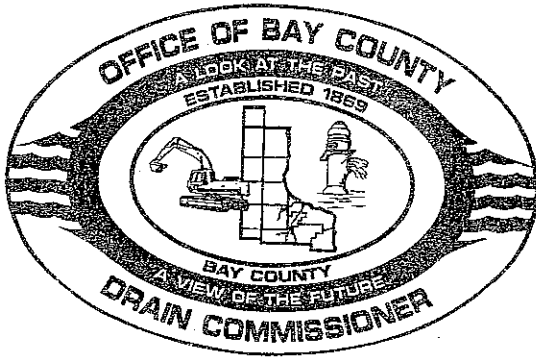


***Storm Water Management
Plan and Design Standards
for
Commercial, Industrial, Subdivision,
Condominium, and Manufactured Home
Site Development***

Standards Comply with NPDES

Issued by
Joseph Rivet
Bay County Drain Commissioner

The Design Standards contained herein will apply to all Commercial, Industrial, Subdivision, Condominium, and Manufactured Home Site Development within Bay County.



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(HEARING IMPAIRED)

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June 16, 2003

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 Bay County Drain Commissioner.

IT IS HEREBY FURTHER ORDERED that the effective date of the following rules shall be the 16th day of June 2003.

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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 Bay 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. 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 Bay 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 Bay 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 Bay 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 Bay County.

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Appendix A:

- Storm Water Management Checklist
- Complete Storm Water Design Submittal Summary
- Application to Connect and Discharge Clean Storm Water to an Established County Drain
- Application for Permission to Tile an Established County Drain
- Application for Permit to Cross or Parallel an Established County Drain
- Application for a Special Temporary Culvert Permit

Appendix B:

- Required Deed Restrictions for Lots Affected by Drain Right-of-Way

Appendix C:

- Details

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.

Clean Storm Water: Storm water effluent free of concentrations of any chemical, mineral or organic matter above ambient natural conditions that is commonly considered pollution by EPA, MDEQ or other similarly qualified organization.

Commissioner: The Drain Commissioner of the County of Bay, 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 Design Submittal: Includes a completed application for permit to connect and discharge clean storm water to an established county drain (Appendix A), three sets of sealed plans, three sets of hydraulic calculations, a completed drainage checklist (Appendix A) and a completed storm water design submittal summary (Appendix A). 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.

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 Bay 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.

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.).

Metering Line: 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. A minimum of 3" diameter line is to be used.

NPDES Phase II General Permit: A NPDES Phase II general permit is required to discharge storm water from a construction site when disturbing one or more acres. Anyone discharging, or proposing to discharge, clean storm water into the surface waters of the State is required by law to obtain a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES program is intended to control direct discharge into the surface waters of the State by imposing effluent limits and other conditions necessary to meet State and Federal requirements. Discharge to a storm sewer that does not go to a municipal treatment facility is considered a direct discharge. Effective March 10, 2003, the developer is required to obtain a NPDES permit for developments of one acre or more.

One Hundred-Year Design Storm: A precipitation event with a duration equal to the time of concentration, having a one percent probability of occurring in any given year or occurring once every 100 years on average.

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

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.

Restrictor: All restrictors shall be metering lines with a minimum three inches in diameter.

Retention Storage: The permanent retaining or storage of storm water in a storage basin, on rooftops, 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 retention storage areas shall not be considered regulated wetlands.

Runoff Coefficient: The actual proposed weighted runoff value based on land use type within the proposed development or redevelopment. The Runoff Coefficient is used to calculate the design discharge (Qd). See page 18 for Runoff Coefficient IMP values.

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 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.

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 0.15 cfs per acre for non improved outlet conditions and .25 cfs per acre for improved outlet conditions.

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.

B. Review Procedure

The Drain Commissioner will not accept runoff into drainage systems located within Bay County from newly developed or redeveloped sites unless they are in compliance with the Storm Water Management Plan.

1. Preliminary Layout

In order that development plats 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.

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 to submitting or discussing the conceptual layouts.

- a. A location map of the site with reference to the section and part of section in which the parcel is situated and the name of the township, city or village.
- b. A topographical map showing actual contours for the drainage area affecting the site. 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.
- c. Location and description of activities that may impact or be impacted by the proposed development or redevelopment both on and off the site. The layout 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 features, that are in existence.

- d. Easements for public utilities shall be shown. The Proprietor is informed that the Consumers Energy and the SBC Ameritech 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.
- e. Acreage of the total site, acreage of the lands currently draining overland the site, and acreage of land upstream of site which contributes runoff to the existing storm drain outlet.
- f. The size and location of the existing storm drain outlets for the proposed site.
- g. A conceptual layout of the proposed storm drainage system for the development or redevelopment.
- h. Knowledge of whether the proposed drainage system is going to be owned and maintained privately or publicly.
- i. The names of the Proprietor and Design Engineer or Surveying Firm, with mailing addresses and telephone numbers for each, shall be included with the layout.
- j. 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 development or redevelopment 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.

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 development or redevelopment will be conveyed to the outlet by means of highway, street or alley drainage structures. Drainage originating outside the development or redevelopment limits, which has historically flowed onto or across the development or redevelopment, natural watercourses and

county drains that traverse or abut the development or redevelopment, will be reviewed by the Commissioner for adequacy.

After review of preliminary information and conceptual layout of the storm drainage system, the Owner/Developer can provide a complete design submittal to the Drain Commissioner. Upon submission of the complete design submittal the formal review process will begin.

2. Formal Review

- a. The Owner/Developer or his/her representative shall submit a complete design submittal, which shall include a completed application for permit to connect and discharge clean storm water to an established county drain (Appendix A), three sets of sealed plans by a professional engineer or surveyor, three sets of hydraulic calculations, a completed drainage checklist (Appendix A) and a completed storm water design submittal summary (Appendix A). The plans and calculations shall comply with the requirements of this Storm Water Management Plan.
- b. An incomplete submittal will be returned to the Owner/Developer and the review process will not begin until a complete design submittal is provided.
- c. Upon receipt of the design submittal, 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 Drain Commissioner. The Proprietor's/Design Engineer will be notified of said charges and in turn is required to provide a 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. The proposed design submittal will be either approved or rejected with comments and returned to the Owner/Developer.
- d. If the proposed design submittal is rejected, a revised design submittal will need to be resubmitted with the corrected revisions.

C. Design Submittal Approval

When the design submittal fulfills the requirements of the Bay County Storm Water Management Plan, the Drain Commissioner will issue an approval letter for the plans as designed and will provide notice to proceed. A permit to connect and discharge clean storm water to an established county drain will be issued to the applicant by the Drain Commissioner. The permit will include inspection and compliance requirements.

D. Changes to Design Submittal after Approval

Any design changes that affect storm water drainage will void said approval and will require the resubmittal of three updated sets of plans and hydraulic calculations to the Drain Commissioner for additional review and approval.

Additional review fees may be required as determined by the Drain Commissioner.

E. Inspection Requirements

General inspection requirements are outlined below.

1. The Drain Commissioner's Engineer must be informed five (5) working days prior to any construction involving an established county drain.
2. In the case of underground detention facilities, the Drain Commissioner and Engineer must be informed five (5) working days prior to construction to perform necessary inspection.
3. Inspection reports shall be completed and kept on file with the Owner/Developer's Engineer.
4. The Drain Commissioner's Engineer may complete periodic site inspections during construction to verify site compliance with the Storm Water Management Plan. Site inspections that indicate non-compliance with the Storm Water Management Plan must be addressed immediately. Corrective measures may be necessary to insure compliance with the Storm Water Management Plan. The Drain Commissioner may require that the Owner/Developer's Engineer complete full-time construction inspection reports or may require that daily construction inspection reports be provided for review and approval. The decision to require full-time inspection will be at the discretion of the Drain Commissioner.
5. 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 metering line size and location.
6. The Owner/Developer's Engineer must provide a letter of certification and "as constructed" plans indicating that construction was completed in accordance with the Storm Water Management Plan. This must be done before the Commissioner will give a final release.

F. 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.

G. Fee Schedule

Upon receipt of the design submittal, 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 Drain Commissioner. The Proprietor/Design Engineer will be notified of said charges and in turn is required to provide a deposit in the amount specified. Any cost incurred over and above the deposit will have to be paid before final approval is issued.

Bonding requirements such as performance bond, certified check or bank draft may be required as determined by the Drain Commissioner.

H. Penalties/Enforcement

The Drain Commissioner will not accept runoff into drainage systems located within Bay County from newly developed or redeveloped sites unless they are in compliance with the Storm Water Management Plan. Failure to comply with the Storm Water Management Plan may void the permit to connect and discharge clean storm water to an established county drain.

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 Bay County Drain Commissioner's office within 30 days of the review and/or inspection.

III. STORM DRAINAGE SYSTEMS JURISDICTIONS

Bay County Drain Commissioner. The Bay 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 be reviewed and approved by the Bay County Drain Commissioner.

