, redevelopment, or land use change must be in compliance with the storm water management plan and construction must be in compliance with the storm water permit.

c. The peak runoff rate during a 10-year storm event from a developed or improved site shall not exceed the allowable discharge rate (Qa). This rate is determined as outlined in the design calculations section of this plan.

d. Engineering calculations must be submitted with the storm water discharge permit application. The calculations shall follow the procedures outlined in this document.

e. Roof drains may be connected to a storm sewer system if the flow through the outlet to the Arenac County Drain Commissioner's system is properly restricted. Unrestricted runoff from the roof drain will not be accepted. There will be no exemptions.

f. The owner/developer and Arenac County Drain Commissioner shall make a determination as to whether any or all of the facilities proposed are to become privately or publicly maintained as part of the Arenac County drainage system, Arenac County Road Commission drainage system, or the Michigan Department of Transportation drainage system.

g. The Drain Commissioner's Engineer shall in the case of a proposed subdivision, make a determination as to those control elevations that shall be entered on the final plat or make a determination as to the necessity for deed restrictions on any particular lot in said subdivision requiring the preservation of mandatory drainage facilities.

h. Proposed storm sewer enclosures must be designed so they will not adversely impact any adjacent properties, upstream or downstream, and must be designed to the impervious factors of the lands based upon zoning, not necessarily existing conditions.

i. Soil erosion and sedimentation control measures, including Best Management Practices (BMP's), must be implemented. Approved BMPs for soil erosion and sediment control can be found through the Michigan Association of County Drain Commissioners, Michigan Department of Transportation, and Michigan Office of Management and Budget.

j. Soil erosion and sediment control (SESC) permits must be obtained prior to approval.

2. Open Drains

a. All work performed in the right-of-way of County Drains shall be in accordance with the Drain Commissioner's rules.

b. All trees and brush, including the roots thereof, shall be removed from the proposed right-of-way of the drains within the limits of the subdivision, unless otherwise permitted by the Commissioner.

c. When street drainage is outletted to County Drains, such outlets shall be so designed so as to enter the drain or watercourse at an angle of 90° or less, as determined by the upstream centerline. Headwalls, rip rap and/or sodding will be required.

3. Storm Sewer Piping Requirements.

a. Where storm sewers are to be constructed, the Proprietor's construction plans and profiles shall show the location and size of each sewer line and drainage structure in the drainage system, together with elevations and proposed grades. The plan sheets shall clearly show the areas that will be contributing storm water runoff to each inlet in the sewer system.

b. Proposed storm sewer shall be designed to have capacity to pass 10-year design storm runoff rate (Qd10). Refer to the Design Calculations section of this document.

c. RCP pipe in accordance with MDOT specifications and approved by the Arenac County Drain Commissioner must be used for Storm Sewers. All sewer and culvert pipe shall be designated on the plans by the appropriate class as specified by A.S.T.M.C-76, A.A.S.H.T.O.M-36.

d. Brownfield developments must have premium joints so water quality of storm water is not affected by contaminated ground water.

e. Where a storm sewer will be continually subjected to a hydraulic head, an internal rubber gasket of a type approved by the Drain Commissioner will be required.

f. Outlets shall require flap gates or check valves when subject to back flow.

g. Provide a minimum of two (2) feet of cover for storm sewer.

h. Provide 18 inches vertical separation between all other utilities including, sanitary sewers and water mains. Provide ten (10) feet of horizontal separation from other utilities.

i. A minimum of four (4) inches of sand bedding is required beneath the pipe and a minimum of 12 inches of sand backfill is required above the pipe.

j. Manhole(s)/catch basin(s) shall be placed at a maximum distance of 400 feet from any other manhole/catch basin for access/maintenance purposes.

k. Provide a sump discharge outlet for each individual property/lot in all developments. Sump leads shall not be connected to rear lot drainage systems. A storm sewer lead extended to the right-of-way/property line of each lot (minimum 4 inches diameter) shall be provided for rear lot drainage.

l. Minimum pipe grades must be such to produce minimum scouring velocity of 2.5 feet per second when pipe is flowing full without surcharging.

m. Storm sewer joints must be soil tight, but not water tight, except in brownfield development sites or sites with known groundwater contamination.

n. Minimum pipe diameter for catch basin leads is 10 inches.

o. Minimum pipe size for storm sewer is 12 inches.

p. When two pipes or more of different sizes come into a structure, the 8/10th flow lines shall match when possible.

q. Catch basins should have a minimum sump depth of 18 inches. It should be noted that some LID designs do not require sumps. If the design is indeed LID and the LID Manual developed for Michigan is used and referenced then this requirement does not need to be enforced.

r. Inlets may be allowed if approved by the commissioner and adequate sediment trapping measures are provided.

4. Culverts

a. When necessary for drainage purposes, crossroad culverts and driveway approach culverts shall be installed at locations shown on the plans or as designated by the Engineer. The pipe used in culverts may be reinforced concrete culvert pipe or corrugated steel pipe and pipe arch. The pipe furnished shall conform to the Current Specifications for Reinforced Concrete Storm Drain and Sewer Pipe, A.S.T.M. Designation: C-76, or to the Current Specifications for Corrugated Steel Culvert Pipe A.A.S.H.T.O. Designation: M-36.

