

# BARRY COUNTY

## DRAIN COMMISSIONER'S RULES

PROCEDURES AND DESIGN CRITERIA FOR  
STORMWATER MANAGEMENT SYSTEMS



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## PREFACE

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Barry County is known for its diverse natural features, prime agricultural lands, and many lakes. Single family residential growth is the result of proximity to Grand Rapids and Battle Creek, lake development, and the appeal of “home town” communities. Growth can enhance the county’s economy but it also can have a negative environmental impact. The Drain Commissioner realizes controlled growth is critical to preserving the unique environmental amenities within Barry County as it continues to grow. In an effort to help the county achieve controlled, well-planned growth these rules have been created to guide stormwater management.

The Drain Commissioner will review proposed growth plans to help minimize adverse effects from development to adjacent property, downstream flooding, and the environment due to stormwater runoff. In order to create consistent review procedures these rules have been developed based on the previous “Subdivision Drainage Rules” created September 8, 1992, and recent technology from the Michigan Department of Environmental Quality’s “Guidebook of BMP’s for Michigan Watersheds”. These new rules will supersede the current rules.

The Drain Commissioner’s objective is to provide adequate stormwater drainage and to manage its quantity and quality. Development alters a watershed’s hydrologic characteristics by filling low areas, and paving pervious areas, both of which had provided infiltration. Storm sewer, and curb and gutters collect more runoff and direct it to streams, lakes or wetlands faster than predevelopment conditions. This produces greater runoff volumes with higher and more frequent flood peaks. It also increases pollutants entering the watercourses. These Rules are meant to minimize the adverse impacts on both downstream and upstream properties and resources.

These Rules do not relieve any professionals involved with the project from their responsibilities and obligations as required by statute and standard practice of their respective professions. The Drain commissioner is attempting to provide controlled, well managed growth that impacts drainage, Public Health, and welfare. Individual designs and recommendations for each project by the proprietor’s consultants must provide due diligence. Discretion and professional judgement, standard to the industry will still be necessary.

It is suggested by these Rules that the developer and their engineer and/or surveyor contact the Drain Commissioner prior to preparing a submittal package to discuss drainage plans. This allows for the Drain Commissioner and his/her consultant if needed, to point out items that will need modified or addressed in the submittal. This will save time for the developer.

Severability Clause: Any portion of these Rules found to be invalid by a court or arbitration board shall not affect the enforcement/authority of the remaining portions.

The Drain Commissioner reserves the right to grant variances to the Rules on an individual basis and to require more than these Rules if he/she feels it is necessary to protect the health and welfare of the public and the environment.

Any request for a discharge to a county drain shall be reviewed and possibly permitted under the provisions of Public Act 40 of 1956, commonly referred to as the "Drain Law."

# **Part I: Plats and Construction Plan Review**

## **A. AUTHORIZATION –**

P.A. 288 of the Michigan Public Acts of 1967, known as the Subdivision Control Act (as amended by PA 591 of 1996) which is now known as the Land Division Act regulates the development of lands being split into multiple parcels. All plats recorded with the Register of Deeds must conform to this act. The Drain Commissioner is required by this act to review drainage and give approvals or reasons for denial.

## **B. PRELIMINARY PLAT SUBMISSION AND APPROVAL**

The first approval by the Drain Commissioner is Preliminary Plat approval. This is the only opportunity for the Drain Commissioner to review what is proposed before it is built so detailed construction plans and specifications will be required. The plans shall meet the requirements of the Construction Plans section of these Rules and supporting calculations shall meet the requirements of the Design Criteria section of these Rules. In order to make sure time is not wasted on preparing plans that need changed, it is strongly encouraged that a concept drainage plan be reviewed with the Drain Commissioner prior to finalizing the construction plans. Submitting a Preliminary Plat as described below less the construction plans would allow for preliminary comments prior to preparing construction plans. Difficult site characteristics, unique stormwater management ideas, and environmental impacts can be reviewed at this time.

### **1. Preliminary Plat Submission Requirements –**

The proposed Preliminary Plat shall be submitted to the Drain Commissioner's office by the proprietor. This plan shall be sealed by a registered professional engineer or registered land surveyor licensed by the state of Michigan. The plan's maximum dimensions shall be 24" x 36" and the scale shall be no smaller than 1" = 100' (1" = 200' is not acceptable). 3 copies of the Preliminary Plat need to be submitted along with the appropriate construction plans, fees and calculations. The submittal shall include a transmittal letter requesting Preliminary Plat review and if found satisfactory, approval. The plat name, proprietor's name, and preparer's name (engineer or surveyor) shall be indicated on the plan along with mailing addresses, fax and telephone numbers, and email addresses (if available) for each.

The following general information shall be shown on the Preliminary Plat plan:

- a. location map showing section lines and numbers, town and range, roads and names, municipal boundaries, prominent water features, north arrow, legal description and engineer's scale (if possible)
- b. over-all plat boundaries including all possible future expansions, phase to be approved clearly designated, plat acreage, lot lines and numbers, road right-of-ways and names, north arrow, graphic scale, and date plan was prepared; lots shall have approximate dimensions indicated
- c. location of all on-site and adjacent features relevant to the proposed plat such as adjoining roads and developments, adjacent property lines and ownership, structures, buildings, railroads, high tension power lines, existing utilities, water supply systems, sewerage systems, parks, cemeteries, watercourses, wetlands, flood plains, lakes, ponds, and zoning; if adjacent lands are platted show the name, Liber, and Page
- d. proposed and existing easements including drainage areas, their intended uses and intended ownership
- e. 2' interval contour lines based on USGS (NVGD 88) datum; topography shall be shown at least 100' beyond the plat boundaries, and further if adjacent property drains towards the proposed plat
- f. existing drainage information such as swales, flow arrows, culverts, county drains, depressions, and soil types; a drawing showing tributary areas to each collection point and showing existing tributary area boundaries shall be submitted
- g. all proposed stormwater collection transmission and storage facilities including pipes, swales, basins, erosion control measures, fences, outlets, and soil borings

The Preliminary Plat of the entire proposed development including any future phases shall be submitted to the Drain Commissioner's office along with construction plans and appropriate storm water calculations of the phase proposed for immediate development. The construction plans shall be prepared in accordance with Part I, Section C of these Rules. Calculations shall be prepared in accordance with the Design Criteria Part II of these Rules. The plans and calculations shall include any collection, conveyance, storage and outlet facilities. Appropriate fees in accordance with Appendix A shall be submitted with the plans and calculations.

## 2. Preliminary Plat Review Requirements –

The Drain Commissioner will review the Preliminary Plat information to attempt to determine if the proposed development will have an adverse effect on the hydrology of the area, the environment, and the development itself. Some of the items that will be considered are:

- a. The proposed watershed boundaries shall conform to existing watershed boundaries, natural drainage patterns and any established county drain districts. A drawing indicating existing and proposed tributary areas shall be reviewed to compare drainage patterns.
- b. Proposed storm water management system shall consider any local watershed management plans that may exist, and shall comply with any ordinance in effect where the plat is to be located.
- c. Any modifications to existing storm water runoff shall not create adverse impacts to adjacent property owners and watercourses.
- d. Proper outlet capabilities must be provided. If a concentrated discharge such as a detention basin outlet pipe, ditch discharge point, or a storm sewer discharge is proposed to allow storm water to leave the boundaries of the plat it must discharge to a public system (county drain, road side ditch, existing storm sewer) or to waters of the State of Michigan (lake, stream, wetland) as long as proper permits and permission are obtained. Proof of the permits acquired and permission obtained will be required. If concentrated discharge must travel across private property off-site drainage and/or flooding easements will be required unless the following conditions are met:
  - i. Discharge does not exceed the pre-development peak flow rate for the 1-year, 2-year, 5-year, 10-year, 25-year, 50-year, and 100-year storm events.
  - ii. An outlet assessment is performed which includes descriptions of the surrounding area, including structures, that would be impacted by the concentration of flow.
  - iii. The developer and his/her engineer determine that no adverse impact will occur to down stream property owners and stipulate this in writing.
- e. Discharge shall not exceed existing capacity of the downstream conveyance system. Both volume and rate of discharge from the plat may be reduced to lower levels than those stated in these rules if proposed discharge levels exceed existing outlet capacities.

Enough space in the form of an easement needs to be reserved for the proper operation and maintenance of the storm management system. In order to accomplish this the following easement widths will be required at a minimum:

- i. Open drains = 40 feet plus the top width of the channel, centered on the drain centerline.

- ii. Enclosed drains = 30 feet centered on the enclosure.
- iii. Other facilities = sufficient easements for access and maintenance.

If the Drain Commissioner determines that additional space is needed these minimum widths will be increased. Reductions may also be made only at the discretion of the Drain Commissioner. Structures, septic tank drain fields, pools, etc. will not be allowed within the easements.

Easements will be required over all stormwater facilities including those located within road right-of-ways.

If any portion of the proposed plat is within 500 feet of a lake, stream, pond or jurisdictional wetlands as defined by the Michigan Department of Environmental Quality (MDEQ) the plat will be considered by the Drain Commissioner to be within an “environmentally sensitive area” and will require more care for any surface runoff leaving the site. Treatment of surface water prior to discharge off-site using one or more of MDEQ’s recommended BMP’s (Best Management Practices) will be required. The Drain Commissioner may consider other BMP’s at his/her discretion. Some suggested BMP’s for plats are shown in Appendix G. Other areas may be determined to be environmentally sensitive for reasons such as a unique upland ecosystem.

### **3. Preliminary Plat Approval -**

Phased developments must include the over-all master plan with the first phase plat delineated on it. Final acceptance by the Drain Commissioner of only one portion or phase of a development does not ensure final acceptance of any subsequent phases or the overall general plat or plan for the entire area; nor does it mandate that the overall general plat or plan be followed as originally proposed, if deviations or modifications acceptable to the Drain Commissioner are proposed.

Once the Preliminary Plat plan, Construction Drawings, and calculations are submitted for Preliminary Plat approval the Drain Commissioner has 30 days to approve or reject them per section 114 (3) of the Land Division Act. If the proposed plat is not approved as originally submitted, the Commissioner will notify the proprietor in writing, setting forth the reasons for withholding approval. If the proposed Preliminary Plat as submitted meets all requirements, one approved copy of the preliminary plat will be returned to the proprietor. Approval by the Drain Commissioner will be valid for a period of two (2) years from the date the Drain Commissioner approves the Preliminary Plat. If the Final Plat has not been submitted within this period of time, the proprietor shall petition the Drain Commissioner in writing for an extension stating the reasons for such extension.

The Drain Commissioner will then decide if the extension will be granted. If petition for extension is not made within said two (2) years the Preliminary Plat approval is voided and the approval process must start over.

Payment of all fees is prerequisite to approval (see Fee Schedule, Appendix A).