The Bay County Soil Erosion Officer. The Bay 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.

Bay County Road Commission. The Bay 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.

In addition, the M.D.E.Q. is responsible for implementing the National Pollution Discharge Elimination System (NPDES) Storm Water Permitting Program for industrial and construction activities. A NPDES Phase II general permit is required to discharge storm water from a construction site when disturbing one or more acres. Anyone discharging, or proposing to discharge, clean storm water into the surface waters of the State is required by law to obtain a National Pollutant Discharge Elimination System (NPDES) permit. The NPDES program is intended to control direct discharge into the surface waters of the State by imposing effluent limits and other conditions necessary to meet State and Federal requirements. The developer is required to obtain a NPDES permit for developments of one acre or more.

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 (Q_a)

The storm water discharge rate from any proposed development, redevelopment, or partial redevelopment site shall be restricted to an allowable discharge (Q_a). The unit allowable discharge required by the Bay County Drain Commissioner shall be 0.15 cfs/acre for non improved outlet conditions and 0.25 cfs/acre for improved outlet conditions. The outlet conditions will be determined by the Bay County Drain Commissioner or the Drain Commissioner's engineer.

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

$$Q_a = \text{Allowable Discharge Rate (cfs).}$$

$$Q_a = (0.15 \text{ cfs/acre})(A_{\text{site}}) \text{ non improved outlet conditions}$$

$$Q_a = (0.25 \text{ cfs/acre})(A_{\text{site}}) \text{ improved outlet conditions}$$

$$A_{\text{site}} = \text{Proposed site area in acres}$$

B. Discharge Metering Line Requirements

A metering line regulates the discharge of storm water to the allowable discharge rate (Q_a) established for a site. The minimum diameter metering line required is three (3) inches.

All metering lines must inlet from a manhole/catch basin and cannot be attached into the mainline storm sewer and grouted in place. Restrictor plates are not allowed.

Calculate the metering line based on Manning's formula:

$$a = \frac{((Q_a)(n/1.486))}{((R^{2/3})(S^{1/2}))}$$

R = Hydraulic Radius (ft).

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

h = Hydraulic Head – The difference between the maximum water surface elevation and the eight-tenth line of the outlet pipe.

n = Manning's Roughness Coefficient (see table below).

Q_a = Allowable Discharge Rate (as defined on page 13).

a = Cross Sectional Area of Outlet Pipe (square foot).

Manning's Roughness Coefficients	
Concrete	0.012
Old Concrete	0.013
Smooth Plastic	0.011
Corrugated Metal or Plastic	0.024

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.

$$Q_r = (1.486/n)(a_a)(R^{2/3})(S^{1/2}).$$

$$Q_r = \text{Actual Discharge Rate.}$$

$$R = \text{Hydraulic Radius (ft).}$$

$$S = \text{Hydraulic Slope (ft/ft) which is (h)/(length of metering line).}$$

$$h = \text{Hydraulic Head (as defined on page 14).}$$

$$n = \text{Manning's Roughness Coefficient (see table on page 14).}$$

$$a_a = \text{Actual Area of Outlet Pipe Used.}$$

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

$$Q_o = (Q_r)/(A * C_w)$$

$$A = \text{Total Catchment Acreage (including any offsite drainage)}$$

$$C_w = \text{Sum of Acreage * Runoff Coefficient for each land use type within proposed development divided by total acreage.}$$

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

$$T = [(8925/Q_o)^{1/2}] - 25$$

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

$$V_s = [(14280)(T) / (T + 25)] - (40)(Q_o)(T)$$

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

$$V_t = (V_s)(A)(C_w)$$

D. Storm Water Conveyance Requirements (10-year)

The 10-year design discharge (Q_{d10}) 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 (Q_{d10}) in cubic feet per second for a site using the Rational Method in the following form:

$$Q_{d10} = CIA$$

$$A = \text{Total catchment acreage}$$

$$I = \text{Design Rainfall Intensity (in/hr)}$$

$$C_w = \text{Weighted Runoff Coefficient (as defined on page 15)}$$

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

$$I_{10} = 120.5 / (16.3 + tc)$$

E. Storm Water Conveyance Requirements (25-year)

The 25-year design discharge (Q_{d25}) 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 (Q_{d25}) in cubic feet per second for a site using the Rational Method in the following form:

$$Q_{d25} = CIA$$

$$A = \text{Total catchment acreage}$$

$$I = \text{Design Rainfall Intensity (in/hr)}$$

$$C_w = \text{Weighted Runoff Coefficient (as defined on page 15)}$$

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

$$I_{25} = 152 / (20 + tc)$$

F. Storm Water Conveyance Requirements (100-year)

The 100-year design discharge (Q_{d100}) 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 100-year design discharge (Q_{d100}) in cubic feet per second for a site using the Rational Method in the following form:

$$Q_{d100} = CIA$$

$$A = \text{Total catchment acreage}$$

$$I = \text{Design Rainfall Intensity (in/hr)}$$

$$C_w = \text{Weighted Runoff Coefficient (as defined on page 15)}$$

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

$$I_{100} = 238 / (25 + tc)$$

G. 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).

Lag time will be 15 minutes, which is the amount of time runoff takes to get into the furthest catch basin. From there, the time of concentration will be your lag time plus the time of flow in the storm sewer system. The time of concentration will be cumulative through each section of pipe. Design calculations will be adjusted for each segment of pipe based on the new time of concentration.

H. Runoff Coefficient

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

TYPICAL RUNOFF COEFFICIENTS ("C" VALUE)

DESCRIPTION OF AREA	RUNOFF COEFFICIENTS
Business	
Downtown areas	0.95
Neighborhood areas	0.70
Residential	
Single-family areas	0.50
Multiunits – detached	0.60
Multiunits – attached	0.75
Residential (suburban)	0.40
Apartment dwelling areas	0.70
Industrial	
Light areas	0.80
Heavy areas	0.90
Parks, cemeteries	0.25
Playgrounds	0.35
Railroad yard areas	0.40
Unimproved areas	0.30
Streets	
Asphalt	0.95
Concrete	0.95
Brick	0.85
Drives and walks	0.85
Roofs	0.95
Agricultural soil	0.10
Lawns, sandy soil	
Flat, 0-2%	0.10
Average, 2-7%	0.15
Steep, 7%	0.20
Lawns, heavy soil	
Flat, 0-2%	0.17
Average, 2-7%	0.22
Steep, 7%	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:

- Detention ponds
- Retention 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

10-year storm for:

- Open channels
- Culverts
- Drain enclosures where the drainage area is not in excess of 300 acres

For improvements in this category, the Proprietor/Developer'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.

All storm systems shall be designed to exit into an outlet with sufficient carrying capacity to carry the additional design flow. The Proprietor/Developer's Engineer shall analyze this condition and submit data substantiating his conclusions. This information shall be submitted to the Drain Commissioner along with the required design forms.

In the event the Proprietor does not have sufficient capacity in the outlet, the following criteria shall apply:

- 1.) The Township shall petition the Commissioner to improve the outlet to the required size to pass the additional water at the design storm. In the event this petition is not successful, the following criteria shall apply.
 - 2.) The unit allowable discharge required by the Bay County Drain Commissioner shall be 0.15 cfs/Ac. All excess shall be detained onsite for duration of time necessary to pass the design storm without causing downstream flooding.
- b. If the development is over 100 acres, the rational method hydrology calculations (Section IV) will not be valid and an alternative method must be used (i.e. TR-55, SCS, etc.).
 - c. The peak runoff rate during a 2-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. All Commercial/Industrial developments shall be required to address parking lot "first flush runoff" and any other subsequent runoff that may produce pollutants to any Bay County Drainage System.
 - e. Retention ponds will be allowed with the appropriate calculations, soil tests, and approval by the Bay County Drain Commissioner.
 - f. Pumped detention ponds will be allowed with the appropriate calculations and approval by the Bay County Drain Commissioner.
 - g. Hydraulic calculations and storm water detention requirements must be in compliance with this Storm Water Management Plan.
 - h. Roof drains may be connected to the Developer/Proprietor's system. Unrestricted runoff from roof drains will not be accepted. There will be no exceptions.
 - i. The Owner/Developer and Bay County Drain Commissioner shall make a determination as to whether any or all of the facilities proposed are to remain privately maintained or maintained publicly as part of the Bay County drainage system, Bay County Road Commission drainage system, or the Michigan Department of Transportation drainage system.
 - j. The Drain Commissioner's Engineer shall in the case of a proposed development or redevelopment, 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 (Appendix B) on any particular lot in said subdivision for the preservation of mandatory drainage facilities.

- k. Drain right-of-way shall be used in accordance with the Michigan Drain Code of 1956, Act 40 of the Public Acts of 1956, sections 280.85 and 280.421 (Appendix B) that being the "Owner's use of land of right of way" and "Obstructions;removal;expenses, notice;livestock;criminal complaint."
- l. In accordance with the Michigan Drain Code of 1956, Act 40 of the Public Acts of 1956, as amended, the drainage of the proposed development or redevelopment 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.
- m. 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.
- n. Soil erosion and sedimentation control measures shall be followed according to Part 91, SEESC, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA).
- o. Soil erosion permits must be obtained prior to approval.
- p. Township Ordinances shall prevail with regard to detention/retention pond safety issues.
- q. A topographical map showing actual contours for the drainage area affecting the site. 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.