5. Detention Requirements.

a. Residential developments will need to provide a separate lot or parcel for detention. In addition the following requirements will apply:

   i. This area can not be dedicated through an easement.

   ii. The lot or parcel must have a recorded ingress/egress easement with a minimum of 20 feet abutting a County right-of-way.

   iii. The outer limits of detention areas shall be delineated on the Exhibit B drawings of a Condominium Development or listed on the Final Plat of a subdivision as stated below.

- Condominium Developments - Detention areas shall be designated as general common areas.

- Platted Developments - Detention areas shall be designated as a storm water detention area or recreation area when appropriate. (See State Requirements).

b. Final ownership of detention areas shall be in accordance with the provision of Act 288 of 1967, as amended, that being the Land Division Act.

c. Ingress/egress areas must have a gravel base suitable for travel of construction equipment.

d. Proposed storm water detention facilities shall be designed to detain the 100-year design storm runoff volume (Vt) from the entire contributing area in excess of the allowable discharge from the site (See Design Calculations, Section IV).

e. The maximum design storage elevation in a detention area must be a minimum of one (1) foot below the lowest ground elevation adjacent to the detention area. Ponding water above existing grade by use of berms will not be allowed

f. The design maximum storage elevation in a detention area must not exceed a depth of nine (9) inches above any paved surfaced in non-residential developments. In residential developments the maximum ponding elevation in the detention basin shall not exceed the lowest rim elevation in the development.

g. The design maximum storage elevation in a detention area must not be closer than one (1) foot below the lowest opening, window, or door of the proposed structure(s) or existing facilities.

h. An emergency overflow shall be provided at the detention basin to insure the maximum ponding elevation does not exceed the depths outlined in items **e**, **f**, and **g**, as mentioned above. This overflow shall be able to allow drainage from the site in the event the 100-year storm is exceeded or the restricted outlet is obstructed.

i. Designs of detention facilities shall incorporate safety features, particularly at inlets, outlets, on steep slopes, (three horizontal to one vertical or steeper) and at any attractive nuisances. These features may include, but not be limited to, fencing, handrails, lighting, steps, grills, signs, and other protective or warning devices so as to restrict access as required by Commissioner.

j. Side slopes and the bottom of detention basins shall be top soiled, to a minimum of four (4) inches, and seeded.

k. The side slopes and bottom of the basins shall be shaped with maximum slopes of three horizontal to one vertical to allow mowing of these surfaces. If side slopes are steeper than three horizontal to one vertical the basin shall be fenced or surrounded by landscaping features that limit access to the basin. Fencing shall be

used if the site is an attractive nuisance or has a depth of two (2) feet of standing water (a wet basin).

l. Detention basins with bottom slopes less than 1% shall be underdrained.

m. Detention basins shall be constructed with the top of banks a minimum of five (5) feet from any pedestrian walkway (i.e. public and private sidewalks/ bike paths).

n. If a detention basin is proposed in a front yard area it must be designed to be aesthetically compatible with the development (i.e. mild slopes, etc.). The owner of the lot must be notified where the basin is located and what its function is, the property deed must communicate this to the property owner(s).

6. Maintenance Requirements for Detention Facilities.

a. Detention basins and restrictors shall be maintained as necessary. If a detention basin is found not to be maintained or a restrictor is removed or not maintained, the owner/developer will have 30 days to complete the necessary maintenance. If said maintenance is not completed, the Arenac County Drain Commissioner will take the necessary action to have the work completed and bill the owner/developer. An additional 20% will be added to the cost of the bill for administrative fees.

b. Condominium Projects - If the detention facility areas are designated as a general common element, the Master Deed will set up a mechanism by which the detention facilities will be maintained by the Condominium Association.

c. Maintenance shall include regular mowing of the basin bottom, side slopes, and removal of debris and sediment from the outlet to insure the basin remains functional and is aesthetically pleasing to surrounding landowners.

7. Rear Lot Drainage Requirements.

Rear lot drainage systems in platted developments are the responsibility of the homeowners and the homeowner's association. An easement is present to provide for maintenance work on rear lot drainage systems. The property must be returned to its pre-maintenance conditions after repairs or maintenance has been performed. The homeowners association should develop a preventive maintenance plan for the rear lot system to assure proper function of the system. If necessary, the homeowner may repair the rear lot system on their own if they so desire. However, the area worked on must be returned to the condition it was in prior to the repair.

a. All lots within a condominium or platted development shall require that a lead be constructed to the edge of the Road right-of-way for future rear lot drainage.

b. Minimum rear lot drainage lead sizes and slopes are as follows:

i. Rear lot drainage leads with contributing drainage areas up to two (2) acres shall have a minimum diameter of six (6) inches and a minimum slope of 0.5%.

ii. Rear lot drainage leads with contributing drainage areas greater than two (2) and less than three (3) acres shall have a minimum diameter of eight (8) inches and a minimum slope of 0.4%.

iii. Rear lot drainage leads with contributing drainage areas greater than three (3) and less than four (4) acres shall have a minimum diameter of ten (10) inches and a minimum slope of 0.32%.

iv. Rear lot drainage leads with a contributing area greater than four (4) acres shall be considered main line storm sewer and shall be designed according to corresponding storm sewer requirements (See design calculations section of this report). Calculations shall be submitted to verify the rear lot drains have capacity to pass the 10-year design storm event. Plastic pipe is acceptable for rear lot drainage systems draining more than 4 acres provided it is installed in landscaped/lawn areas.

c. Sand backfill and bedding is required for rear lot drainage leads located under traveled areas.

d. Rear lot drainage leads must be constructed at a depth so that two feet of cover can be provided at low upstream locations.