BARRY COUNTY DRAIN COMMISSIONER'S  
PRELIMINARY PLAT REVIEW CHECK LIST

- Preliminary Plat plan shall be sealed by a professional engineer or registered land surveyor licensed by the State of Michigan.
- The Preliminary Plat plan shall be represented on 24" x 36" paper with a scale no smaller than 1" = 100' (1" = 200' is not acceptable).
- Submit four (4) copies of the Preliminary Plat, Construction Plans, Design Criteria/calculations and appropriate fees.
- Indicate the plat name, proprietor's name, and preparer's name (engineer or surveyor) along with mailing addresses, fax and telephone numbers, and email addresses (if available) for each.
- Included a location map showing section lines and numbers, town and range, roads and names, municipal boundaries, prominent water features, north arrow, legal description of the parcel to be platted, and an engineer's scale (if possible).
- Show relevant features on the plans such as adjoining roads, developments, property lines, adjacent property ownership, structures, railroads, power lines, utilities, watercourses, wetlands, etc. Show parcel numbers, Liber and Pages of recorded documents in and adjacent to the proposed plat.
- Indicate contour lines based on USGS datum at 1 or 2' intervals to a least 100' beyond the plat boundaries and further if adjacent property drains towards the proposed plat.
- Show proposed roads, lots, easements, parks, etc.
- Show all existing and proposed stormwater systems.
- A plan showing the future phases (if there are any) of the over-all development shall be provided.
- Submit Construction Plans in accordance with these Rules.
- Submit calculations in accordance with the Design Criteria section.
- Provide a USGS (NGVD 88) benchmark description.
- Provide a Legend on each sheet of the plans.
- Provide an overall metes & bounds property description (with ties to government corner) of the proposed plat.
- Show lot dimension (scaled or computed) on the plat plan.
- Show lot numbers on the plat plan.
- Building setback lines shall be shown.
- Provide a typical lot grading plan detail, with information regarding typical drainage, drainage arrows and the minimum house opening elevation.
- Indicate soil types using available soils data, and soil borings or backhoe cut results. Include logs and locations plus ground elevations and water table information. Soils shall be classified using USDA terminology.
- Show any offsite watershed areas that drain onto the proposed plat (with boundaries, land use and acreage's).
- Show all existing drainage courses and structures (with proper labeling as to type, size and invert elevations).
- Indicate the 100-year flood plain contour (existing and proposed).
- Provide offsite drain easements or right-of-way as proposed.

## **C. CONSTRUCTION PLANS**

### **1. General Information-**

If other review agencies, having authority over the proposed development, have more stringent rules, then the more stringent rules will supersede these Rules.

When plans have been approved, electronic file copies of the plans formatted in a way acceptable to the Drain Commissioner may be required.

### **2. Submission Requirements**

Three (3) complete sets of 24" x 36" plans shall be submitted using a scale of no smaller than 1" = 50' (except for the Over-all Hydrology plan). The plans shall be sealed by a licensed Professional Engineer registered in the State of Michigan. The proprietor's and engineer's names, addresses, and phone numbers shall be shown on the first sheet of the plans. A sheet number, revision date, north arrow, and graphic scale shall be shown on each sheet. A small location map shall be included on the cover sheet, and the project name shall be clearly visible on each sheet.

#### **a. Over-all Hydrology Plan-**

- i. Provide a sheet to whatever scale necessary that shows the entire proposed development and contributing watershed.
- ii. If the development will be phased indicate the over-all boundary and designate the phase that approval is being requested for.
- iii. A legal description of the development with a total acreage shall be shown along with individual phase acreage.
- iv. This Plan shall show topography with no less than 2 foot contour lines using USGS (NGVD 88) datum for the entire watershed (development plus up gradient). If the watershed extends more than 300 feet beyond the development boundaries USGS Quad map topography can be used.
- v. Indicate the existing and proposed stormwater drainage flow patterns on this sheet.
- vi. Adjoining roads, subdivisions, railroads, high tension power lines, underground lines, land uses, natural and artificial watercourses, wetlands, floodplains, lakes, ponds, drains, sewers, water mains, septic tanks, and wells should be shown.

b. Site Grading Plans(s)-

- i. Provide as many sheets as necessary in the construction plans to show the proposed project layout with dimensions, including all proposed stormwater facilities.
- ii. At least one bench mark elevation, location and description shall be shown per sheet and existing information such as structures, utilities, and easements need to be indicated.
- iii. 2 foot or less existing and proposed contours using USGS (NGVD 88) datum shall be shown.
- iv. Show flow arrows to designate surface water runoff directions and indicate all stormwater conveyance systems such as inlets, manholes, pipes, and swales. Include cross sections of swales and details and specifications for structures and pipes.
- v. Any 100-year flood plains existing or proposed within the project area shall be shown. This includes stormwater storage basins and low areas that have no outlet.
- vi. Minimum basement opening elevations shall be shown where walkout or day light easements are proposed. These minimum elevations, once reviewed, may be required in the deed restrictions prior to a final approval if one is appropriate.
- vii. Permanent and temporary erosion control measures need to be shown including details and specifications. Show specifications for establishing vegetation in all areas disturbed by construction.
- viii. Proposed stormwater related easements shall be shown along with a note stating that no septic tank drain fields may be placed within these easements.
- ix. Lines indicating tributary areas to each stormwater intake location shall be shown unless a reduced version of such is included with the calculations.
- x. Show flood routing information; designate what would happen if the storm runoff conveyance systems were overloaded and backed up.
- xi. Cross-sections detailing typical erosion protection, dimensions, slope and location shall be provided for each swale proposed.
- xii. Pipe material type, class, length, slope (%), invert elevations, and burial depth shall be shown for each run. Pipe material, and class shall be in accordance with Road Commission's or local municipality's specifications which ever is appropriate.
- xiii. Calculations to size stormwater transmission systems are defined in the Design Criteria section of these Rules.
- xiv. Typical pipe trench, manhole, and inlet details must be shown, and shall include specifications for all components, backfill type, and compaction.
- xv. Rim or flow line elevations for every subsurface structure must be shown.

- xvi. Inlets/manholes or intake structures shall be placed so that surface road runoff does not travel more than 300 feet. Exceptions to this rule will only be allowed if the project engineer provides proof that the 1 year storm peak flow to a particular structure is less than 1 cubic foot per second (cfs).
- xvii. Minimum pipe cover shall be eighteen (18) inches for twelve (12) inch pipe and more as pipe size increases. The project engineer will need to provide proof that the cover proposed is acceptable under County Road Commission or local Municipality specifications.
- xviii. Each storage area (detention/retention basins, and self-contained low areas) shall have its tributary area designated on the plans. Unless a special variance is granted by the Drain Commissioner, no single retention basin tributary area shall be larger than fifty (50) acres.
- xix. Show locations of soil borings and provide soil-boring logs. Backhoe cuts are acceptable. A minimum of one boring per acre of storage basin is required. Borings in the stormwater storage basins(s) must extend to at least ten (10) feet below the proposed bottom. Soil classifications using USDA terminology is required.
- xx. For all stormwater storage areas show the volume, top elevations, bottom elevation inlet structure details outlet structure details and freeboard.
- xxi. An emergency over-flow weir with appropriate erosion protection designed to handle a 100-year storm shall be provided for any detention basin.
- xxii. Sufficient information describing the outlet pipe system shall be provided.
- xxiii. On-site retention will be required of all developments unless a positive outlet is acquired to a natural stream approved by the DEQ, to a county drain approved by the Drain Commissioner or to a roadside drainage system approved by the Road Commission or local municipality.
- xxiv. Retention basins can be man-made or an existing low area. If the existing low area is wetland, a DEQ permit may be required.
- xxv. Inflow pipes entering storage basins shall be a minimum of 12 inches above the bottom of the basin.
- xxvi. Calculations for storage basins shall be in accordance with the Design Criteria section of these Rules.
- xxvii. Some developments are intricate enough that plan and profile sheets and/or detail sheets will be necessary in order to communicate all information about the stormwater facilities. If public sewer or water is proposed in the development, plan and profile sheets at 1" = 40' scale will be required.
- xxviii. If details, specifications, storage basin data, etc. need a separate sheet(s) in order to clearly explain what is proposed, then they shall be included.
- xxix. In some cases stormwater infiltrating into the soil may "stack-up" on top of ground water and cause adverse effects on adjacent property. This is

known as ground water mounding. If the proposed development has the potential to do this the Drain Commissioner will require a hydrogeological study. This study must show that the ground water mounding will not affect easements, structures, lawns, etc. in order for the proposed basin location to be considered. The study must be performed by a qualified professional.

- xxx. Fencing requirements are defined in the Design Criteria section of these Rules.

BARRY COUNTY DRAIN COMMISSIONER'S  
CONSTRUCTION PLAN CHECK LIST

General

- Provide electronic file (format shall be comparable with county's system) of plans once plans are approved.
- Submit 3 sets of 24" x 36" plans.
- The minimum scale used on plans shall be: 1" = 50' (1" = 60' not acceptable; over-all hydrology plan may be larger) 1" = 40' for plan and profile plans
- Plans shall be sealed by a Professional Engineer licensed in Michigan.
- Provide name, address, and phone number for the proprietor and engineer on the cover sheet.
- Show a sheet number, revision date, north arrow, and graphic scale on each page.
- Provide a location map on the cover sheet.
- Show in large text the proposed development's name on the cover sheet, and in the border or title block of all other sheets.

Over-all Hydrology Plan

- Show the entire watershed that drains across the proposed development.
- Indicate any phases for future growth of the development and clearly show which phase is requesting approval.
- Provide a legal description of the development with total acreage; provide approximate acreages for all phases.
- Show contour lines at no less than 2-foot intervals using USGS datum for the entire watershed. If the watershed extends more than 300 feet beyond the development boundaries USGS Quadrangle Topography may be provided in lieu of 2-foot contours.
- Indicate existing and proposed stormwater drainage flow patterns using arrows.
- Show existing utility, and transportation systems along with land uses, water features, and drainage courses.

Site Grading Plan(s)

- Provide at least one benchmark elevation, location, and description per sheet.
- 2 foot or less existing and proposed contour lines using USGS datum shall be shown.
- Indicate flow arrows showing surface water runoff directions.
- Show all stormwater conveyance items such as inlets, manholes, pipes, and swales; label elevation, sizes, types, and slopes.
- Show any 100-year flood plain, existing or proposed, that is within the boundary of the project. This includes stormwater storage basins and low areas that have no outlet.
- Indicate minimum basement opening elevations.
- Provide permanent and temporary erosion control measure locations, details and specifications.
- Show specifications for establishing vegetation in all areas disturbed by construction.