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 development or redevelopment, 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. Right-of-Way Requirements

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 development or redevelopment; except those established county drains in existence prior to the proposed development or redevelopment, 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.
- e. 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.

4. Storm Sewer Piping Requirements for Established Bay County Drains

- 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 clean contaminant free 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. Concrete Pipe in accordance with MDOT specifications and approved by the Bay County Drain Commissioner must be used for Storm Sewers. Corrugated metal and plastic pipe will be allowed at the discretion of the Bay County Drain Commissioner. All storm sewer and culvert pipe shall be designated on the plans by the appropriate class.
- 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. "Truck wells" must discharge to sanitary sewer if available.
- h. Provide a minimum of two (2) feet of cover for storm sewer.
- i. 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.
- j. A minimum of four (4) inches of sand bedding is required beneath the pipe and a minimum of 12 inches of fully compacted sand backfill is required above the pipe.
- k. 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. Oil and grease separator catch basin(s) must be used in areas where potential hazardous material may enter the drainage system. All catch basins shall be labeled with proper NPDES markings (i.e. "No Dumping Drains To River"). If catch basins are not labeled, the Drain Commissioner may impose a fee to have the work performed.
- l. A storm sewer lead extended to the right-of-way/property line of each lot (minimum 4 inches) shall be provided for rear lot drainage.
- m. Provide a sump discharge outlet for each individual property/lot in all developments. Sump leads shall not be connected to rear lot drainage systems.

- n. Minimum pipe grades established must have a minimum flowing full velocity of 2.5 feet per second and a maximum of 10 feet per second.
- o. Storm sewer joints must be soil tight, but not water tight, except in Brownfield development sites or sites with known groundwater contamination.
- p. Minimum pipe diameter for catch basin leads is 10 inches.
- q. Minimum pipe size for storm sewer is 12 inches.
- r. When two pipes or more of different sizes come into a structure, the 8/10th flow lines shall match when possible.
- s. Catch basins should have a minimum sump depth of 18 inches and should be marked/stenciled with the proper NPDES markings (i.e. "No Dumping Drains To River"). If catch basins are not labeled, the Drain Commissioner may impose a fee to have the work performed.
- t. Inlets may be allowed if approved by the Drain Commissioner and adequate sediment trapping measures are provided.

5. Culverts

- a. When necessary for drainage purposes, crossroad culverts, deceleration lanes, potential full enclosures and driveway approach culverts shall be installed at locations shown on the plans or as designated by the Engineer. The pipe used for crossroad culverts, deceleration lanes, potential full enclosures and driveway approach culverts shall be concrete pipe. The pipe furnished shall conform to the Current Specifications for Reinforced Concrete Storm Drain and Sewer Pipe, A.S.T.M. Designation C-76. Corrugated metal and plastic pipe will be allowed at the discretion of the Bay County Drain Commissioner. A permit to tile an established county drain is required from the Bay County Drain Commissioner for all culvert installations.

6. Detention Requirements

- a. Residential developments will need to provide a separate lot or parcel for detention. In addition the following requirements will apply:
 - 1.) This area can not be dedicated through an easement.
 - 2.) The lot or parcel must have a recorded ingress/egress easement with a minimum of 20 feet abutting a County right-of-way.

- 3.) 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 (V_t) from the entire contributing area in excess of the allowable discharge from the site (See Design Calculations, Section IV).
- e. Underground detention storage will be allowed, if required storage is obtained.
- f. 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.
- g. 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.
- h. 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.
- i. 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.

- j. All internal drainage systems are to outlet directly to detention basin. The detention basin shall discharge with a metering line to an approved storm water drainage system.
- k. Designs of detention facilities shall incorporate safety features, particularly at inlets, outlets, on steep slopes, (six 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 the access as required by the Drain Commissioner or Township Ordinances.
- l. Side slopes and the bottom of detention basins shall be topsoiled, to a minimum of four (4) inches, seeded, and stabilized with mulch blankets or approved tackifying polymers to prevent rilling or other undesirable erosion.
- m. The side slopes and bottom of the basins shall be shaped with maximum slopes of six (6) horizontal to one (1) vertical to allow mowing of these surfaces. Township ordinances shall govern in regards to safety issues.
- n. Detention basins with bottom slopes less than one (1) percent shall be underdrained when feasible.
- o. 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).
- p. 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.).

7. Maintenance Requirements for Detention Facilities.

- a. Detention basins and metering line shall be maintained as necessary. If a detention basin is found not to be maintained, the owner/developer will have 30 days to complete the necessary maintenance.
- 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 so the basin remains functional and is aesthetically pleasing to surrounding landowners.

8. Rear Lot Drainage Requirements.

- a. Rear lot drainage shall not be considered an established county drain and will belong to the owners of the land where located.
- b. 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.
- c. Minimum rear lot drainage lead sizes and slopes are as follows:
 - 1.) 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%
 - 2.) Rear lot drainage leads with contributing drainage area 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%.
 - 3.) Rear lot drainage leads with contributing drainage area 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%.
 - 4.) Rear lot drainage leads with contributing drainage 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.
- d. Sand backfill and bedding is required for rear lot drainage leads located under traveled areas.
- e. Rear lot drainage leads must be constructed at a depth so that two feet of cover can be provided at low upstream locations.
- f. A ten (10) foot wide private easement shall be provided on each lot adjacent to rear lot drainage systems, providing a total of a 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.
- g. Existing rear lot drainage systems abutting a proposed development may be used for the new development provided:

- 1.) The existing rear lot drainage system has the capacity to convey storm water runoff from the proposed rear lot drainage areas.
- h. Phased developments owned by the same proprietor may utilize proposed rear lot drainage for a current development phase on future phases provided:
 - 1.) 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.
 - 2.) Rear lot drainage shall be shown on the preliminary plat (subdivisions) or site plan (condominiums).
 - 3.) All rear lot drains shall connect to an approved storm water drainage system.

B. Variances From Requirements

Variances from the requirements may be issued under extremely rare and extenuating circumstances.

C. Final Cleanup, Seeding, Sodding and Mulching

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.

Sodding, seeding and mulching where required shall be done in accordance with the requirements of the Soil Erosion Permit. The work shall be performed according to Part 91, SESC, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). 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.

D. Grading

All finish grading shall be performed to achieve adequate drainage to approved drainage systems. Maps of finished grade elevations may be required by the Drain Commissioner.

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. 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 of Final Plat

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 0.2% 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 development or redevelopment 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 development or redevelopment. The top of these monuments shall be approximately level with the finished grade at the time the final improvements are completed.

C. 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 development or redevelopment before submission of the final plat, the Proprietor's Engineer shall prepare drainage plans in accordance with this plan.
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.
3. 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 development or redevelopment, 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.

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. 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 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.

VII. Staking Requirements For Established County Drains

A. County Drain Enclosures

1. Show offset to utility on construction stakes and "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 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 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. 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.

APPENDIX A

- ◇ *STORM WATER MANAGEMENT CHECKLIST*
- ◇ *COMPLETE STORM WATER DESIGN SUBMITTAL SUMMARY*
- ◇ *APPLICATION TO CONNECT AND DISCHARGE CLEAN STORM WATER TO AN ESTABLISHED COUNTY DRAIN*
- ◇ *APPLICATION FOR PERMIT TO TILE AN ESTABLISHED COUNTY DRAIN*
- ◇ *APPLICATION FOR PERMIT TO CROSS OR PARALLEL AN ESTABLISHED COUNTY DRAIN*
- ◇ *APPLICATION FOR A SPECIAL TEMPORARY CULVERT PERMIT*

STORM WATER MANAGEMENT CHECKLIST

- _____ 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 and on adjacent property to determine overall drainage area.
- _____ 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.
- _____ Stamp and signature of a 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.
- _____ Metering line location noted on plans.
- _____ N.P.D.E.S Permit (when required).
- _____ Soil Erosion Control Permit.
- _____ Oil Separator Catch Basin.

Note: This checklist must be submitted with the design submittal

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.