e. A ten (10) foot wide easement shall be provided on each lot adjacent to rear lot drainage systems, providing a total of 20 foot wide easement. Said easements shall be written as to permit neighboring property and/or condominium owners to maintain the rear lot drainage system as it may effect their property.

f. Existing rear lot drainage systems abutting a proposed development may be used for the new development provided:

i. The existing rear lot drainage system has the capacity to convey storm water runoff from the proposed rear lot drainage areas.

ii. A signed agreement is obtained from property owners located within the existing subdivision allowing the proposed subdivision's rear lot storm water runoff to pass through their existing system.

g. Phased developments owned by the same proprietor may utilize proposed rear lot drainage for a current development phase on future phases provided:

i. Covenants shall be recorded into the deeds of the property owners affected in the current phase allowing for future phases of the development to drain into the current phase's rear lot drainage system.

- If covenants are not made as outlined above, future phases will require separate rear lot drainage systems or agreements from the current land owners allowing for the use of their rear lot drainage system.

- The rear lot drainage system shall be constructed to convey rear lot drainage from both the existing and proposed rear lot drainage areas.

- Easements shall be provided allowing for maintenance by both abutting landowners in current and proposed phases of development.

ii. Rear lot drainage shall be shown on the preliminary plat (subdivisions) or site plan (condominiums).

iii. All rear lot drains shall connect to an approved storm water drainage system.

B. General Compliance Guidelines.

The following guidelines are recommended and are provided only for your reference.

1. The minimum surface slopes for overland drainage are as follows:

   For bituminous paved surfaces, 1%.
   For concrete paved surfaces, 0.5%.
   For concrete curb and gutter, 0.32%.
   For drainage swales and valley shaped ditches, 0.5%.
   For rear lot drainage swales and valley shaped ditches, 0.5%.
   Landscape grading, 2%.

2. The maximum surface slopes for overland drainage are as follows:

   For bituminous, concrete paved surfaces, 5%.
   For concrete curb and gutter, 5%.
   For drainage swales and valley shaped ditches, 5%.
   For rear lot drainage swales and valley shaped ditches, 5%.
   Drainage swales and valley shaped ditches shall have maximum side slopes of 3 horizontal to 1 vertical.
   Landscape grading, 4 horizontal to 1 vertical.

C. Variances from Requirements.

The Commissioner may issue a storm water discharge permit that waives allowable discharge requirements and or detention requirements. Variation from these requirements shall require the approval of the Arenac County Drain Commissioner, whose actions shall be conditioned upon the following:

1. A petition shall be submitted describing in detail the rationale for the proposed design changes including hydraulic and/or hydrologic computations.

2. Special circumstances or conditions exist which will affect the property under consideration such that strict compliance with the provisions of the storm water discharge permit would deprive the applicant of the reasonable use of their land.

3. A variance is necessary for the preservation and enjoyment of a substantial property right of the proprietor.

4. Granting of the variance will not be detrimental to the public health, safety or general welfare, or injurious to other property in the territory in which said property is located.

5. An affirmative recommendation must be received from the Drain Commissioner's Engineer supporting such variance. In the event that the Drain Commissioner's Engineer does not submit an affirmative recommendation, a recommendation shall be received from the Arenac County Drain Commissioner.

D. Final Cleanup, Seeding, Sodding and Mulching

1. The Proprietor shall be responsible for cleaning all sewers, manholes, catch basins, or other structures affected by the operations in the subdivision before final release.

2. Sodding, seeding and mulching where required shall be done in accordance with the requirements of the Commissioner's General Specifications (See Specifications). The work shall be performed only after prior acceptability of the finished grade. This work must be performed under the inspection of the Commissioner or his agent.

3. Before applying fertilizer, the soil must be tested to determine if phosphorus application is necessary. If phosphorus is proven by soil testing to be necessary then it may be applied carefully. Otherwise use fertilize that does not have any phosphorus in it. Phosphorus is generally not necessary and it is a nutrient that creates many water quality problems for open drains, streams, rivers, Saginaw Bay and the Great Lakes. Unnecessary application of phosphorus is being banned by almost all counties in Michigan and the Great Lakes States.

E. Contingencies

It is not the intent of the above requirements and specifications to cover every foreseeable item of work which may be necessary in order to complete the improvements to the satisfaction of the Commissioner. If it should become necessary, in the opinion of the Commissioner, that certain work not heretofore itemized be performed as part of the drainage improvement, it shall be the Proprietor's obligation to do so upon the direction of the Commissioner. Any disagreements between the Proprietor and the Commissioner's Engineer as to the obligations of the Proprietor shall be presented to the Commissioner and his decision in the matter shall be final.

VI. STAKING REQUIREMENTS

The following are the minimum requirements for construction staking:

A. Storm Sewers

1. Show offset to utility on stakes of "cut sheet."

2. Alignment stakes must be furnished every 100' on straight lines, every 50' on radii over 200' and every 25' on radii under 200'. (Grade stakes as required by the Commissioner).

3. Set a top of casting grade for all structures. (In addition, reference top of casting grade to the flow line).

4. Furnish grade stakes every 100' on which flow line grade is clearly written. A "cut sheet" shall also be used to indicate the flow lines.

5. Each structure should be witnessed by two stakes, and direction and size of all pipe entering the structure should also be clearly indicated by use of stakes.