- All proposed easements shall be shown and stormwater related easements shall be dimensioned. A note stating that no septic tanks or drain fields may be placed within a stormwater related easement shall be provided (where public sanitary sewer is not going to be constructed only).
- Indicate tributary areas to each stormwater intake location unless a reduced version of this information is being provided with calculations.
- Provide flood routing information to show what would happen if the conveyance systems were over loaded or plugged.
- Include typical cross-sections of swales, pipe trenches, structures, erosion control measures, etc. Provide details and specifications for erosion control in swales and at end sections. Indicate backfill and compaction specifications. All dimensions needed for construction shall be shown. Covers, materials, minimum depths, etc. will be required to be noted.
- Label pipe material type, class, length, slope (%), invert elevations, and burial depth for each pipe run.
- Label rim or flow line elevations for every structure.
- Place stormwater intake structures every 300 feet or further if appropriate calculations are provided to show that flow to the structure is less than 1 cfs for a 10-year storm.
- The minimum pipe cover shall be 18" for 12" pipe. Minimum cover for larger pipe shall meet local authority specifications or MDOT's requirements.
- Designate the total tributary area to each stormwater storage basin. No tributary area to a basin shall exceed 50 acres unless a variance is granted by the Drain Commissioner.
- Show soil boring or backhoe cut locations on the plan (s). Provide soil-boring logs for each and classify soils using USDA terminology. A minimum of one boring/cut shall be performed per acre of storage basin. The boring/cut (s) shall extend a minimum of 10' below the proposed bottom of each basin.
- Show details and specifications for emergency over flow weirs of detention basins and design them to handle the 100-year flow rate.
- Provide details and specifications for flow rate control orifices (or other similar system).
- Provide proof of adequate outlet system for detention basins along with permission form appropriate agencies.
- Pipes entering a stormwater storage basin shall be a minimum of 12" above the bottom of the basin.
- If fence is required show its location along with appropriate gate and provide details and specifications.

#### Plan and Profile Plans(s)

- If plan and profile drawings are necessary they shall be prepared at a horizontal scale of 1" = 40' and vertical scale of 1" = 4'. All pipes shall be shown and labeled.

## **D. FINAL PLAT APPROVAL**

The final Drain Commissioner approval requirement of the Land Division Act for plats is Final Plat approval. Typically the construction has been completed in accordance with the approved Preliminary Plat plans and Final Plat mylars are ready for signature when the Final Plat is submitted for approval.

### **1. Final Plat Submission Requirements-**

- a. The Proprietor shall submit two (2) copies of the Final Plat drawings and the original mylars to the Drain Commissioner along with all necessary review fees as outlined in Appendix A and all other fees as described below.
- b. In order to perform initial maintenance on the stormwater management facilities after the plat has been recorded, a maintenance fund will be set up by the Drain Commissioner in the name of the drain district (usually the plat lot owners). A \$2500.00 fee will be required from the proprietor prior to granting Final Plat approval to set up this account. The Drain Commissioner may require less if the plats's stormwater facilities are so minimal that a fund less than \$2500.00 is warranted. This decision is solely at the Drain Commissioner's discretion.
- c. Any easements necessary that are outside of the boundaries of the Final Plat proposed for approval must be worded in a way that is acceptable to the Drain Commissioner and must be recorded prior to Final Plat approval consideration.
- d. Deed restrictions proposed for recording must be submitted with the Final Plat information. The Drain Commissioner may require additional restrictions such as limitations to the use of easements, and minimum finish floor and basement opening elevations.
- e. Evidence of final Preliminary Plat approval by the municipality of jurisdiction must be submitted with the Final Plat.
- f. All drainage easements and detention (or retention) areas are to be under the jurisdiction of the Barry County Drain Commissioner and the drain district created for the Final Plat being considered. This will be accomplished by utilizing Section 433 of the Michigan Drain Code of 1956, Public Act No. 40, as amended. The purpose of section 433 is to establish an agreement to create a drain and drain district within the plat. This type of agreement is commonly known as a "433 Agreement". Appendix B has Barry County's standard 433 agreement and will need to be fully executed to the Drain Commissioner's satisfaction prior to Final Plat approval. The 433 agreement and appropriate fees and certificates must be submitted with the Final Plat information for approval consideration.
- g. As-built drawings and verification by a licensed professional engineer registered in the state of Michigan will be required as part of the Final Plat approval process. As-built drawings must indicate actual locations of

underground facilities, pipe inverts within manholes, end section inverts, pipe slopes, pipe sizes and types, actual elevations of open drains and storage basins, actual basin volumes, and other pertinent actually constructed information. The drawings must be on mylar so that they will survive long-term usage.

- h. The engineer's verification is needed for assurance that the stormwater management facilities were constructed in accordance with the approved plans from the Preliminary Plat stage. The verification used shall be the one found in Exhibit B of Appendix B or a similar alternative acceptable to the Drain Commissioner.
- i. If the proprietor wishes to receive Final Plat approval prior to the completion of construction of the stormwater facilities proper financial surety will be required to assure that construction will be completed in a proper and timely manner. The amount of this surety must include typical construction costs, engineering review fees and Drain Commissioner administration costs. Construction costs shall be determined by the proprietor and their engineer, and approved by the Drain Commissioner. The cost of hiring a different contractor to finish any necessary work shall be taken into account in this cost estimate. Review and administration fees will be determined by the Drain Commissioner and are to reflect actual costs as a result of seeking approval prior to construction completion. The types of surety acceptable are:
  - i. Cash Deposit
  - ii. Irrevocable Letter of Credit (see Appendix C )
  - iii. Bond
  - iv. Escrow Account
- j. In no case will approval of the Final Plat before construction completion be considered unless copies of all necessary permits (wetlands, floodplain, inland lakes and streams, sedimentation and erosion control, local permits, etc.) have been submitted to the Drain Commissioner.

## **2. Final Plat Approval-**

- a. If the Drain Commissioner approves the plat they will sign the certificate on the Final Plat mylars and notify the proprietor that the Final Plat has been approved by the Drain Commissioner. If the Drain Commissioner rejects the Final Plat, reasons for the rejection will be given to the proprietor in writing within ten (10) days after the day the Final Plat was received by the Drain Commissioner.
- b. A final inspection of the stormwater facilities by the Drain Commissioner or their representative will take place and it must conclude with an acceptable result for Final Plat approval.

BARRY COUNTY DRAIN COMMISSIONER'S  
FINAL PLAT REVIEW CHECK LIST

- Submit two (2) sets of prints and one (1) set of mylars of the proposed Final Plat along with fees defined in Appendix A.
- Submit the \$2500 maintenance account deposit.
- Provide two (2) copies of the recorded easements outside the plat boundaries. Liber and Page must be shown.
- Provide proposed deed restrictions.
- Provide evidence of municipal approval.
- Submit the fully executed "433 Agreement" (see Appendix B).
- Submit "As-Built" drawings on mylar.
- Provide the engineer's verification (see Exhibit B of Appendix B).
- Reconstruction approval; provide the following:
  1. Cost opinion of construction yet to be finished
  2. Copies of any permits required for construction
  3. Payment of the appropriate fees
  4. All items in the above check list except as-builts
  5. Acceptable financial surety

## **E. SUBDIVISION CONDOMINIUMS, LAND DIVISIONS AND COMMERCIAL/INDUSTRIAL SITE PLANS**

### **1. Authorization-**

The development of lands using Public Act 59 of 1978, as amended, commonly known as Subdivision Condominiums and Site Plans do not require Drain Commissioner approval unless it is required by local ordinance. If the municipality of jurisdiction requires approval by the Drain Commissioner then the approval process will be similar to that of the Preliminary Plat. Private stormwater facilities that are never met to be part of Drain Commissioner jurisdiction will not need a 433 agreement.

### **2. Subdivision Condominiums-**

Approval of a Subdivision Condominium by the Drain Commissioner will be based on the same requirements as the Preliminary Plat approval section of these Rules. The Preliminary Plat submission and Approval section shall be followed as well as the Construction Plans and Design Criteria sections. Review times and approval periods will be the same as Preliminary Plat approval. Fees will be in accordance with Appendix A. An approval/denial letter prepared by the Drain commissioner will be sent to the municipality within 30 days of receipt of all necessary information. If approval is granted it shall be effective for two (2) years from the date of the letter.

Final approval of a Subdivision Condominium will be based on proof that the approved plans and specifications were followed during construction, proof of recorded easements and agreements (if necessary), review of the Master Deed, and a final inspection by the Drain Commissioner or their representative. As-built mylars prepared under the direct supervision of a licensed professional engineer or registered land surveyor shall be submitted which show actual pipe slopes, basin volumes, and all other pertinent as constructed information. Final approval of a Subdivision Condominium will be in writing and within 30 days of the receipt of the proper documents unless a letter of disapproval is sent to the proprietor. Fees for final condominium approval will be the same as those for Final Plat approval. If the stormwater management system is to remain private no maintenance account fee will be necessary.

Since the Drain Commissioner's review of Subdivision Condominium is based on local ordinance requirements, the municipality may choose to enforce or reject all or part of the Drain Commissioner's approval recommendations.

### **3. Site Plans**

Review by the Drain Commissioner will be based on construction plans and calculations prepared in accordance with these Rules. Construction plans for the stormwater management system shall be prepared in accordance with Part I, C, "Construction Plans". Hydraulic calculations shall be designed in accordance

with Part II, "Design Criteria". The time for review shall be the same as Preliminary Plat approval.

Submittals include the "Site Plan Review Application" (Appendix D), review fee, and "Request for Review Agreement" (Appendix E). Review fees will be in accordance with Appendix A. The agreement allows the Drain Commissioner, at their discretion, to hire an outside consultant for review of the storm water management plan and to invoice the applicant/owner for the services provided.

Approval or denial of the plan by the Drain Commissioner will be sent in the form of a letter to the municipality within 30 days of receipt of all necessary information. If approval is granted it shall be effective for two (2) years from the date of the letter.

The Drain Commissioner will conduct a final inspection of the construction site if a final Site Plan approval is required by the municipality or jurisdiction. Drain Commissioner must be contacted prior to final completion to conduct final inspection.

## **F. Manufactured (Mobile) Home Parks**

### **1. Authorization-**

Pursuant to Public Act 96 of 1987, as amended (the Mobile Home Commission Act) the county Drain Commissioner is to review preliminary plans of proposed Mobile Home Parks to determine if the drainage outlet is acceptable. This Act does not require the submittal of detailed Construction Plans however it does allow each individual county to publish and enforce their own standards (rules). Barry County has developed these Rules, which require the submission of Construction Plans and calculations for Drain Commissioner review of preliminary plans for Mobile Home Parks.

### **2. Manufactured Home Park Submission Requirements-**

A minimum of three (3) sets of Construction Plans and Design Criteria calculations must be submitted to the Drain Commissioner along with fees according to Appendix A. An over-all development sheet shall be included in the Construction Plans and it must follow the requirements for Preliminary Plat plans.

### **3. Manufactured Home Park Approval-**

Once all appropriate information is submitted, the Drain Commissioner will perform a review and prepare an approval or denial letter. The letter will be prepared within 30 days of receipt of all necessary information and will be sent to the proprietor of the proposed Mobile Home Park. If approval is granted it shall be effective for two (2) years from the date of the approval letter.

## **Part II: DESIGN CRITERIA**

### **A. GENERAL-**

This section sets the design standards that will be used by the Drain Commissioner when reviewing a proposed development's stormwater management system. Storm water conveyance systems and storage systems shall be designed using the criteria in this section in order to minimize negative effects of development to a watershed.