_____ Sewers, if any.

_____ Additional on site utilities.

_____ 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:

_____ Contributing Area (includes adjacent lands)

_____ 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 metering line.

Performed Site Inspection on _____

Signature

Note: This checklist must be submitted with the design submittal

Bay County Drain Commissioner Complete Storm Water Design Submittal Summary

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 (*Calculations must be submitted for verification. Calculation must have clearly labeled headings, clearly labeled formulas, and clearly labeled units.)	
Type of Development (Circle): <i>COMMERCIAL SITE, INDUSTRIAL SITE, RESIDENTIAL PLATTED, RESIDENTIAL CONDOMINIUM, OTHER</i>	
*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 (Qa) (cfs):	
*TOTAL VOLUME OF STORAGE REQUIRED (Vt)(cu. ft.)	
*TOTAL VOLUME OF STORAGE DESIGNED (cu. ft.)	
100 YR. DESIGN STORM WATER 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):	
*2 YEAR DESIGN DISCHARGE (cfs):	
*HEAD DIFFERENTIAL THROUGH METERING LINE (ft.):	
*DIAMETER OF PROPOSED METERING LINE (in.):	
*ACTUAL RESTRICTED DISCHARGE (cfs):	
Authorized Signature	Date

Note: This summary must be submitted with the design submittal

BAY COUNTY DRAIN COMMISSIONER

JOSEPH RIVET
rivetj@baycounty.net

515 CENTER AVENUE, SUITE 601
BAY CITY, MICHIGAN 48708-5127
drainoffice@baycounty.net

PHONE (898) 895-4290
FAX (989) 895-4292
TDD (989) 895-4049
(HEARING IMPAIRED)

APPLICATION FOR PERMIT TO CONNECT AND DISCHARGE CLEAN STORM WATER TO AN ESTABLISHED COUNTY DRAIN

Applicant's Name: _____

Mailing Address: _____

City, State, Zip: _____

Telephone Number: (_____) _____

Contractor's Name: _____

Mailing Address: _____

Telephone Number: (_____) _____

Applicant's Contact Name and Telephone Number: (_____) _____

=====

I do hereby make application for a permit to make connection and discharge directly or indirectly to
the _____ County Drain at the following location:

_____ in the Township of _____

for the purpose of **discharging clean unpolluted storm water.**

I certify that I accept the following:

1. Commencement of work set forth in the permit application constitutes acceptance of the permit as issued.
2. Failure to object within ten (10) days to the permit as issued constitutes acceptance of the permit as issued.
3. If this permit is accepted by either of the above methods, I will comply with the provisions of the permit.
4. I will be responsible for and pay all costs incurred by the Bay County Drain Commissioner and the Drainage District for engineering service in reviewing this Permit Application and for all costs of inspection of the work performed there under.
5. I hereby agree to comply with all terms and conditions as set forth in the permit, together with the following rules and regulations as established by the Bay County Drain Commissioner for connecting to a County Drain:
6. All connections to established county drains shall be done in a professional manner acceptable to the Bay County Drain Commissioner. When connection is made to an enclosed storm sewer, the connection hole must be cored or cut with a concrete saw to the appropriate diameter. **(ANY METHOD SUCH AS JACKHAMMER, SLEDGEHAMMER, OR BREAKING THROUGH THE WALL IS UNACCEPTABLE.)** All connections must be properly sealed to prevent leakage and/or infiltration into the system.
7. It is desired that all connections be tapped into a manhole or catch basin. If this is not possible and connection must be made in the main line sewer, the following will apply: **(SEE ATTACHED DRAWING: TAP CONNECTION DETAILS FOR ENCLOSED COUNTY DRAINS).**
8. Open drain connection must be restored and protected against erosion and bank failure by use of seed, hydroseed, sod, rip rap, stone, concrete spillways, etc. as determined appropriate for the situation and approved by the Bay County Drain Commissioner.
9. Any structures removed such as headwalls, wingwalls, concrete slabs, rip rap, erosion protection, tiling and culverts - metal or concrete, must be replaced with new material and reconstructed to original condition or better.
10. All ditch banks, when disturbed, must be reshaped to a minimum of 2:1 slope, compacted, topsoiled and seeded, fertilized and mulched or hydroseeded, as determined suitable for the situation.
11. Five (5) days notice is required to the inspection department prior to any construction that will involve a county drain. Connection should not be back filled until inspected and approved.
12. Equipment and materials may not be stored in any way so as to cause blockage of a county drain.
13. Permittee is responsible for maintaining all storm drainage during the time of construction, whether by use of pumping equipment or construction of a bypass system.

14. **Permittee is allowed to discharge clean unpolluted stormwater only.** Any product or material entering the established county drain through the authorized connection that is deemed unacceptable and considered pollution is the sole responsibility of the Permittee in regard to liability and expense for cleanup, fines, or penalties under local, state and federal law.

15. Permit fee will be One-Hundred Dollars (\$100.00), payable by check to the BAY COUNTY TREASURER. Prior to issuance of a permit, proof of Contractor's Liability Insurance must be filed with the Office of the Drain Commissioner, with the named insured, in compliance with the Bay County Drain Commissioner's standards. Additionally, if determined necessary by the Bay County Drain Commissioner, an indemnity insurance in the amount of \$1,000,000.00 may be required.

16. This permit does not relieve applicant from meeting any application requirement of law or of other public bodies or agencies, local, state or federal.

17. Permittee shall be responsible for and pay all costs for engineering and inspection services incurred by the Bay County Drain Commissioner in the review of the Permit Application and inspection of work performed hereunder. Payment to be made within thirty (30) days of invoice.

18. Permittee shall notify this office upon completion of construction.

Further, Permittee shall hold harmless and indemnify the Bay County Drain Commissioner, the Drainage District, and their employees, agents or contractors from any injury or fines to person or property sustained as a result of the placement or the uses specified herein.

DATE: _____

Applicant's Signature

Its: _____

I hereby certify that I am acting as authorized agent on behalf of the above named applicant.

DATE: _____

Authorized Agent's Signature

BAY COUNTY DRAIN COMMISSIONER

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(HEARING IMPAIRED)

APPLICATION FOR PERMIT TO TILE AN ESTABLISHED COUNTY DRAIN

The following information and specifications should be provided to your pre qualified contractors to assure that you, as landowner, receive quality products that are installed properly and will not be an impediment to the established county drain.

Applicant's Name: _____

Mailing Address: _____

City, State, Zip: _____

Telephone Number: (_____) _____

Parcel Code #: _____

Contractor's Name: _____

Mailing Address: _____

Telephone Number: (_____) _____

=====

I do hereby make application for a permit for installation of a tile to be placed in the _____
_____ County Drain at the following

location:(address) _____,

Township of _____ approx. distance for closest intersection: _____

I certify that I accept the following:

1. Installation contractors must be pre-qualified by the Bay County Drain Commissioner.
2. Commencement of work set forth in the permit application constitutes acceptance of the permit as issued.
3. Failure to object within ten (10) days to the permit as issued constitutes acceptance of the permit as issued.
4. I will be responsible for and pay all costs for engineering and inspection services incurred by the Bay County Drain Commissioner in reviewing this Permit Application and for all costs of

inspection of the work thereunder.

5. The permit fee is \$300.00, which includes setting grade, culvert installation inspection and final "as constructed" inspection. The fee is based on an eight hour work day and any additional services that are required will be billed at \$150.00 per half day and \$300.00 per full day. Overtime and holiday pay will meet the requirements of the Bay County Labor Agreements. Please make checks payable to the Bay County Treasurer and mail to this office.
6. All culverts must be of proper size and material set at the established drain bottom. New material to be used only.
7. **Before setting the new drive culvert/tile the drain is to be excavated down to clay and stone bedding prepared at an elevation suitable for the type of pipe to be set to insure that the new structure meets the required elevation and grade.**
8. Any structures removed such as headwalls, wingwalls, concrete slabs, rip rap, erosion protection, tiling and culverts - metal or concrete, must be replaced with new material and reconstructed to original condition or better.
9. All ditch banks, when disturbed, must be reshaped to a minimum of 2:1 slope, compacted, topsoiled and seeded, fertilized and mulched or hydroseeded.
10. **Five (5) days notice** is required to the inspection department prior to any construction and final inspection request that will involve a county drain.
11. Equipment and materials may not be stored in any way so as to cause blockage of a county drain.
12. Contractor is to complete the attached Culvert Installation Verification & Request for Final Inspection upon completion of the culvert installation.
13. Permittee is responsible for maintaining all storm drainage during the time of construction, whether by use of pumping equipment or construction of a bypass system.
14. Depending on circumstances, prior to issuance of a permit, proof of Contractor's Liability Insurance should be filed with the Office of the Drain Commissioner, with the named insured, in compliance with the Bay County Drain Commissioner's standards.
15. This permit does not relieve applicant from meeting any application requirement of law or of other public bodies or agencies, i.e. local, state or federal.
16. Permittee shall hold harmless the Drainage District, the Bay County Drain Commissioner, or Drainage Board, County of Bay, and State of Michigan for any liability connected with installation of said tile.
17. Any failure of the work performed under this permit that causes an obstruction shall be subject to the provisions set forth under Section 280.421 of the Michigan Drain Code, Act 40 of 1956, as amended.