6. At each deflection in alignment or change in flow line grade, there must be a minimum of two back sight stakes.

B. Open Drains

1. Show offset to utility on stakes or "cut sheet."

2. Alignment stakes must be furnished every 100' on straight lines, every 50' radii over 200' and every 25' on radii under 200'. (Grade stakes as required by the Commissioner).

3. Each structure should be witnessed by two stakes, with a hub marking the actual location.

C. General

1. Where required, the Proprietor's contractor must furnish the Commissioner's inspector with two copies of all "cut sheets" prior to starting work.

2. All the above requirements are the necessary minimum and their fulfillment will be a prerequisite to any work which requires alignment or grade. These requirements will satisfy normal operations but may have to be modified or expanded for unusual construction operations.

STORM WATER PERMIT APPLICATION

PROJECT NAME:	
Property Tax Identification #:	
Site Plan Review Date:	
Date Applied:	
Deposit Amount Submitted:	
NAME OF DEVELOPER/OWNER:	**ENGINEER/ARCHITECT:**
Contact Person:	Contact Person:
Street Address:	Street Address:
City, State, Zip:	City, State, Zip:
Telephone:	Telephone:
Fax:	Fax:
PROJECT LOCATION:	
Street Address:	
Name of Subdivision/Plat:	
Drainage District:	

STORM WATER DESIGN INFORMATION (*Calculation must be submitted for verification. Calculations must have clearly labeled headings, clearly labeled formulas, and clearly labeled units.)

Type of Development (Circle): *COMMERCIAL SITE, INDUSTRIAL SITE, RESIDENTIAL PLATTED, RESIDENTIAL CONDOMINIUM, OTHER*

*AREA OF DEVELOPMENT (acres):	
*AREA OF CONTRIBUTING DRAINAGE DISTRICT (acres):	
*AREA OF EXISTING IMPERVIOUS SURFACE (acres):	
*AREA OF PROPOSED IMPERVIOUS SURFACE (acres):	
*ALLOWABLE DISCHARGE RATE (Q_a) (cfs):	
*TOTAL VOLUME OF STORAGE REQUIRED (cu. ft.)	
*TOTAL VOLUME OF STORAGE DESIGNED (cu. ft.)	
100 YR DESIGN STORMWATER DETENTION STORAGE ELEVATION:	
EMERGENCY OVERFLOW/MAXIMUM STORAGE ELEVATION:	
LOWEST FINISHED FLOOR ELEVATION:	
OUTLET DRAIN SIZE AND DESIGN FLOW CAPACITY:	
OUTLET DRAIN INVERT ELEVATION:	
DESIGN IMPERVIOUS FACTOR (IMP):	
*10 YEAR DESIGN DISCHARGE (cfs):	
*HEAD DIFFERENTIAL THROUGH RESTRICTOR (ft.):	
*DIAMETER OF PROPOSED RESTRICTOR (in):	
*ACTUAL RESTRICTED DISCHARGE (cfs):	

AUTHORIZED SIGNATURE DATE	PLEASE ATTACH DRAINAGE PLAN CHECKLIST TO ASSURE ALL INFORMATION IS PRESENT FOR THE REVIEW

STORM WATER MANAGEMENT CHECKLIST

Submission of Tentative Layout

_____Total acres of site.

_____Total Contributing acres to the site.

_____Location of site, including dimension to nearest intersection, road or section line.

_____Existing ground elevations at minimum 50' centers, including shots on perimeter of site.

_____Elevations of ground, edge of pavement, and buildings within 50' of site.

_____Top of curb, gutter, ditch line, and centerline of road elevation at minimum 50' intervals.

_____Existing storm catch basins, manholes, sewers, and culverts showing rim and invert elevation(s).

_____Proposed elevations showing parking lot grades and control and building elevations.

_____Greenbelt areas.

_____Size, length, slope, and type of proposed storm sewer.

_____Rim and invert elevation(s) of proposed manholes and catch basins.

_____Location of on-site storage showing contour line for top of storage elevation.

_____Registered professional engineer or registered land surveyor.

_____Scale - Not more than 1" = 200'; North arrow included.

_____Future phases of development.

_____Site Report furnished by the Health Department.

_____Emergency overflow location and elevation.

_____Restrictor location noted on plans.

STORM WATER MANAGEMENT CHECKLIST (Continued)

_____Name of Township, City or Village (Section, Part of Section).

_____Proposed street and alley layout.

_____Lot and plat dimensions.

_____Rivers, if any.

_____Natural watercourses, if any.

_____County Drains, if any.

_____Sanitary Sewers and water mains, if any.

_____Additional on site utilities, gas, electric, phone, etc.

_____Easements, if any.

_____Any other feature, the existence, location, or description, which might be of value in determining the overall requirements for the subdivision.

Each of the following items shall be included in the submitted calculations:

_____Drainage District

_____Calculation of maximum allowable discharge

_____Calculation of unrestricted discharge

_____Calculation of actual restricted discharge

_____Calculation of on-site storage required.

_____Calculation of storage volume provided.

_____Calculation of size of restrictor.

_____Hydrologic and Hydraulic calculations showing that there will be no adverse impacts upstream or downstream of the proposed development.