Retention systems (on-site disposal) allow stormwater to infiltrate into the ground which more closely matches predevelopment conditions and will there for be the highest priority for stormwater storage. If conditions such as poor ("heavy") soils, high ground water, or ground water mounding dictate the need for a detention (outlet flow) system, then establishment of a proper outlet will be required, and treatment of the runoff will be necessary.

New land developments in Barry County shall provide stormwater storage management utilizing detention or retention systems. Detention systems temporarily store stormwater and have an outlet that slowly empties the basin into an acceptable downstream system. Retention systems allow stormwater to infiltrate into the soils and have no other outlets. Storage systems also provide water quality benefits. This component will be emphasized in areas designated by the Drain Commissioner as "environmentally sensitive". Outlets from detention basin(s) will be reviewed very closely. The proprietor is responsible for obtaining permission from down stream authorities and properties.

Assuring that the flow velocity, and rate meet their requirements of these Rules, is the sole responsibility of the proprietor. It is the proprietor's responsibility to have design and construction of, the stormwater management system done to meet all requirements of these Rules. If as-built conditions show that differences exist then the proprietor at his/her expense will perform or have performed any necessary additional work to bring the system into compliance.

In order to determine surface runoff amounts and rates the "Rational Method" is generally acceptable for sites less than 640 acres in size. Sites over 100 acres in size may require caution so other methodologies for predicting runoff, such as runoff hydrographs may be necessary. The Drain Commissioner may require the use of programs such as HEC-1, UD-21, TR-20 or TR-55 to model potentially problematic sites.

### **B. CONVEYANCE SYSTEMS**

Enclosed conduits such as pipes and culverts, and open channel systems such as swales (road side ditches) that are created to move stormwater runoff to a lower location will be reviewed by the Drain commissioner using the criteria in this section. Unless the Drain Commissioner feels a larger storm event is necessary due to potential flooding or safety issues, a 10-year (10%) design storm shall be used to size conveyance systems. Passage of all 10-year storms, using gravity flow shall be provided in each conveyance run.

“Manning’s” formula shall be used to size pipes and open channels.

$$Q = (1.49/n) A R^{2/3} S^{1/2}$$

Q = flow, in cubic feet per second (CFS)

A = cross sectional area of the stormwater, in square feet (SFT)

n = Mannings coefficient of roughness

(n = 0.013 for most pipes; n = 0.035 for grassed swales)

R = Hydraulic radius = A/P, in feet

P = Wetted perimeter

S= Slope of the bottom of the conveyance system

If the Manning formula is not used, the Drain Commissioner will consider the alternative method and decide if it is acceptable. Calculation for each segment (manhole to manhole; branch to branch) shall be submitted verifying the cross-section proposed. Provide a sketch, to scale, showing the tributary area to each intake point.

All structures/systems shall be constructed in accordance with governing specifications (MDOT, Barry County Road Commission, Local City or Village). In the event of no other governing specifications, the latest edition of the MDOT Standard specification for Construction will be used.

## 1. Swales –

Vegetated swales of open ditches (roadside ditches) help infiltrate stormwater into the ground which is beneficial to the stormwater management system however they must be designed and constructed properly to assure erosion and sedimentation will not occur. Proper maintenance needs to be practiced to assure the swales do not get filled in or modified in ways that would interfere with their function. The following criteria will also be used during the review of swales:

- a. Natural Streams (existing) shall be preserved and protected in their current location and shall have a 20-foot (minimum) vegetated buffer strip on each side.
- b. Constructed swales shall follow natural, pre-development drainage paths when possible, and shall be well vegetated, wide, and shallow.
- c. Flow velocities, in general, for the 10 year storm will be 1.5 feet per second (FPS) minimum and 4.0 feet per seconds (FPS) maximum. Where flow velocity must exceed 4.0 FPS, the channel shall be protected by an adequate erosion control system.
- d. Side slopes of swales shall be no steeper than 3:1 (horizontal: vertical). Soil conditions, vegetative cover and maintenance ability will be the governing factors for determining side slope requirements.
- e. In general, a 4-foot clearance will be necessary between swale inverts and underground utilities unless special provisions are approved by the Drain Commissioner. Encasement of the utility lines in concrete under the swale will be acceptable however in no case will the clearance be less than 2 feet.

## 2. Enclosed System –

Storm sewers, culverts, manholes, inlets and end sections shall be constructed according to local governing specifications. In the event of no other governing specifications, the latest edition of the MDOT Standard Specifications for Construction will be observed. Specifications and details shown on the plans shall reflect the proper specifications. The following criteria will also be used during the review of enclosed systems:

- a. Pipes shall be free flowing and self-cleansing. Velocities of full flowing pipe shall be greater than two (2) feet per second. No portion of a pipe shall be permanently submerged.
- b. The minimum pipe size shall be twelve (12) inches (interior diameter).
- c. Gravity flow during a ten (10) year storm must be provided in the pipe. The hydraulic gradient shall be no higher than the top of the inside of pipe.
- d. The Mannings coefficient of roughness used for pipe sizing shall be 0.013 unless proof is provided to justify a different number. .021 shall be used for corrugated metal pipe.
- e. Pipes shall be centered in a twenty (20) foot minimum width easement. The Drain Commissioner may require wider easements at his/her discretion in order to provide enough space for maintenance.
- f. Pipe joints and connections to structures shall be premium silt tight.
- g. Structures that intake stormwater at the surface and convey it to pipes (manholes, inlets, catchbasins, etc.) shall be located to assure positive drainage of all areas within the development not designated as stormwater retention or detention areas. All low points of roads or rear yards (unless designated as a retention area) shall have an intake structure. Flow across pavement from one side of the road to the other will not be allowed unless super elevating curve is necessary.
- h. The maximum distance stormwater travels along a road shall be three hundred (300) feet unless calculations are provided showing that further spacing will not result in more than one (1) cubic foot of stormwater per second to an individual intake structure (10 year storm).
- i. A two (2) foot minimum sump will be required for all manholes and inlets.
- j. Drops inside any manhole from inflowing pipes to the outflowing pipe shall be limited to two (2) feet.
- k. All outlets will be provided with flared end sections and energy dissipation to assure no erosion/scour will take place.

- l. End section discharges from pipes shall be designed so that velocities will be appropriate to receiving waterways and will not cause damage to them.
- m. Calculations justifying the median (d 50) size riprap shall be provided. Riprap placement dimensions, and total quantity in square yards shall be determined based on pipe size, design velocity and discharge. All riprap shall have a geotextile underlay. The minimum thickness of riprap will be twice the median (d50) dimension. Placement of riprap shall be designated to require the center is lower than the sides so that the stormwater will not flow around the outside edges of the riprap.

## **C. STORAGE SYSTEMS**

### **1. CALCULATION METHODS**

The “rational method” of calculating stormwater runoff is generally acceptable for sites less than 640 acres in size. Other methodologies for predicting runoff, such as unit hydrographic methods, may be required by the Drain Commissioner for sizing stormwater storage systems on sites that he/she deems potentially problematic. Watersheds greater than or equal to two (2) square miles will require an MDEQ approval.

### **2. GENERAL DESIGN CRITERIA**

All runoff generated by proposed impervious surfaces, unless otherwise permitted by the Drain Commissioner, must be conveyed into a stormwater storage facility for water quality treatment and detention/retention prior to being discharged from the site. The following criteria will apply to the design of all stormwater retention and detention facilities.

- a. Public safety will be a paramount consideration in stormwater storage system design. Providing safe retention/detention is the proprietor’s responsibility. Basin designs will incorporate gradual side slopes, vegetative and barrier plantings, and safety shelves. Where further safety measures are required, the proprietor is expected to include them within the proposed development plans. Fencing shall be required if basin side slopes are steeper than 4 to 1 (4 horizontal to 1 vertical). A four (4) foot chain link fence with gate in accordance with Appendix G is required.
- b. Stormwater management systems incorporating pumps shall not be permitted in developments with multiple owners, such as subdivisions and site condominiums. Variances from this rule will be considered only as a measure of last resort, subsequent to demonstration that no alternative system designs are technically feasible. Special requirements, such as the establishment of an operations and maintenance escrow account by the

- Proprietor, may be imposed to help defray special assessments that would be levied upon future property owners for maintenance of the system.
- c. Drainage systems proposed to be maintained by the Drain Commissioner will require a 433 Agreement (see Appendix B). The stormwater ordinance of the local municipality will govern where private systems may be located.
  - d. Sediment forebays (upper stage) will be provided at the inlet of all stormwater management facilities to provide energy dissipation and to trap and localize incoming sediments. The forebay will be a separate basin, which can be formed by gabions or a compacted earthen berm. The capacity of the forebay will be equivalent to 5% of the required design storm volume based on the area tributary to the inlet. Direct maintenance access to the forebay for heavy equipment will be provided.
  - e. For safety purposes and to minimize erosion, basin side slopes will generally not be steeper than one-foot vertical to three feet horizontal (3:1). For basins proposed to be under the jurisdiction of the Drain Commissioner, slopes steeper than one foot vertical to four feet horizontal, will be permitted only with the installation of a four-foot-high chain link fence completely surrounding the storage facility. In such cases, a 12-foot-wide access gate shall be provided. Installation of fencing on private systems shall be in accordance with local ordinance.
  - f. All basins will have provisions for a defined emergency spillway, routed such that it can be picked up by the main outflow channel while not discharging directly over the outlet pipe. The emergency spillway will be set at an elevation six inches above the design high water elevation.
  - g. Adequate maintenance access from public or private right-of-way to the basin will be reserved. The access will be on a slope of 5:1 or less, stabilized to withstand the passage of heavy equipment, and will provide direct access to both the forebay and the riser/outlet.
  - h. The placement of retention/detention basins within a floodplain of a stream, creek, or lake is prohibited.
  - i. When a storage basin is proposed with a top elevation above any possible basement levels (existing or proposed) that are within reasonable influence of groundwater mounding a hydrogeological study shall be performed to verify that the proposed basin will not cause adverse effects on the basements. Groundwater mounding is the underground piling up of water as it tries to infiltrate through the soils. Usually the courser the soils the less mounding effect there is and visa versa.
  - j. The use of underground retention/detention on new and existing developments is strongly discouraged and prohibited on drains proposed to be under the jurisdiction of the Drain Commissioner. Exceptions may be granted if each of the following conditions exists:
    - 1) Extensive soils information is available to at least ten (10) feet below the bottom of the proposed system and the soils are classified as sand.
    - 2) A catastrophic property loss results in the need to rebuild an existing commercial facility that was not previously equipped with

retention/detention, and the installation of an aboveground retention/detention, facility would significantly reduce the available square footage for a replacement structure.

- 3) No public drainage system is available, within a reasonable distance, to tie into.
- 4) The provision of aboveground retention/detention on an existing commercial parcel less than two acres in size would preclude development of the property under its current zoning.