I hereby agree to comply with all terms and conditions as set forth in the permit, together with the rules and regulations as established by the Bay County Drain Commissioner:

DATE: _____

Applicant's Signature

BAY COUNTY DRAIN COMMISSIONER

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rivetj@baycounty.net

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TDD (989) 895-4049
(HEARING IMPAIRED)

APPLICATION FOR PERMIT TO CROSS OR PARALLEL AN ESTABLISHED COUNTY DRAIN

Applicant's Name: _____

Mailing Address: _____

City, State & Zip: _____

Telephone Number: (_____) _____

Parcel Code #: _____

Contractor's Name: _____

Mailing Address: _____

City, State, & Zip _____

Telephone Number: (_____) _____

Applicant's Contact Name and Telephone Number: (_____) _____

=====

I do hereby make application for a permit to cross or parallel the right-of-way of the
_____ County Drain at the following location:

for a period commencing _____ and ending

_____ for the following purpose: _____

I certify that I accept the following:

1. Commencement of work set forth in the permit application constitutes acceptance of the permit as issued.
2. Failure to object within ten (10) days to the permit as issued constitutes acceptance of the permit as issued.
3. If this permit is accepted by either of the above methods, I will comply with the provisions of the permit.
4. I will be responsible for and pay all costs incurred by the Bay County Drain Commissioner and the Drainage District for engineering service in reviewing this Permit Application and for all costs of inspection of the work performed thereunder.
5. I further agree to comply with the following rules and regulations as established by the Bay County Drain Commissioner for Crossing or Paralleling a County Drain:
 6. All utilities and/or facilities must be a minimum of four (4) feet below the established drain bottom when crossing or paralleling a county drain or right-of-way.
 7. Any structures removed such as headwalls, wingwalls, concrete slabs, rip rap, erosion protection, tiling and culverts - metal or concrete, must be replaced with new material and reconstructed to original condition or better.
 8. All ditch banks, when disturbed, must be reshaped to original slope, compacted, topsoiled and seeded, fertilized and mulched or hydroseeded, as determined suitable for the situation.
 9. Five (5) days notice is required to the inspection department prior to any construction that will involve a county drain.
 10. Equipment and materials may not be stored in any way so as to cause blockage of a county drain.
 11. Permittee is responsible for maintaining all storm drainage during the time of construction, whether by use of pumping equipment or construction of a bypass system.
 12. Permit fee will be One-Hundred Dollars (\$100.00), payable by check to the BAY COUNTY TREASURER. Prior to issuance of a permit, proof of Contractor's Liability Insurance must be filed with the Office of the Drain Commissioner, with the named insured, in compliance with the Bay County Drain Commissioner's standards. Additionally, if determined necessary by the Bay County Drain Commissioner, an indemnity insurance in the amount of \$1,000,000 may be required.

13. This permit does not relieve applicant from meeting any application requirement of law or of other public bodies or agencies, i.e. local, state or federal. Additionally, the issuance of this permit does not relieve the utility of any future expense for relocation of said utility to accommodate for future drain improvements.

14. Permittee shall be responsible for and pay all costs for engineering and inspection services incurred by the Bay County Drain Commissioner in the review of the Permit Application and inspection of work performed hereunder. Payment to be made within thirty (30) days of invoice.

15. Permittee is allowed to cross or parallel the county drain as specified herein only. Any product or material entering the established county drain through the utility that is deemed unacceptable and considered pollution is the sole responsibility of the Permittee in regard to liability and expense for cleanup, fines, or penalties under local, state and federal law.

Further, the owner of said utility shall hold harmless the Drainage District, the Bay County Drain Commissioner, or Drainage Board, County of Bay, and State of Michigan for any liability connected with the utility being located within the easement of a county drain.

16. OTHER: Permittee further agrees, either to pay any increased cost to the Drainage District due to this utility occupying said drain, said cost to be determined as a separate bid item during construction or reconstruction, or if determined necessary by the Bay County Drain Commissioner, the Utility Company occupying said drain right-of-way, shall relocate or lower if the location of the utility shall increase the cost of performing drain improvements or drain maintenance.

All expenses pertaining to said relocations shall be paid for by the owner of the utility company. Relocation shall be completed within 90 days from receipt of written request by the Drain Commissioner.

Additional time may be granted by the Drain Commissioner if determined necessary.

Permittee does hereby acknowledge and agree, that in the event that the area of the right-of-way for which this permit is granted is necessary for the future maintenance and operation of the _____ Drain, that Permittee, at its own expense, shall remove any and all conflicting facilities, structures, pipelines, cables and other appurtenances to said use in and during the time of the maintenance of said Drain. Upon request of the Drainage District said utility will be relocated within 90 days from request.

Further, Permittee shall hold harmless and indemnify the Bay County Drain Commissioner, the _____ Drain Drainage District, and their employees, agents or contractors from any injury to person or property sustained as a result of the placement or the uses specified herein or any liability connected therewith.

The terms and conditions of the permit shall be binding on the owner of the utility company occupying the drain right-of-way and its successors and assigns.

DATE: _____
_____ Applicant's Signature

Its: _____

I hereby certify that I am acting as authorized agent on behalf of the above named applicant.

DATE: _____
_____ Authorized Agent's Signature

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(HEARING IMPAIRED)

APPLICATION FOR SPECIAL TEMPORARY CULVERT PERMIT

Applicant's Name: _____

Mailing Address: _____

City, State, Zip: _____

Telephone Number: (_____) _____

Contractor's Name: _____

Mailing Address: _____

City, State, Zip: _____

Telephone Number: (_____) _____

Applicant's Contact Name and Telephone Number: (_____) _____

=====

I do hereby make application for a permit for installation of a temporary culvert to be placed in the _____ County Drain at the following location: _____

for a period commencing _____ and ending _____
365 days thereafter for the following purpose: _____

Installation of temporary culvert for construction access and to be removed after completion of project.

I certify that I accept the following:

1. Commencement of work set forth in the permit application constitutes acceptance of the permit as issued.
 2. Failure to object within ten (10) days to the permit as issued constitutes acceptance of the permit as issued.
 3. If this permit is accepted by either of the above methods, I will comply with the provisions of the permit.
 4. I will be responsible for and pay all costs incurred by the Bay County Drain Commissioner and the Drainage District for engineering service in reviewing this Permit Application and for all costs of inspection of the work performed thereunder.
 5. I hereby agree to comply with all terms and conditions as set forth in the permit, together with the following rules and regulations as established by the Bay County Drain Commissioner:
 6. All temporary culverts must be of proper size and material set at the established drain bottom when crossing or paralleling a county drain or right-of-way. Please indicate proposed location on accompanying section map.
 7. Any structures removed such as headwalls, wingwalls, concrete slabs, rip rap, erosion protection, tiling and culverts-metal or concrete, must be replaced with new material and reconstructed to original condition or better.
 8. All ditch banks, when disturbed, must be reshaped to original slope, compacted, topsoiled and seeded, fertilized and mulched or hydroseeded, as determined suitable for the situation.
 9. Five (5) days notice is required to the inspection department prior to any construction that will involve a county drain.
 10. Equipment and materials may not be stored in any way so as to cause blockage of a county drain.
 11. Permittee is responsible for maintaining all storm drainage during the time of construction, whether by use of pumping equipment or construction of a bypass system.
 12. Permit fee will be One-Hundred Dollars (\$100.00), payable by check to the BAY COUNTY TREASURER. Prior to issuance of a permit, proof of Contractor's Liability Insurance must be filed with the Office of the Drain Commissioner, with the named insured, in compliance with the Bay County Drain Commissioner's standards.
- Additionally, if determined necessary by the Bay County Drain Commissioner, an indemnity insurance in the amount of \$1,000,000 may be required.
13. This permit does not relieve applicant from meeting any application requirement of law or of other public bodies or agencies, i.e. local, state or federal.
 14. Permittee shall be responsible for and pay all costs for engineering and inspection services

incurred by the Bay County Drain Commissioner in the review of the Permit Application and inspection of work performed hereunder. Payment to be made within thirty (30) days of invoice.

15. Permittee shall hold harmless the Drainage District, the Bay County Drain Commissioner, or Drainage Board, County of Bay, and State of Michigan for any liability connected with installation of said tile.

Further, this permit is subject to additional terms and conditions as follows: **This is a temporary crossing and the culvert must be removed after completion of the project or one (1) year from date of issuance of permit, whichever occurs first.**

DATE: _____
Applicant's Signature

Its: _____

I hereby certify that I am acting as authorized agent on behalf of the above named applicant.

DATE: _____
Authorized Agent's 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

DETAILS

HEADWALL SPECIFICATIONS

1. GENERAL

- A. **Pre-mix bags will NOT be allowed for headwall construction in any established county drain. If constructing Bag Rip-Rap headwalls please see attached specifications and details.**
- B. For established county drains parallel to county roads or state highways, 30" diameter pipe and smaller will require the use of flared end sections. Flared end sections must be in compliance with Road Commission and Michigan Department of Transportation standards.
- C. Poured-in-place headwalls may be allowed with provided shop drawings from the contractor and approval by the Bay County Drain Commissioner.
- D. Masonry headwalls may be allowed with provided shop drawings from the contractor and approval by the Bay County Drain Commissioner.