Performed Site Inspection on _____:

_____

Signature

APPENDIX B

REQUIRED DEED RESTRICTIONS FOR LOTS
AFFECTED BY DRAIN RIGHT-OF-WAY

REQUIRED DEED RESTRICTIONS FOR LOTS AFFECTED BY DRAIN RIGHT-OF-WAY

ACT NO. 40 OF THE PUBLIC ACTS OF 1956

Section 280.85

The owner of any land over, through or across which a district has acquired a right of way for the construction and maintenance of an open or covered drain by grant, dedication, condemnation or otherwise, may use the land occupied by such right of way in any manner not inconsistent with the easement of the district. Any use of the right of way which will interfere with the operation of the drain or will increase the cost to the district of performing any of its work thereon is deemed to be inconsistent with the district's easement. Any landowner who violates any of the above provisions shall be subject to the penalties provided in section 421 of this act.

Section 280.421

Whenever any person shall obstruct any established drain, it shall be the duty of the commissioner to cause such obstruction to be removed. Any lessening of the area of a drain, which area shall be a cross section of the drain, shall be deemed to be an obstruction. The person causing such obstruction shall be liable for the expense attendant upon the removal thereof, together with the charges of the commissioner, and the same shall be a lien upon the lands of the party causing or permitting such obstruction, and all of the expense shall by the commissioner be reported to the board of supervisors, together with the report of his doings in the premises, and by said board ordered spread upon the land of the offending party, should the same remain unpaid: Provided, That the offending party causing such obstruction shall be given a notice in writing of at least 5 days to remove such obstruction. This provision as to obstruction of any drain shall not apply where the obstruction was caused by natural causes, but the owner of the stock who shall permit his horses, cattle, pigs and other stock to obstruct any drain by tramping in it shall be deemed to be the party causing such obstruction. Nothing contained in this section shall in any way impede or bar the right of any person to make criminal complaint under any existing law for any obstruction of a drain.

APPENDIX C

REGULATORY PERMIT FORMS

GENERAL PERMIT APPLICATIONS

To assure that all agency forms are as up to date as possible the Arenac County Drain Commissioner has provided the following web site addresses that various forms may be attained at for use by developers and design engineers.

1. **MICHIGAN DEPARTMENT OF TRANSPORTATION PERMIT APPLICATION FOR USE OF RIGHT-OF-WAY**, is available at

http://mdotwas1.mdot.state.mi.us/public/webforms/detail.cfm?ALLFORMS__FormNumber=2205

2. **MICHIGAN DEPARTMENT OF TRANSPORTATION STORM WATER DISCHARGE PERMIT APPLICATION**, is available at:

http://mdotwas1.mdot.state.mi.us/public/webforms/detail.cfm?ALLFORMS__FormNumber=2484

3. DEPARTMENT OF NATURAL RESOURCES – ENVIRONMENT (DNRE) F formerly known as the MICHIGAN DEPARTMENT OF ENVIRONMENTAL QUALITY **JOINT PERMIT APPLICATION** is available at:

   http://michigan.gov/deq/0,1607,7-135-3307_29692_24403---,00.html

4. **ARENAC COUNTY SOIL EROSION AND SEDIMENTATION CONTROL PERMIT APPLICATION.**

   Contact: Arenac County Building Dept.
   120 N. Grove Street, PO Box 724
   Standish, MI 48658

   Dale Zygeil
   Ph. 989-846-9791
   Fax: 989-846-9188

SEE NEXT PAGE FOR MORE INFORMATION REGARDING SOIL EROSION AND SEDIMENT CONTROL

A general procedure for Soil Erosion and Sediment Control (SESC) and NPDES permits to discharge storm water from construction sites:

There have been changes in the permitting for construction sites for contractors, developers, municipalities, and other public agencies. These rules took effect at the date listed below; everyone must adhere to these changes and be aware of them.

EFFECTIVE DATE – MARCH 10, 2003

General procedure to follow:

Site has a soil disturbance of 1 to <5 acres:

Apply for Soil Erosion Sediment Control permit from either the county enforcement agency (CEA) or municipal enforcement agency (MEA).
The NPDES discharge permit for this site is covered by the "permit by rule"; no permit or application needs to be filled out for the state.

Note: If client is an APA (authorized public agency for soil erosion and sediment control) they still must follow the permit by rule, they do not need a SESC Permit as they have procedures approved by MDEQ. The rules are at the following site:
http://www.michigan.gov/documents/deq/wb-stormwater-nocrules_248578_7.pdf

Site has a soil disturbance of 5 or more acres:

Apply for Soil Erosion Sediment Control permit from either the county enforcement agency (CEA) or municipal agency (MEA) first.
Then fill out the NPDES Notice of Coverage form for discharges from the construction site, attached the proper fee, and send it to the State at the address listed on the form.
Once the state receives the form, the site is covered.

Note: If client is an APA (authorized public agency for soil erosion and sediment control) they still must obtain and fill out the NPDES Notice of Coverage to discharge storm water from a construction site; they do not need SESC Permit as they have procedures approved by MDEQ.
http://www.michigan.gov/documents/deq/water-stormwater-NOCform_217038_7.doc

If you need to renew the permit use the following web site
http://www.michigan.gov/documents/deq/wb-stormwater-NOC_Renewal_225375_7.doc

Once the project site is stabilized and has good vegetative cover, remember to fill out a project termination form, this can be found at:
http://www.michigan.gov/documents/deq/wb-stormwater-NOTform_248588_7.doc

Determine inspection responsibilities:

Make sure that SESC issues are an agenda item at the pre-bid meeting and at the pre-construction meeting. Do not just put a note on the plans that SESC is the contractor's responsibility; make sure they are fully aware of their site responsibilities. Remember that the owner of the project is ultimately the responsible party, the DEQ or enforcing agency will be fining them. If the owner is a municipality that we are doing a service for, we must protect them as best we can.