### **3. RETENTION BASINS-**

The temporary storage of stormwater in a basin with no outlet except infiltration into the soils and evapotraspiration will be encouraged as the storage system of choice provided soil conditions are proper. Constructed or natural low areas that have no way for stormwater to escape across the surface will be considered retention basins and shall conform to the following criteria:

- a. The total volume of the basin shall exceed the runoff volume from a 100-year storm, 24-hour duration, below the free board volume. The rainfall duration frequency table (Appendix H) shall be used with the Rational Method to determine the rainfall intensity for a rainfall duration equal to the time of concentration. Calculations used to determine this volume must be submitted.
- b. The total tributary area to a retention basin shall not exceed 50 acres unless the Drain Commissioner grants a variance to this rule. A sketch or drawing showing the tributary area to each basin must be submitted. The “developed” tributary area(s) should match the “predeveloped” tributary area(s) as closely as practical.
- c. Any inlet pipes must enter the basin and discharge a minimum of one (1) foot above the bottom of the basin.
- d. A forebay for sediment removal shall be provided in each retention basin. The volume of this forebay shall be 5% of the 100-year, 24-hour duration storm. The forebay may be made by constructing a stable berm with erosion control bagion baskets, or other methods acceptable to the Drain commissioner. The overflow elevation from the forebay into the remainder of the retention basin shall be lower than the invert elevation of the lowest inlet pipe.
- e. Soil borings/backhoe cuts shall be performed in every retention basin area. A minimum of one shall be performed and for basins larger than one (1) acre one boring/cut shall be done for every acre of water surface area of the basin when full. The boring(s) /cut(s) shall extend to at least ten (10) feet below the proposed bottom (lowest elevation) of the basin. Soil logs must be submitted classifying each soil type encountered using USDA terminology.

- f. Each retention basin shall be sized to store the entire 100-year storm volume. No credit or reduction in volume will be given for infiltration (unless Drain Commissioner determines that a variance is justified) or evaporation.
- g. All stormwater entering a retention basin must infiltrate into the soil within 72 hours. In order to assure this will happen, calculations must be submitted showing that the basin is sized and shaped so that water will be gone within 72 hours. The most limiting saturated hydraulic conductivity of the soils shall be used for these calculations. The method used to determine the hydraulic conductivity preferred by the Drain Commissioner is to use the table found in Appendix E which uses USDA soils classification terminology. Laboratory tests to determine the hydraulic conductivity sometimes do not represent the actual conductivity after construction equipment has run over the soils, and after some siltation therefore lab testing is discouraged. Once a saturated hydraulic conductivity is determined it is recommended that half of its value be used for the calculations. It is the proprietor's sole responsibility to assure the stormwater infiltrates in less than 72 hours. If it does not, modifications including enlarging of the basin, will be required and the cost will be completely covered by the proprietor. Retention basins will not be considered where the most limiting soil's saturated hydraulic conductivity rate is  $\leq 0.52$  inches per hour.
- h. Runoff coefficients used to determine the stormwater volume shall follow the recommendations found in Appendix F. Weighted runoff coefficient determination calculations shall be submitted for review.
- i. An emergency overflow spillway shall be specified and it must have permanent erosion protection. The spillway must be capable of passing flow equivalent to the 100 year storm rate. Calculations shall be submitted for each emergency overflow spillway.
- j. No basin volume will be considered if it is below the seasonal high groundwater level as determined by the design engineer.
- k. Credit for retention volume in flooded parking lots will not be allowed.
- l. Areas designed for retention storage shall remain the property of the development (i.e. homeowners association for subdivisions) and shall have an easement over them for operation and maintenance by the Drain Commissioner if they are going to be "publicly" maintained. Usually this is done through a "433 Agreement" which can be reviewed in Appendix B.

#### **4. DETENTION BASINS –**

The temporary storage of stormwater in a basin with a structural outlet that empties over a relatively short period of time will be allowed if a retention basin is not allowable and if proper provisions are made for an acceptable outlet. It shall be the proprietor's responsibility to assure that the detention system

performs according to these Rules. Detention basins are necessary to minimize stream bank erosion, sedimentation, flood, and pollutant increases that commonly occur as a result of development.

The following shall be provided for each detention basin:

- a. A forebay for sedimentation maintenance with a capacity equivalent to 5% of the 25-year storm volume based on the tributary area draining to the basin shall be provided. Direct maintenance access to the forebay for heavy equipment is required.
- b. The volume of a detention basin in Barry County below the lowest point of outlet discharge shall be greater than the volume of a ½" rainfall over its tributary area. This is called the "wet" volume and helps treat the "first flush" which usually contains a significant amount of pollutants.
- c. Detention Basins shall be sized by determining the difference in volumes between inflow and outflow. The inflow shall be calculated based on the 25-year storm and the rainfall duration frequency table (Appendix H) whose duration matches the time of concentration of the basin's tributary area completely developed. Discharge that increases as the basin fills shall be limited as described below. Hydrology and hydraulic calculations shall be submitted verifying this.
- d. Detention basins shall have a controlled outlet system that limits discharge to the predevelopment 2 year storm rate or 0.2 cfs/acre which ever is less.
- e. There shall be assurance of no adverse effects down stream: The proprietor (developer) shall be responsible for assuring that the required maximum outlet discharge rate is not exceeded after the system is built. A stand pipe or orifice outlet system with an emergency over-flow capable of handling the 100 year storm is required.
- f. If the detention basin discharges to private property, permission from this landowner will be necessary.
- g. Typical details of a detention basin for the Barry Co. Drain Commission can be found in Appendix J.

## Appendix A - Review Fees

## REVIEW FEES

All review fees are payable at the time of plan submittal. Resubmittals after the initial review shall include an additional fee in an amount equal to 50% of the initial review cost.

1. **PRELIMINARY REVIEW**  
(Total = Administrative Fee + Review Cost)
  - a. Administrative Fees      \$150.00 Flat Fee
  - b. Review Costs

<b>Development Type</b>	<b>Fee Per Lot or Unit</b>	<b>Minimum Fee</b>
Land Division (e.g. plat, parcel split, site condominium)	\$15.00 per lot or unit	\$200.00
Multiple Family Residential Sites (e.g. Apartments and condominiums)	\$10.00 per unit	\$300.00

2. **CONSTRUCTION PLAN REVIEW**  
(Total = Administrative Fee + Review Cost)
  - a. Administrative Fees      \$150.00 Flat Fee
  - b. Review Costs

<b>Development Type</b>	<b>Fee Per Lot or Unit</b>	<b>Minimum Fee</b>
Land Divisions (e.g. plat, parcel split, site condominium)	\$30.00 per lot or unit	\$400.00
Multiple Family Residential Sites (e.g. Apartments and condominiums)	\$20 per unit	\$500.00
Commercial or Industrial Sites	See Appendix D – Request for Review Agreement	

Appendix B - 433 Agreement and Release of  
Right of Way

AGREEMENT  
FOR THE ESTABLISHMENT OF A COUNTY DRAIN  
AND COUNTY DRAINAGE DISTRICT  
PURSUANT TO SECTION 433 OF ACT NO. 40  
OF THE PUBLIC ACTS OF 1956, AS AMENDED

**THIS AGREEMENT**, made and entered into this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, by and between **Russ Yarger, Barry County Drain Commissioner**, hereinafter referred to as "Drain Commissioner" on behalf of the proposed (insert proposed drain name) Drain Drainage District; and (insert Landowner/Developer's name) , a Michigan (insert type of Business) , as owner(s) of the land described in Exhibit A attached hereto, hereinafter referred to as "Landowner".

**WITNESSETH:**

**Whereas**, Section 433 of Act No. 40 of the Public Acts of 1956, as amended, authorizes the Drain Commissioner to enter into an Agreement with the Landowner and developer, if any, to establish a drain which was constructed by the Landowner or Developer to service an area of its own land as a County Drain; and,

**Whereas**, Landowner, pursuant to Section 433 of Act No. 40 of 1956, as amended, wishes to provide drainage service to its own lands and has requested same to be established and dedicated as a County Drain under the jurisdiction of the Barry County Drain Commissioner; and,

**Whereas**, Landowner has been advised and understands and agrees to assume the total cost of the construction of the drain to include engineering, inspection, easement acquisition, legal and administrative expenses and cost attendant to this Agreement; and,

**Whereas**, Landowner further understands that the Drain constructed, or to be constructed, pursuant to this Agreement, when finally accepted by the Drain Commissioner, will be known as the (insert drain name) Drain and that the land to be drained will be known and constituted as the (insert drain name) Drain Drainage District and will be subject to assessments, for cost of future operation, inspection, maintenance and improvement; and,

**Whereas**, Landowner has agreed to assume and pay all cost as set forth herein; and,

**Whereas**, Landowner has obtained, at its own expense, a certificate from a registered professional engineer satisfactory to the Drain Commissioner to the effect that the Drain has sufficient capacity to provide adequate drainage service without detriment to or diminution of the drainage service which the outlet currently provides. A copy of said certificate being attached hereto as Exhibit B.

**Now, Therefore**, in consideration of the premises and covenants of each, the parties hereto agree as follows:

1. Landowner agrees to construct and/or has constructed, at its expense, the Drain in accordance with plans and specifications approved by the Drain Commissioner.
2. The Landowner agrees to pay the cost of construction of said Drain and drainage facilities, including the acquisition of the necessary rights of way or easements, engineering, surveying, inspection, legal and administrative cost. In addition, the Landowner has deposited with the Drain Commissioner an amount of money equivalent to five (5%) percent of the cost of construction of the drainage facilities, not to exceed Two Thousand Five Hundred and No/100 (\$2,500.00) Dollars, which monies are to be deposited in a special drain fund to be used for future maintenance of the Drain, hereinafter referred to as "(insert drain name) Drain Maintenance Fund".
3. That the Landowner shall secure at its own expense, all easements or rights of way necessary for the construction of the Drain over and across the properties owned by Landowner and across such other lands as necessary for the construction of the Drain from the point of beginning at the outlet of the point of ending. Said easements or rights of way shall be secured in writing and in a form acceptable to the Drain Commissioner. The Landowner shall be responsible for all cost for the recording of said easements, as directed by the Drain Commissioner.
4. Landowner shall secure all necessary permits or authorizations as may be required by local, state or federal law and provide copies to the Drain Commissioner. The Drain Commissioner shall be provided copies of all correspondence and reports involving any governmental agency with respect to the Drain.
5. The (insert drain name) Drain Maintenance Fund is agreed and understood as being for the sole benefit of the (insert drain name) Drain Drainage District at large, or part thereof, and that such payment shall not relieve the subject property from any future assessments levied pursuant to the Drain Code of 1956, as amended.
6. Landowner agrees to indemnify and hold harmless the Drain Commissioner and the (insert drain name) Drain District for any and all claims, damages, lawsuits, cost and expenses, arising out of or incurred as a result of the Drain



Notary Public  
Barry County, Michigan  
My Commission Expires:\_\_\_\_\_

**STATE OF MICHIGAN )**  
**) SS.**  
**COUNTY OF BARRY )**

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, before me, a Notary Public in and for said County, personally appeared (insert signatory name), to me known to be the person described in and who executed the foregoing instrument and acknowledged the same to be his free act and deed.