BAG RIP RAP HEADWALL SPECIFICATIONS

1. MATERIALS

- A. **Stacked "Quik-Crete" bags for construction of headwalls will not be accepted.**
- B. Wet Mixed Concrete – One (1) part cement to five (5) parts 40-60 concrete gravel or transit mixed with a 28-day compressive strength of 3,000 psi.
- C. Burlap Bags – Made of biodegradable cotton burlap material and of adequate size to provide for a filled dimension of six inches high with a one-foot width.
- D. Steel Reinforcing Bars – Grade 60 steel reinforcing bars meeting the requirements of ASTM A-615, A-616, or a 617 of 1/2 inch diameter (#4).
- E. Filter Fabric – Mechanically-bonded, non-woven, SUPAC 4NP or approved equal. In accordance with 02279 – Filter Fabric.

2. PREPARATION

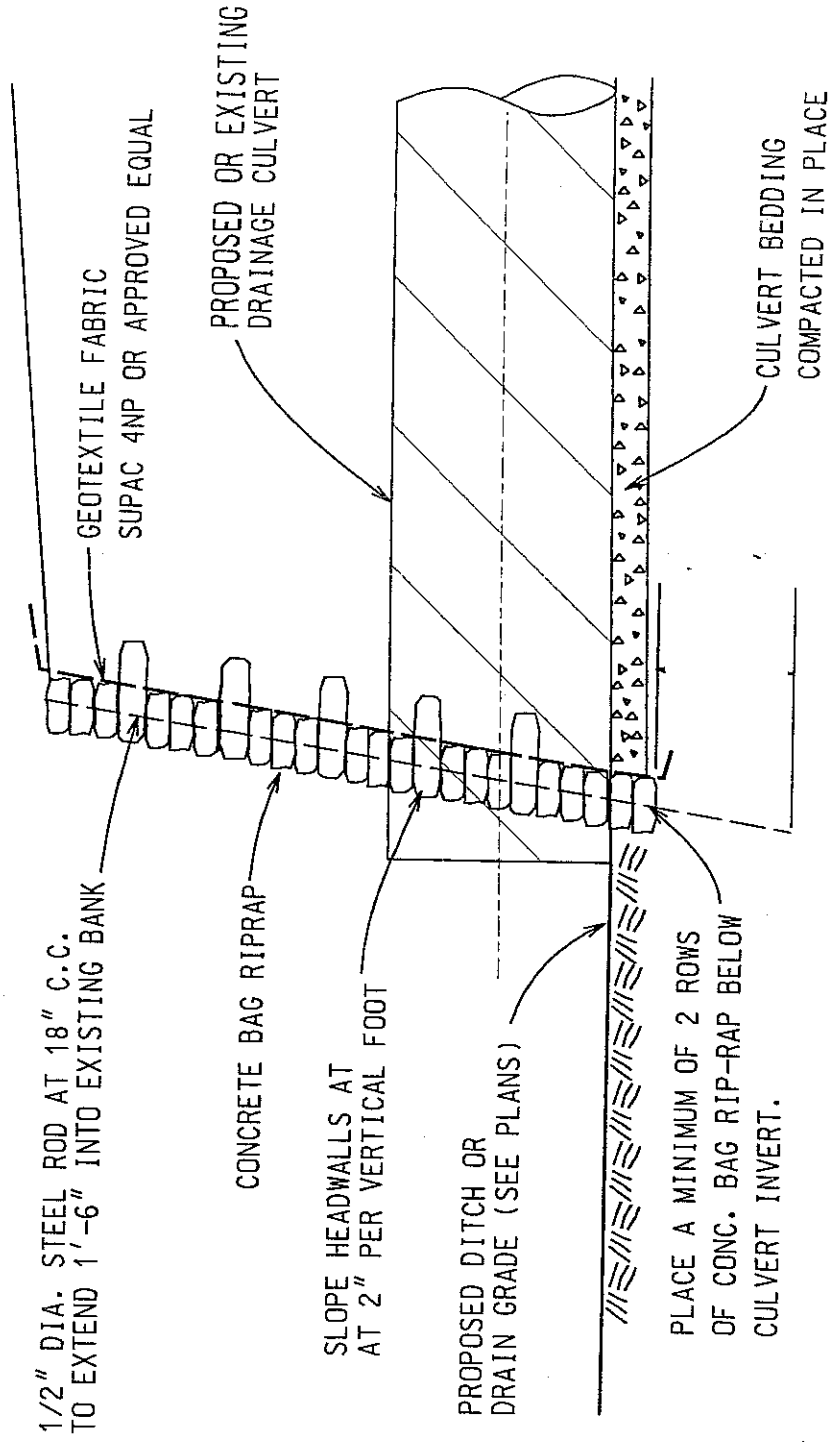
- A. Cut out soft areas of subgrade not capable of insitu compaction. Backfill with Type A fill and compact to density equal to or greater than 95% of maximum dry density in accordance with standard proctor test, ANSI/ASTM D698.

3. EXECUTION (see attached diagrams)

- A. Fill concrete bags to a maximum thickness of six inches.
- B. Place riprap beginning a minimum of 12 inches below invert of crossing or subgrade elevation.
- C. Stagger bags to provide minimum 1/3 bag overlap on subsequent layers.
- D. Place subsequent rows of bags to taper in toward center of crossing at one-foot horizontal to six-foot vertical.
- E. Extend riprap a minimum of 18 inches perpendicular into the side slopes of the proposed channel or undisturbed bank.
- F. Extend riprap to a height of six inches below the finished surface of a driveway or farm crossing.
- G. Height of riprap for a County Road or State Highway crossing shall be as indicated on the drawings or as directed by the authority having jurisdiction.
- H. Drive reinforcing bars vertically through all rows of the headwall and all bags.
- I. Install filter fabric behind bag riprap and secure with a minimum of overlap of one foot in any direction.

BAG RIPRAP HEADWALL

NOTE:
 CONCRETE BAG RIP-RAP SHALL BE
 PLACED WITH THE LONG WAY AT RIGHT
 ANGLE TO THE CULVERT. EVERY 4TH
 ROW OF BAGS SHALL BE PLACED WITH
 THE LONG WAY PARALLEL TO CULVERT.



1/2" DIA. STEEL ROD AT 18" C.C.
 TO EXTEND 1'-6" INTO EXISTING BANK

GEOTEXTILE FABRIC
 SUPAC 4NP OR APPROVED EQUAL

PROPOSED OR EXISTING
 DRAINAGE CULVERT

CONCRETE BAG RIPRAP

SLOPE HEADWALLS AT
 AT 2" PER VERTICAL FOOT

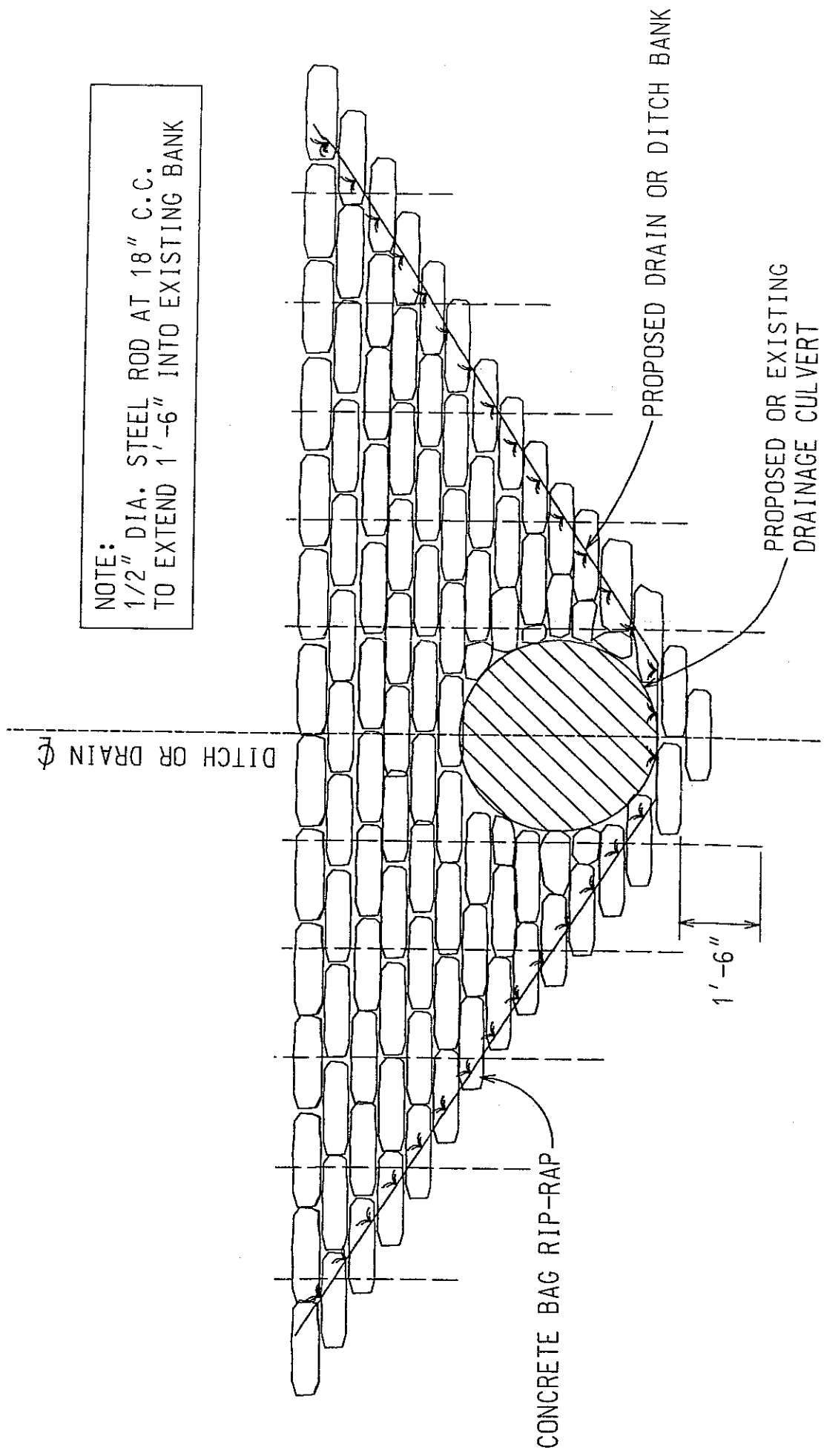
PROPOSED DITCH OR
 DRAIN GRADE (SEE PLANS)