APPENDIX D

SUBDIVISION CONTROL PROCEDURES
PURSUANT TO ACT 288 OF 1967, AS AMENDED

The Land Division Act (formerly the Subdivision Control Act of 1967) requires the County Drain Commissioner to publish rules governing the internal and external drainage of proposed subdivisions and the outlets for drainage. The rules are designated to assist land developers by providing uniform procedures to be followed in the processing of subdivision plats.

IT IS HEREBY ORDERED that the "Rules of the County Drain Commissioner pursuant to Section 105 (c) of Act 288 of the Public Act of Michigan of 1967, as amended" are hereby amended and shall be followed in the processing of all subdivision plats, the improvement of all drainage which is now or will come under the jurisdiction of the office of the Arenac County Drain Commissioner.

IT IS HEREBY FURTHER ORDERED that the effective date of the following rules shall be the 1st day of January, 1995.

Arenac County Drain Commissioner
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I. PURPOSE

A. Act 288 of the Public Acts of 1967 is known as the Land Division Act (formerly the Subdivision Control Act of 1967). All plats to be recorded with the Register of Deeds must be in conformity with this Act. The following Rules are issued to guide land developers interested in subdividing land and to provide for a uniform method of preparing plats submitted to the office of the Drain Commissioner for processing in accordance with said Act.

B. The Drain Commissioner of Arenac County, through legislative enactment, has acquired jurisdiction over Established County Drains and may under the terms of this Act acquire jurisdiction of drainage systems within subdivided lands and drains external to the proposed subdivision after January 1, 1968. In accordance with the provisions of the Act, the Drain Commissioner has the right to require that County Drains, both within and outside the plat, be approved to the standards established by the Drain Commissioner. The Act also makes it possible for the Proprietor to record a plat before the required improvements are made, provided a satisfactory bond is deposited with the Drain Commissioner to insure performances.

II. DEFINITIONS

See Page 2.

III. PRELIMINARY PLAT REQUIREMENTS

A. Submission of Tentative Layout

1. In order that subdivision plat may be prepared in conformity with the Land Division Act (formerly the Subdivision Control Act of 1967), as amended, the Proprietor shall have prepared a preliminary or tentative plan showing the layout of the area intended to be platted. This plan shall be prepared under the direction of a registered professional civil engineer or a licensed land surveyor, and shall be drawn to a scale not more than 1" = 200'. Each copy of the preliminary plat shall be accompanied by a copy of the site report furnished the Department of Health under their rule unless sanitary sewer capacity is available to serve the proposed development.

2. Upon receipt of the preliminary plat it will be reviewed by the reviewing Engineer and a fee will be determined to cover engineering services. The Proprietor shall be responsible for and pay all costs for engineering and inspection services incurred by the Commissioner.

The Proprietor/Design Engineer will be notified of said charges and in turn is required to provide deposit in the amount specified before Notice to Proceed will be issued. Any cost incurred over and above the deposit will have to be paid before final approval is issued.

3. The tentative plan shall give the location of the proposed subdivision 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 plan shall show the proposed street and alley layout, lot and plat dimensions, all pertinent factors such as adjoining roads and subdivisions, contours, rivers, railroads, high tension tower lines or underground transmission lines, cemeteries, parks, natural water courses, county drains, sewers, easements, or any other feature, that existence, location or description of which might be of value in determining the overall requirements for the subdivision. Storm drainage system shall be tentatively shown evidenced by hydraulic calculations to determine if storm water detention will be necessary. If increased storm water discharge from the site is proposed, evidence that sufficient capacity exists in the drainage system must be provided. This may require the Proprietor to have completed a hydraulic analysis of the entire drainage district. Detention basin sizing shall be calculated using a generally accepted engineering method. Storm water detention shall be designed for a 100-year storm event. The tentative storm layout shall generally incorporate minimum design standards. Consideration shall be given for storm water detention and will be required on most developments so as not to increase the amount of discharge to the drainage system greater than present land use.

4. Easements for public utilities shall be shown with the tentative layout. The Proprietor is informed that the Consumers Power Company and the General and/or Michigan Bell Telephone Companies have prepared a utility easement guide for use by interested parties. Inasmuch as improper utility easement location can result in a change in plat layout, the Proprietor is advised to consult with the respective utility companies before presentation of the tentative layout for approval. Contour information should be shown on the same plan; otherwise, it shall be submitted separately.

5. In the case where the Proprietor wishes to subdivide a given area but wishes to begin with only a portion of the total area, the original plat shall include the proposed general layout for the entire area. The part which is proposed to be subdivided first shall be clearly superimposed upon the overall plan in order to illustrate clearly the method of development which the Proprietor intends to follow. Each subsequent plat shall follow the same procedure until the entire area controlled by

the Proprietor is subdivided. The final acceptance of a subdivision which is a partial development of a larger general layout does not automatically insure the final acceptance of the overall layout. The intent is to permit some flexibility as necessary to make any changes.

6. With the preliminary plat a topographical map must be submitted showing contours at one (1) foot intervals for the site drainage area affecting the subdivision. The map will show the delineation of the drainage boundary of the site and any other contributing area and the acres inside the boundary. The map shall be legibly drawn to a datum determined by U.S.G.S. or U.S.C. & G.S. with reference to what datum is selected and shall show the north arrow and scale.