\_\_\_\_\_  
Notary Public  
Barry County, Michigan  
My Commission Expires:\_\_\_\_\_

Instrument Drafted by:  
(insert draftee name)

When recorded return to:  
The Barry County Drain Commissioner

## EXHIBIT "A"

Legal description of the Drainage District for the (insert drain name) Drain.

Legal description of the route and course for the (insert drain name) Drain:

**EXHIBIT "B"**

I, (insert engineer name), a Registered Professional Engineer in the State of Michigan, do hereby certify to the following for the (insert drain name, use development name), Drain Drainage District in Section (insert section number) of (insert Township name):

1. The above-mentioned lands to be developed naturally drain into the area served by the existing drains and that the existing drains are the only reasonable available outlet for the drainage from the lands to be developed.
2. To my knowledge, there is existing capacity in the existing drains to serve the lands to be developed without detriment to or diminution of the drainage service provided or to be provided in the foreseeable future in the existing district.
3. This statement is made with reliance upon consultation with the Barry County Drain Commissioner and upon review and approval of the construction plans by that office.

\_\_\_\_\_  
(type Engineer name and number)

Date: \_\_\_\_\_

**RELEASE OF RIGHT OF WAY**

Section 74, Chapter IV and Section 127, Chapter VI, Act No. 40, P.A. of 1956, As Amended

For and in consideration of prospective benefits to be derived by reason of the locating, establishing, constructing and maintaining of a certain Drain under the supervision of the county Drain Commissioner of the County of Barry and State of Michigan, as hereinafter described.

I/We, **(Insert name and address)** ( \_\_\_\_\_ )  
Marital Status

Do hereby release to the **(insert name of drain)** Drainage District, the Right of Way for a certain Drain, hereinafter more particularly designated and described, over and across the following lands owned by me (us) and situated in the Township of **(insert name of Township/City/Village)**, County and State aforesaid, which lands are described as:

INSERT TAX ID NUMBER

INSERT LEGAL DESCRIPTION OF PARCEL

The Right of Way or Easement conveyed is described as:

INSERT LEGAL DESCRIPTION OF EASEMENT

The Right of Way hereby conveyed and released is for the sole and only purpose of locating, establishing, constructing and maintaining over and across said premises of a certain Drain, petition for which in writing was made on **(insert date of petition)** the necessity for which has been determined by a Board of Determination bearing the date **(insert date of necessity)**.

The Route and Course of said Drain is described as follows:

INSERT LEGAL DESCRIPTION OF DRAIN ROUTE AND COURSE

This conveyance shall be deemed a sufficient conveyance to vest in the Drainage District an easement in said lands for the uses and purposes of drainage together with such rights of entry upon, passage over, deposit of

excavated earth and storage of material and equipment on such lands, as may be necessary or useful for the construction, maintenance, cleaning out and repair of such Drain.

WITNESS: Our hand(s) and seal(s) dated \_\_\_\_\_

WITNESS: (TWO REQUIRED - please type  
Or print names under signatures)

\_\_\_\_\_  
\_\_\_\_\_

\_\_\_\_\_  
INSERT NAME OF PROPERTY OWNER

**STATE OF MICHIGAN )**  
**) SS.**  
**COUNTY OF BARRY )**

On this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_, before me, a Notary Public in and for said County, personally appeared (insert signatory name), to me known to be the person described in and who executed the foregoing instrument and acknowledged the same to be his free act and deed.

\_\_\_\_\_  
Notary Public  
Barry County, Michigan  
My Commission Expires:\_\_\_\_\_

Instrument Drafted by:  
(insert draftee name)

When recorded return to:  
The Barry County Drain Commissioner

PLEASE TYPE OR PRINT NAMES UNDER ALL SIGNATURES

Appendix C - Irrevocable Letter of Credit  
(sample)

(Date)  
Barry County Drain Commissioner  
220 W State Street  
HASTINGS MI 49058

IRREVOCABLE LETTER OF CREDIT                      No.

RE: (insert name of entity letter is from)

PROJECT: (insert project/drain name)

To Whom It May Concern:

At the request of the Barry County Drain Commissioner we hereby establish our Irrevocable Letter of Credit in your favor and authorize you to draw on us to an aggregate, the amount of (amount written out) U.S. dollars 00/100 (\$\_\_\_\_) and we engage with that all drafts at sight drawn under and in compliance with the terms of this credit will be fully honored by us if presented a this office on or before (date), 20\_\_ or any extended date, provided:

Any draft(s) drawn by you under this Letter Of Credit shall be accompanied by a letter executed by an authorized official (or one describing himself or herself therein as an authorized official) of the Office of Barry County Drain Commissioner stating as follows:

1. "Claims have been submitted or may be submitted to the Barry County Drain Commissioner which remain unfulfilled by the (Sub)Contractor, and the funds represented by the attached in compliance with our contract with (Sub)Contractor."
2. Drafts presented must bear on their face the clause "drawn under (bank name and address) Letter of Credit No. \_\_\_\_ dated \_\_\_\_\_.
3. Drafts presented no later than \_\_\_\_\_, 20\_\_, \_\_\_\_\_ p.m. local time after which time this Letter Of Credit shall be null and void.

We hereby agree that any draft drawn and presented in conformity with the terms of this Letter Of Credit will be duly honored if presented to us on or before the time of expiration set forth herein.

Very truly yours,

## Appendix D – Site Plan Review Application



## Appendix E – Request for Review Agreement

# REQUEST FOR REVIEW AGREEMENT

Barry County Drain Commissioner  
 220 W. State St.  
 Hastings, MI, 49058  
 (269) 945-1385 Fax: (269) 948-4884

The Barry County Drain Commissioner may, at their discretion hire an outside consultant for review of the storm water management plan. Outside consultant services will be based on their current hourly billing rates for actual time and reimbursable expenses to perform review and inspections. This form must be signed and submitted to the Barry County Drain Commissioner along with the submittal fee and application for the plan review application to be considered complete.

The applicant grants Barry County Drain Commissioner authority to utilize outside consultants and to invoice the applicant/owner for the services provided. Invoices shall be paid within 15 days of receipt of the invoice.

<b>SITE INFORMATION</b>	<b>BILLING INFORMATION</b>
Parcel No:	Project Name:
Property Owner/Business Name:	Name:
Address:	Address:
Telephone:	Telephone:

*I declare under penalty of perjury that I am the property owner or that I am authorized to enter into this fee agreement on his/her behalf. I have read the conditions concerning Barry County Drain Commissioner outside consultant fees and I understand that in the event that the billing party I have indicated does not pay required fees, I will be responsible for payment.*

Dated: \_\_\_\_\_

\_\_\_\_\_  
*Signature & Title*

Telephone #: \_\_\_\_\_

\_\_\_\_\_  
*Printed Name*

Appendix F  
Runoff Coefficient  
(Rational Method Runoff Coefficients)  
(% impervious Ranges)

Rational Method  
Runoff Coefficients "C"

The range of coefficients, classified with respect to the general character of the tributary area reported in use, is:

<u>Description of Area</u>	<u>Runoff Coefficients</u>
Business	
Downtown .....	0.70 to 0.95
Neighborhood.....	0.50 to 0.70
Residential	
Single-family.....	0.30 to 0.50
Multi-units, detached .....	0.40 to 0.60
Multi-units, attached .....	0.60 to 0.75
Residential (suburban) .....	0.25 to 0.40
Apartment.....	0.50 to 0.70
Industrial	
Light .....	0.50 to 0.80
Heavy.....	0.60 to 0.90
Parks, cemeteries .....	0.10 to 0.25
Playgrounds .....	0.20 to 0.35
Railroad yard.....	0.20 to 0.35
Unimproved.....	0.10 to 0.30

It often is desirable to develop a composite runoff coefficient based on the percentage of different types of surface in the drainage area. This procedure often is applied to typical "sample" blocks as a guide to selection of reasonable values of

the coefficient for and entire area. Coefficients with respect to surface type currently in use are:

<u>Character of Surface</u>	<u>Runoff Coefficients</u>
Pavement	
Asphaltic and Concrete .....	0.70 to 0.95
Brick .....	0.70 to 0.85
Roofs.....	0.75 to 0.95
Lawns well drained (sandy soil)	
Flat, 2 percent.....	0.05 to 0.10
Average, 2 to 7 percent .....	0.10 to 0.15
Steep, 7 percent .....	0.15 to 0.20
Lawns poor drainage, (heavy soil; clayey)	
Flat, 2 percent.....	0.13 to 0.17
Average, 2 to 7 percent .....	0.18 to 0.22
Steep, 7 percent .....	0.25 to 0.35
Forested .....	0.06 to 0.20
Farmland/pasture .....	0.05 to 0.30

The coefficients in these two tabulations are applicable for storms of 5 - 10 year frequencies. Less frequent, higher intensity storms will require the use of higher coefficients because infiltration and other losses have a proportionally smaller effect on runoff. The coefficients are based on the assumption that the design storm does not occur when the ground surface is frozen.

Appendix G  
Saturated Hydraulic Conductivity  
(The following information was extracted from  
Stormwater Infiltration, by Bruce K. Ferguson, 1994)



Appendix H  
Rainfall Distribution-Frequency Table

## Rainfall Amount (inches)

<b>Duration</b>	<b>1-year</b>	<b>2-year</b>	<b>5-year</b>	<b>10-year</b>	<b>25-year</b>	<b>50-year</b>	<b>100-year</b>
<b>24-hr</b>	2.03	2.42	2.98	3.43	4.09	4.63	5.20
<b>18-hr</b>	1.91	2.27	2.80	3.22	3.84	4.35	4.89
<b>12-hr</b>	1.77	2.11	2.59	2.98	3.56	4.03	4.52
<b>6-hr</b>	1.52	1.82	2.24	2.57	3.07	3.47	3.90
<b>3-hr</b>	1.30	1.55	1.91	2.20	2.62	2.96	3.33
<b>2-hr</b>	1.18	1.40	1.73	1.99	2.37	2.69	3.02
<b>1-hr</b>	0.95	1.14	1.40	1.61	1.92	2.18	2.44
<b>30-min</b>	0.75	0.90	1.10	1.27	1.51	1.71	1.92
<b>15-min</b>	0.55	0.65	0.80	0.93	1.10	1.25	1.40
<b>10-min</b>	0.43	0.51	0.63	0.72	0.86	0.97	1.09
<b>5-min</b>	0.24	0.29	0.36	0.41	0.49	0.56	0.62

Source: Table 5 – Michigan, Section 9, Rainfall Frequency Atlas of the Midwest, Bulletin 71, Huff and Angel, 1992.

# Appendix I Glossary of Terms

## GLOSSARY

### **As-Built Plans –**

Drawings prepared by an engineer or surveyor that represent conditions as they were actually constructed.

**Base Flow** - The portion of stream flow that is not due to runoff from precipitation, usually supported by water seepage from natural ground water.

**Basin –** A surface water runoff storage area.

### **Best Management Practice (BMP) –**

Structural, vegetative, or managerial practices used to protect and improve our surface waters and groundwater's. The most cost effective management practice that achieves the design goal.