PLACE A MINIMUM OF 2 ROWS
 OF CONC. BAG RIP-RAP BELOW
 CULVERT INVERT.

CULVERT BEDDING
 COMPACTED IN PLACE

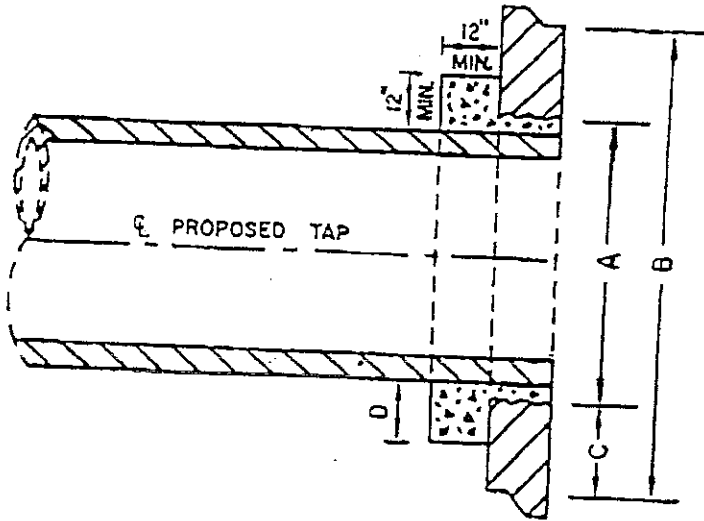
HEADWALL DETAIL FOR CULVERTS OR DRIVEWAYS

NOTE:
1/2" DIA. STEEL ROD AT 18" C.C.
TO EXTEND 1'-6" INTO EXISTING BANK



TAP CONNECTION DETAILS FOR ENCLOSED COUNTY DRAINS

PROPOSED TAP - 27" OR LARGER

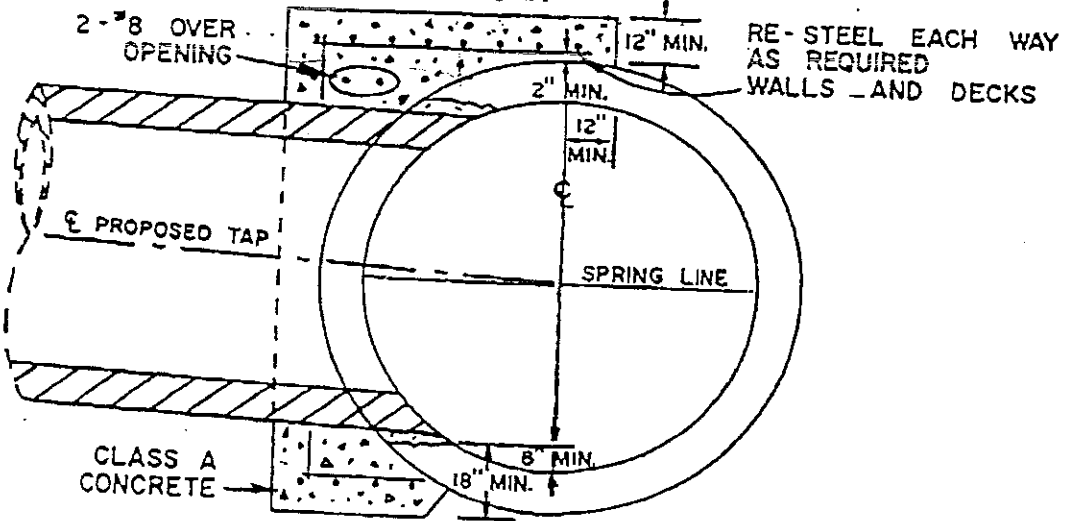


IF B-A IS GREATER THAN 3'
USE SECTION 1

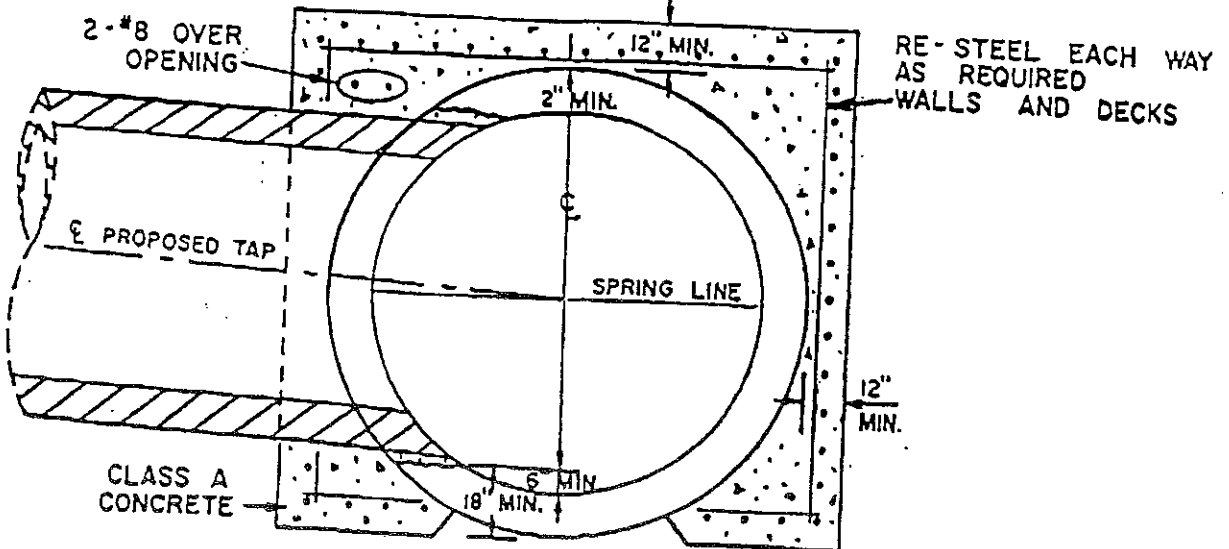
IF B-A IS LESS THAN 3'
USE SECTION 2

IF C IS LESS THAN 18"
D MUST BE GREATER THAN 30"