7. Three prints of the preliminary plat layout prepared in accordance with the above requirements shall be submitted together with a letter of transmittal requesting that the plat plan be reviewed and, if found satisfactory, approved. The names of the Proprietor and Design Engineer or Surveying Firm, with mailing addresses and telephone numbers for each, shall be included with the transmittal.

8. If the proposed plat as submitted meets with all the requirements, one approved copy of the tentative plan will be returned. Approval of the preliminary plan is required before proceeding with the preparation of final drainage plans. If the proposed plat is not approved as originally submitted, the Commissioner notifies the Proprietor in writing setting forth the reasons for withholding approval and requests that the necessary changes be made and the revised layout "resubmitted."

9. Approval of the tentative layout is not intended to be final approval. If either the Proprietor or the Commissioner find it advantageous to make changes before the final plat is presented to the Commissioner for signature, such changes can be made, provided that the same procedures outlined above are repeated with each change in the layout. The Proprietor is reminded that approval of the proposed subdivision by the local governing body is also required under the Land Division Act. Such changes shall be incorporated in the layout and a new preliminary plan resubmitted even though the original layout may have already been approved by the Commissioner. If the Proprietor does not present the final plat to the Commissioner for approval within a period of two years (2) after receiving approval of the tentative layout, it may be necessary that he or she resubmit the layout for review in the light of new information which may have become available during the interim.

B. Right-of-Way Requirements

1. The following minimum right-of-way widths are required for established county drains and natural watercourses that will be utilized and lay within the confines of the proposed subdivision; except those established county drains in existence prior to the proposed development, said right-of-way shall remain in full force and effect or additional right-of-way may be necessary.

   a. Open drains and watercourses shall have a right-of-way equal to the bottom width of the drain, plus four (4) times the depth of the drain, plus four (4) rods.

   (See Illustration - Appendix C)

   b. The easement shall be centered on the centerline of the drain or watercourse and described by legal description of route and course and to be provided in recordable form by the Proprietor.

   c. Enclosed drains shall have a right-of-way of 30 feet for 36 inch or less and a right-of-way of 40 feet for 42 inch or more.

   d. The development must be contiguous to a county drain or certification from governing County Road Commission is required that existing road drainage will provide adequate capacity.

2. The above widths shall govern generally. However, if such as the Engineer determines that additional right-of-way is required for proper construction, or because of special circumstances, or depth, such facts shall be made known to the Proprietor after a review of the preliminary layout by the Engineer. Exceptions to the above right-of-way requirements may be made only at the discretion of the Commissioner.

C. Drainage Districts

In accordance with Act 40 of the Public Acts of 1956, as amended, the drainage of the proposed subdivision will be contained within the Drainage District or Drainage Districts of the established County Drain, or if there is no established drainage district, then one will be established, including the drainage improvements. There are provisions for minor alterations of the legal limits of established drainage districts.

D. Road and Street Drainage

The Land Division Act (formerly the Subdivision Control Act of 1967), as amended, recognizes that the responsibility of the Board of County Road Commissioners to establish rules for Plat Submission and for proper drainage for highways, streets and alleys in its jurisdiction. It is contemplated that the drainage of the land embraced by the subdivision will be conveyed to the outlet by means of highway, street or alley drainage structures. Drainage originating outside the subdivision limits, which has hitherto flowed onto or across the subdivision, and natural watercourses and county drains that traverse or abut the subdivision, will be reviewed by the Commissioner for adequacy.

IV. FINAL PLAT REQUIREMENTS

A. How Final Plat is Approved

The Land Division Act requires that the Proprietor submit five true copies of the final plat to the Commissioner, or six true copies if the Proprietor requests an additional copy to be returned to him. Such final plat must be prepared in accordance with the requirement of the Land Division Act which sets forth the size, scale, material, and reproduction process. If the Commissioner approves the plat, he will transcribe thereon its certificate of approval and deliver the plat within ten days after date of approval. If the Commissioner rejects the plat, written notice of such rejection and reason therefore are given to the Proprietor within ten days.

B. What is Required Before Approval

Prior to approval of the final plat, the Commissioner may require that the County Drains and watercourses shown on the plat shall be improved in accordance with the construction standards of the Commissioner, including any bridges or culverts where necessary. The minimum grade is 0.5% and maximum distance of overland or gutter line flow is 300 feet. Maximum calculated velocity in open channels shall be 3 feet per second as derived from "Manning's" formula calculation. Where calculated velocity exceeds 3 fps, measures will be required to ensure the stability of the drain channel. Such improvements shall be made prior to the submission of the final plat for the Commissioner's approval. However, the Commissioner may approve the plat prior to the making of the necessary improvements, provided the Proprietor files a satisfactory bond with the Commissioner to guarantee the improvements after the approval of the plat. The Commissioner will determine the amount of the bond after a review of the subdivision layout. Such bond shall be posted prior

to submission of the final plat for Commissioner's approval. The Proprietor is reminded that under the Land Division Act he or she is required to place monuments of certain points in the subdivision. The top of these monuments shall be approximately level with the finished grade at the time the final improvements are completed.

C. Procedures When Drainage Improvements are Made Before Submission of Final Plats

1. If the Proprietor desires to make the necessary drain improvements required in the proposed subdivision before submission of the final plat, his engineer shall prepare drainage plans in accordance with these rules showing in detail the work which will be performed.