### **Borings –**

Cylindrical samples of soil profile used to determine soil types, ground water level(s), and infiltration capacity. Backhoe cuts are acceptable and in many cases are a preferred alternative. USDA terminology is to be used when identifying soils.

### **Buffer Strip –**

A zone where plantings capable of filtering stormwater are established or preserved and where construction, paving and chemical applications are prohibited.

### **Check Dam –**

An earthen, rock or log structure used in grass swales to reduce water velocities, promote sediment deposition and enhance infiltration.

### **Contractor –**

Any person(s) or company that actually constructs the development.

### **County Drain –**

An open or enclosed stormwater conveyance system that is under the legal jurisdiction of the Drain Commissioner for construction, operation and maintenance.

### **Culvert –**

A conduit used for the passage of surface water under a road or other embankment.

**MDEQ –**

Michigan Department of Environmental Quality

**Design Flow –**

Projected flow through a watercourse, which will recur with a stated frequency. The projected flow for a given frequency is calculated using statistical analysis of peak flow data or using hydrologic analysis techniques.

**Detention –**

Practices which store stormwater for some period of time before releasing it to a surface waterbody. See also retention.

**Developer –**

Anyone who organizes the actual development of land and may or may not be the landowner.

**Development –**

Modifications to a property to enhance a new usage. Infrastructure construction such as roads and storm sewer is typical of a development.

**Discharge –**

Volume of water moving out of a basin, structure, or pipe per unit time.

**Easement (also know as a “Right-of-way”) –**

A legal right granted by a property owner to another entity giving that entity limited use of the property involved for a specific purpose. The Drain Commissioner secures temporary and permanent easement adjacent to stormwater facilities for the purpose of construction and maintenance access.

**Erosion –**

The wearing away of the land surface by wind, water, ice and gravity dislodging of soil particles. Evidence of erosion are gullies, rills, sediment, plumes, etc.

**First Flush –**

The delivery of a highly concentrated pollutant loading during the early stages of a storm due to the washing effect of runoff on pollutants that have accumulated on the land.

**Flood Plain –**

For a given flood event that area of land adjoining a continuous watercourse that has been covered temporarily by water.

**Flood Routing –**

The planning of what runoff water would do if it exceeds the capacity of a conveyance system or storage basin. This answers the question “what would happen if an event that exceeded the design event happened?”

**Forebay –** A separate storage area near the inlet to a storage basin, used to trap and settle incoming sediments before they can be delivered to the basin.

**Freeboard –**

The space from the top of an embankment to the highest water elevation expected for the largest design storm to be stored. The space is required as a safety margin in a pond or basin.

**Gabion -** A rectangular box of heavy gage wire mesh that holds cobble size rock.

**Groundwater –** (see also Seasonal High Groundwater Level)

**Hydrograph –** A graph, usually of discharge or stage versus time, at a given point along a drain.

**Hydrology –**

The occurrence, distribution, and movement of water both on and under the earth’s surface.

**Impervious Surface –**

Means rooftops, road pavement, parking areas, and other surfaces which do not allow water to infiltrate into the ground.

**Infiltration Capacity –**

Rate at which water can enter soil with excess water on the surface.

**Invert –**

The lowest (elevation) point in a conveyance system cross section. The very bottom of the inside of a pipe is its invert. Sometime referred to as the flow line.

**Orifice –** An opening in a wall or plate.

**Outlet –** The point, location, or structure where drainage discharges from a storage basin or conveyance system to a receiving system; also called an "outfall".

**Peak Flow –**

Maximum flow through a watercourse which will recur with a stated frequency. The maximum flow for a given frequency may be based on measured data, calculated using statistical analysis of peak flow data, or calculated using hydrologic analysis techniques. Projected peak flows are used in the design of culverts, bridges, and dam spillways.

**Permanent Soil Erosion and Sediment Control Measures –**

Means control measures installed or constructed to control erosion and sedimentation and maintained after project completion.

**Precipitation –**

Water that falls to earth in the form of rain, snow, hail, or sleet.

Private –

**Project Engineer –**

A professional engineer licensed in Michigan that performs the engineering design for the development.

**Proprietor –**

Any person, firm, association, partnership, corporation or any combination thereof that owns property proposed for development.

**Rational Formula –**

A simple technique for estimating peak discharge rates for small developments based on the rainfall intensity, watershed time of concentration and runoff coefficient.

**Retention –**

Practices which capture stormwater and release it slowly through infiltration into the ground. See also detention.

**Riprap –**

A combination of large stone, cobbles and boulders used to line channels, stabilize banks, reduce runoff velocities or filter out sediment.

**Runoff –**

Flow of water across the land surface. The volume is equal to the total rainfall minus the rainfall that is stored, infiltrates into soils, or is taken up by plants.

**Runoff Coefficient –**

Ratio of runoff to precipitation.

**Saturated Hydraulic Conductivity** – The ability of water to pass through soils when completely saturated. This is the most accurate measure of infiltration.

**Seasonal High Groundwater Level** –

The highest level of groundwater that occurs frequently enough for the water to stain the soils.

**Sediment** –

Soil fragmental material that originates from weathering of rocks and is transported or deposited by air, water, or ice.

**Sheet Flow** –

Runoff which flows over the ground surface as a thin even layer, not concentrated in a channel or pipe.

**Spillway** –

A depression in the embankment of a pond or basin used to pass peak discharges in excess of the design storm.

**Stream** – By MDNR definition; "a river, creek, or surface waterway that may or may not be defined by Act 40, P.A. Of 1956: has definite banks, a bed, and visible evidence of continued flow or continued occurrence of water, including the connecting water of the Great Lakes".

**Swale** –

A natural depression or wide shallow ditch used to temporarily convey, store, or filter runoff.

**Temporary Soil Erosion and Sediment Control Measures** –

Means interim control measures which are installed or constructed to control soil erosion or sedimentation until permanent soil erosion control measures are established.

**Time of Concentration** –

Time at which outflow from a basin is equal to inflow or time of equilibrium.

**Tributary Area** – The total surface area that contributes runoff to a particular point.

**Unit Hydrograph** –

Graph of runoff vs. time produced by a unit rainfall over a given duration.

## **USDA – United States Department of Agriculture**

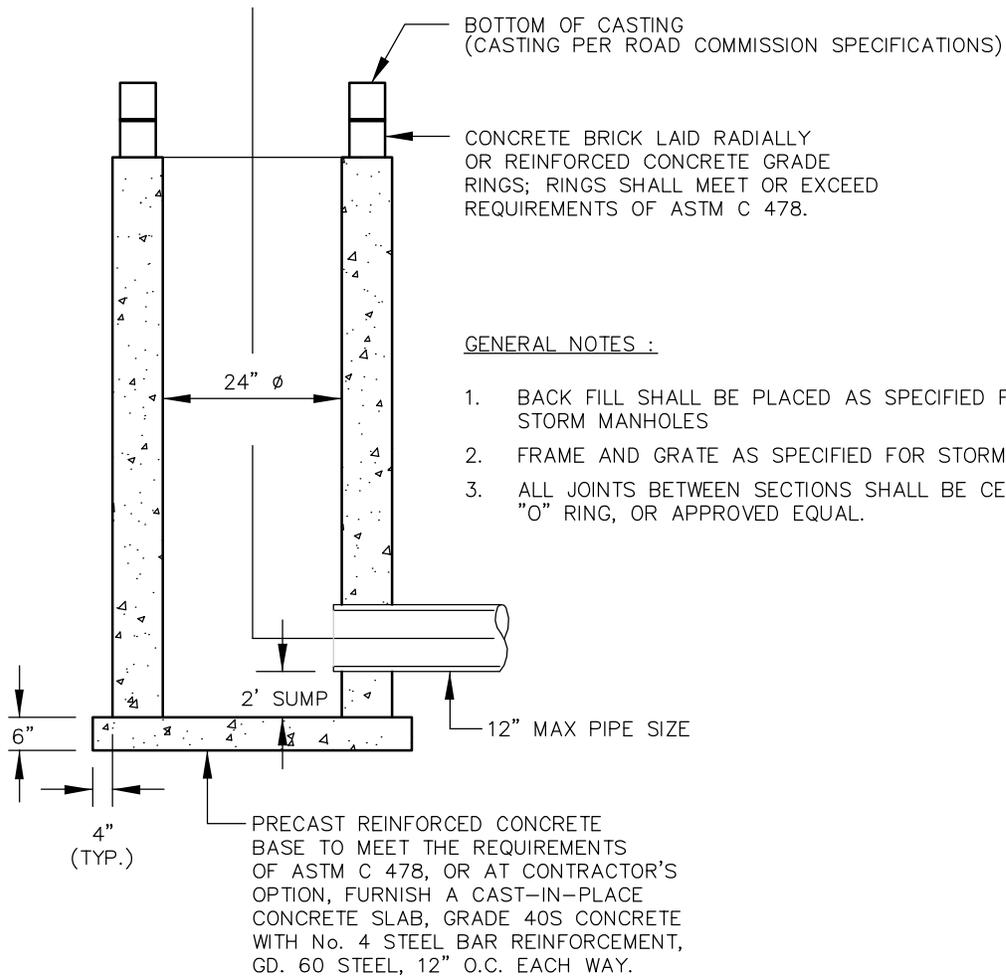
### **Water Course –**

Means any natural or artificial water course including, but not limited to; streams, rivers, creeks, ditches, channels, canals, conduits, culverts, drains, gullies, ravines, or washes which has definite banks, a bed, and in which waters flow in a definite direction or course, either continuously or intermittently, and including any area adjacent thereto which is subject to inundation by reason of water flow or floodwater.

**Weir –** A device that has a crest and some side containment, and is used to measure, regulate, or restrict flow. The amount of flow that may pass over the weir is a function of the weir geometry and upstream height of water above the crest.

**Wetland –** An area that is regularly saturated by surface or ground water and subsequently is characterized by a prevalence of vegetation that is adapted for life in saturated soil conditions. Examples include: swamps, bogs, fens, and marshes.