PLAN

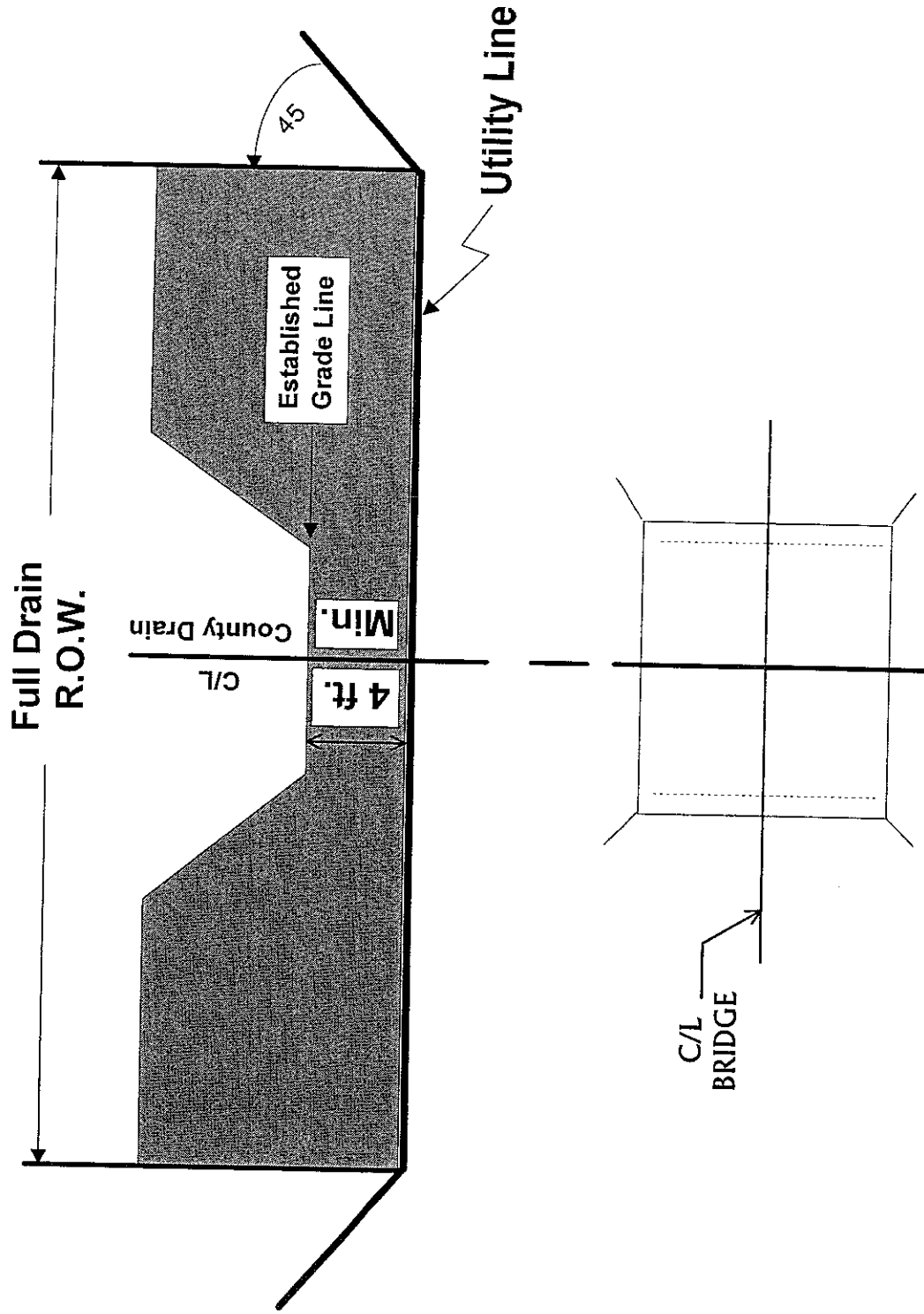


SECTION DETAIL 1



SECTION DETAIL 2

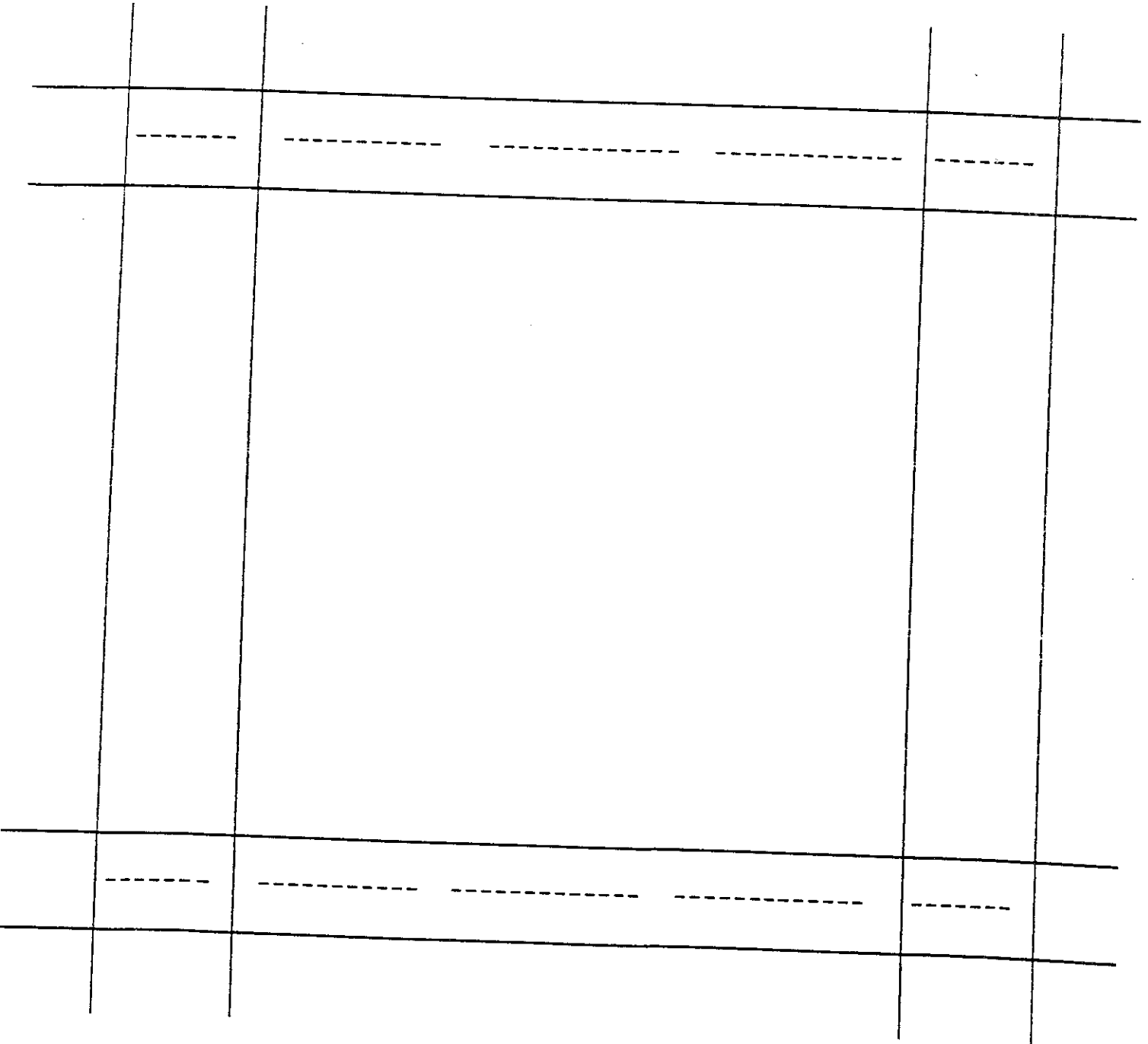
TYPICAL X-SECTION FOR UTILITY CROSSING



UTILITY LINE - NEVER UNDER NOR THRU STRUCTURE

15 ft. Minimum Clearance

N

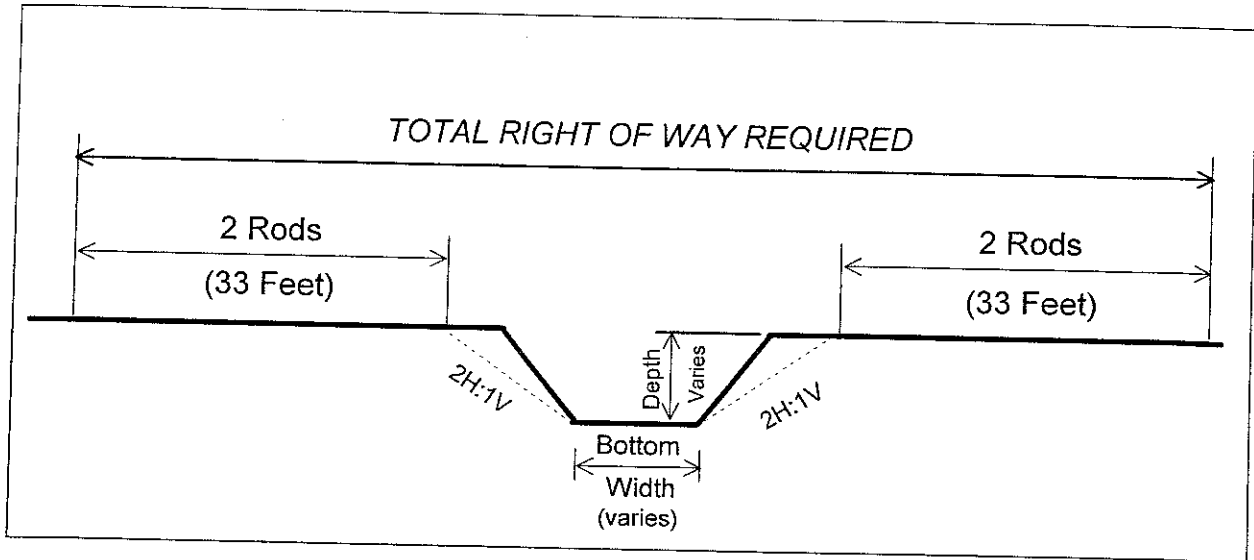


SECTION _____

TOWNSHIP _____

NAME OF DRAIN INVOLVED _____

Right-Of-Way Requirements



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

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