2. The following provisions will be applicable only when the proposed drainage is not within road right-of-way and accepted as a facet of the road or street:

   It will be necessary that the Proprietor make satisfactory arrangements with the Commissioner before commencing to do any work in the subdivision to provide for the inspection of the project by the Commissioner's Engineer. These arrangements shall include, among other things, the submission of three set of approved drainage plans and sepias, satisfactory evidence of insurance coverage, and a copy of the signed contract between the Proprietor and his or her Contractor covering the work to be performed. The proposed improvement shall be established as county drains pursuant to Section 433 of Act 40 of 1956 as amended. If the drainage work contemplates a relocation, tiling deepening or widening of a County Drain, application for permission 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. If it is necessary to retain a natural watercourse because this watercourse serves land outside the subdivision, 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 project, and the proposed completion date. At the time this information is supplied to the Commissioner, inspection deposits shall be computed and payment of it shall be made to the Commissioner prior to commencing work. The Proprietor will be held responsible for the actual inspection costs incurred by the Commissioner. Before work commences, the Drain Commissioner must assign an inspector to the project.

3. The Proprietor should take whatever precautions he/she deems necessary in his/her direct relations with this contractor in order to assure that the work performed by the contractor meets the approval of the Engineer. The Proprietor shall be held totally responsible for the fulfillment of his/her obligations to the Commissioner notwithstanding that his/her contractor or consulting engineer may be at fault.

4. Upon completion of the improvement to the satisfaction of the Commissioner, the Proprietor may submit his/her final plat to the Commissioner for approval. At this time he/she may be required to post a nominal bond with the Commissioner to guarantee repairs of any defects that may show up as a result of poor workmanship or defective materials within one year after completion of the improvement. The Proprietor shall execute all required documents and comply with inspection and review procedures prior to submitting the plat document. 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.

D. Procedures When Drainage Improvements are Made After Approval of Final Plat

1. If it is the desire of the Proprietor to have the plat recorded before completing improvements, he/she shall enter into an agreement with the Commissioner and post a bond in an amount determined by the Commissioner to guarantee the completion of all improvements in accordance with the Commissioner's requirements.

2. The time of completion of the drainage improvements under this arrangement shall generally not extend for a period greater than one year from the original date of the agreement. If after this period the improvements are not completed, the Commissioner may exercise his right under the terms of the agreement to forfeit the bond and proceed to fulfill the Proprietor's obligation under such agreement at such time and in such manner as the Commissioner may determine.

3. In the event the Proprietor makes a cash deposit to guarantee the requirements with the plat, the Commissioner shall rebate to him portions of the original deposit as the work progresses. However, the amount of deposit retained by the Commissioner will at no time be reduced to less than the estimated cost of the work still remaining to be completed.

V. CONSTRUCTION PLANS

A. Drainage Plans

After the preliminary plan of the proposed subdivision has been approved by the Commissioner as outlined heretofore, the Proprietor's Engineer may proceed with the preparation of the drainage plans for the improvement of the subdivision. These plans shall show plan, profile, cross sections, location of drainage facilities and structures, hydrological calculations, perimeter lot drainage and final grading, special details, size, material, grades and such other information as may be necessary to complete the work. All plans shall be referenced to the U.S.G.S. or U.S.C & G.S. Bench Mark Systems and labeled accordingly. Three sets of prints and drainage plans shall be submitted to the Commissioner for review. After the plans have been reviewed by the Commissioner, one set of prints will be returned to the Proprietor's Engineer marked with either an approval or with corrections or changes which may be required. When the improvement plans have been finally approved by the Commissioner and all required agreements executed, the Proprietor may proceed to make the final arrangements for placing the work under construction, as outlined in Section IV above. It should be noted at this point that if the information given to the Commissioner does not represent the conditions as they exist on the ground, and should any revisions be required as a result of this lack of complete information, the Proprietor notwithstanding shall make such revisions that the plans had been approved. The Proprietor's Engineer shall submit one set of "as constructed" plans to the Commissioner when all drainage improvements have been completed. This must be done before the Commissioner will give a final release.

B. Utility Plans

If any utilities are to be located within the drainage right-of-way of the proposed subdivision, the Proprietor's Engineer shall present plans of such utilities to the Commissioner for his approval as to location. If possible, such plans should be presented at the same time as drainage plans so that all details of construction and location may be checked and properly oriented with each other. In order to avoid conflict, it is important that a careful investigation be made where underground utilities are in close proximity to proposed storm sewers, or where they cross each other.

VI. IMPROVEMENTS REQUIRED

See Design Standards (Page 24).

VII. INSURANCE REQUIREMENTS

The Proprietor shall cause its contractor(s) to furnish to the Drain Commissioner satisfactory evidence of public liability and property damage insurance coverage as set forth by the State of Michigan and in accordance with Drain Commissioner standards for limits of liability coverage.

VIII. STAKING REQUIREMENTS

See page 35.

IX. REQUIRED DEED RESTRICTIONS FOR LOTS AFFECTED BY DRAIN RIGHT-OF-WAY

When drain right-of-way exists, the following statutory language governing owner's use of right-of-way will have to be referenced as a deed restriction on each lot affected.

(SEE APPENDIX B)

X APPLICABLE DRAIN PERMITS

1. Utility Crossing Permits
2. Discharge/Tapping Permits
3. Drain Tiling Permits

(SEE SAMPLE APPLICATION FORMS - APPENDIX A)

Compliance with these regulations does not preclude the applicant from obtaining any or all other State, Federal, or Local Permits and approvals which may be required.

XI PRECONSTRUCTION MEETING

1. A preconstruction meeting is required prior to initiating construction.