Appendix J  
Standard Details  
&  
Suggested BMP Criteria



## **24" DIA. INLET DETAIL**

NO SCALE

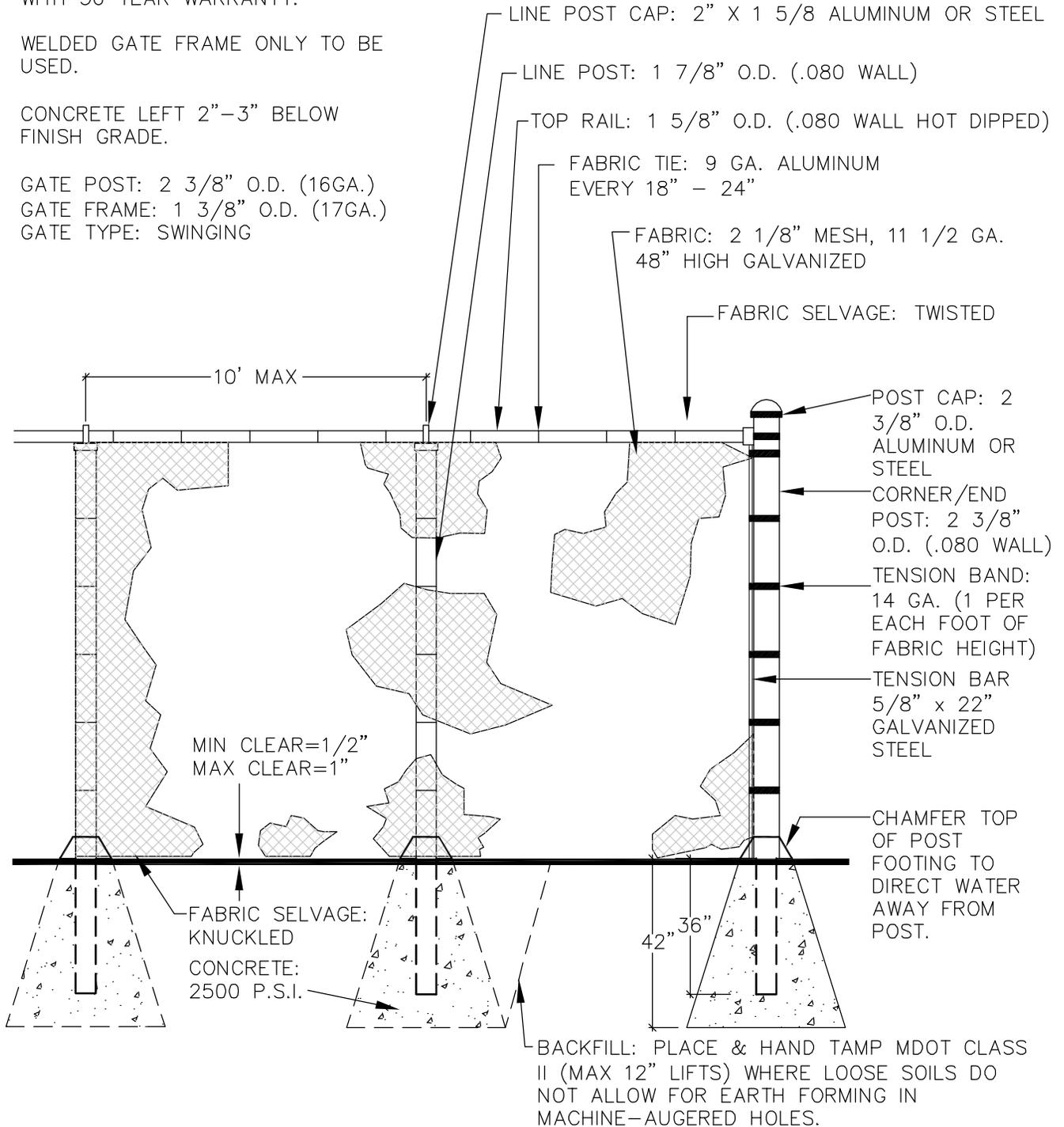
GENERAL NOTES:

FABRIC. ASTM 491 ALUMINIZED WITH 30 YEAR WARRANTY.

WELDED GATE FRAME ONLY TO BE USED.

CONCRETE LEFT 2"–3" BELOW FINISH GRADE.

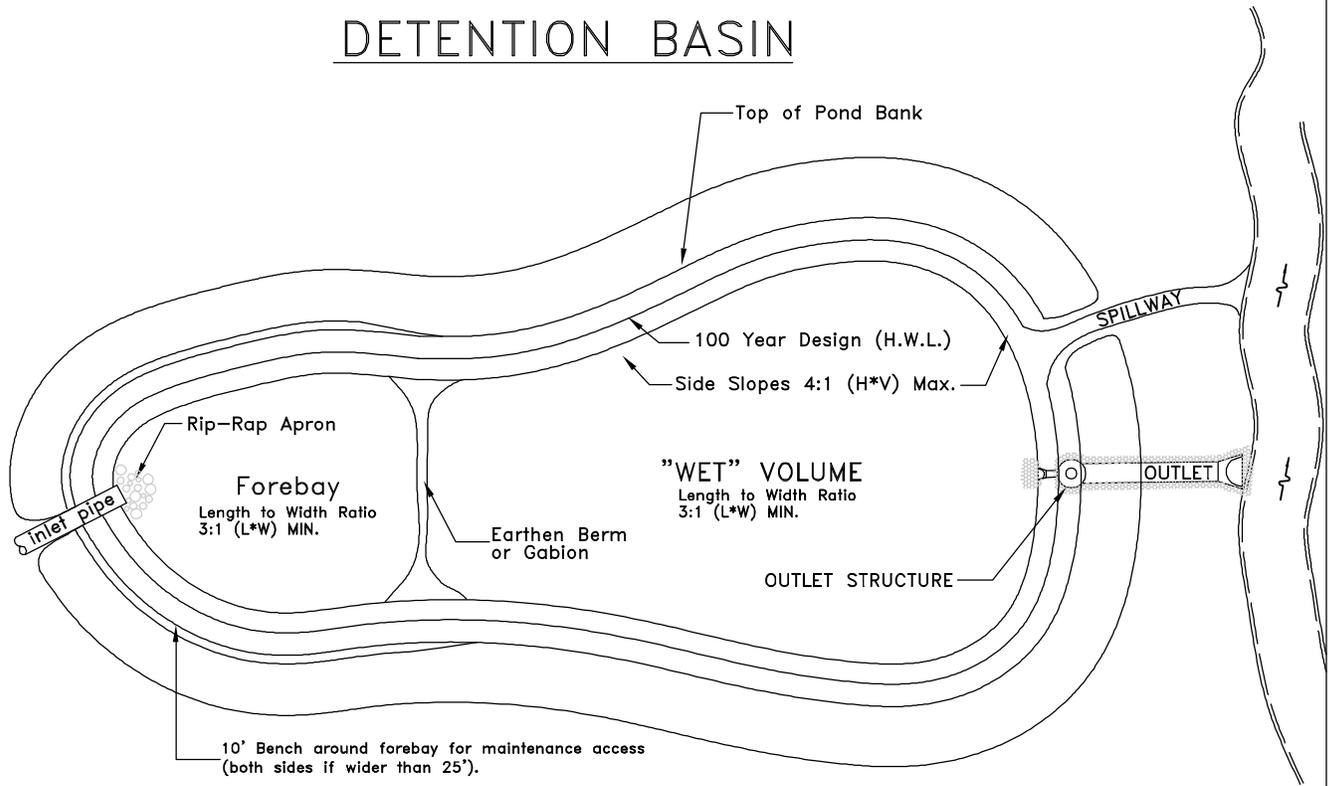
GATE POST: 2 3/8" O.D. (16GA.)  
GATE FRAME: 1 3/8" O.D. (17GA.)  
GATE TYPE: SWINGING



**4' CHAIN LINK FENCING DETAIL**

NO SCALE

# DETENTION BASIN



**NOTE:**

1. The use of a perforated standpipe-type riser structure or an orifice plate to assure an appropriate detention time for all storm events is required.
2. Hoods or trash racks shall be installed to prevent clogging. Grate openings shall be a maximum of three inches.
3. The riser shall be placed near the pond embankment to provide for ready maintenance access.
4. Barrels and risers will be constructed of materials that will reduce future maintenance requirements. The riser pipe shall be a minimum of 36 inches in diameter for riser pipes up to four feet in height. Riser pipes greater than four feet in height shall be 48 inches in diameter. Riser pipes will be constructed with concrete bottoms.
5. Where feasible, a drain for completely de-watering the pond should be installed for maintenance purposes.

## PLAN VIEW

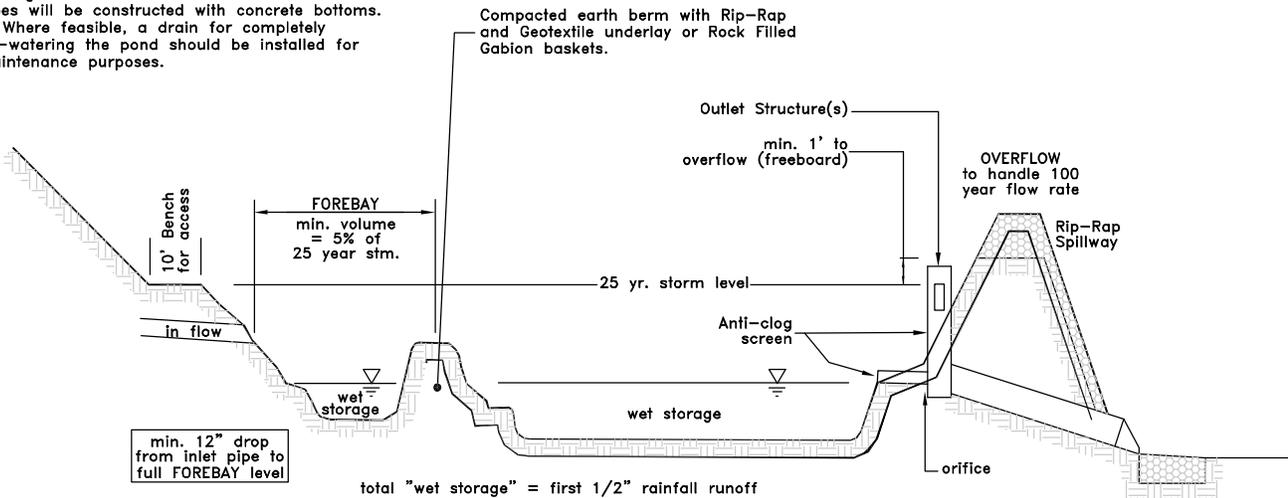
No Scale

**NOTE:**

A wedge shaped plan view area is preferred.

**NOTE:**

Total detention basin volume above lowest discharge elevation shall equal the total 25 year storm volume less allowable outlet volume. The 25 year storm used shall be the one that matches the tributary area's time of concentration.



**NOTE:**

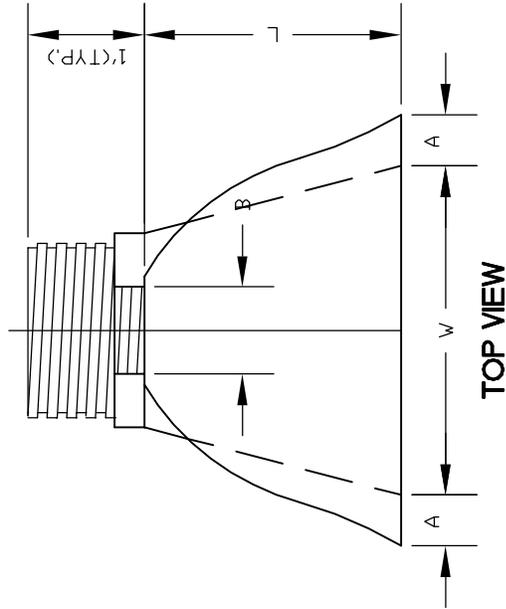
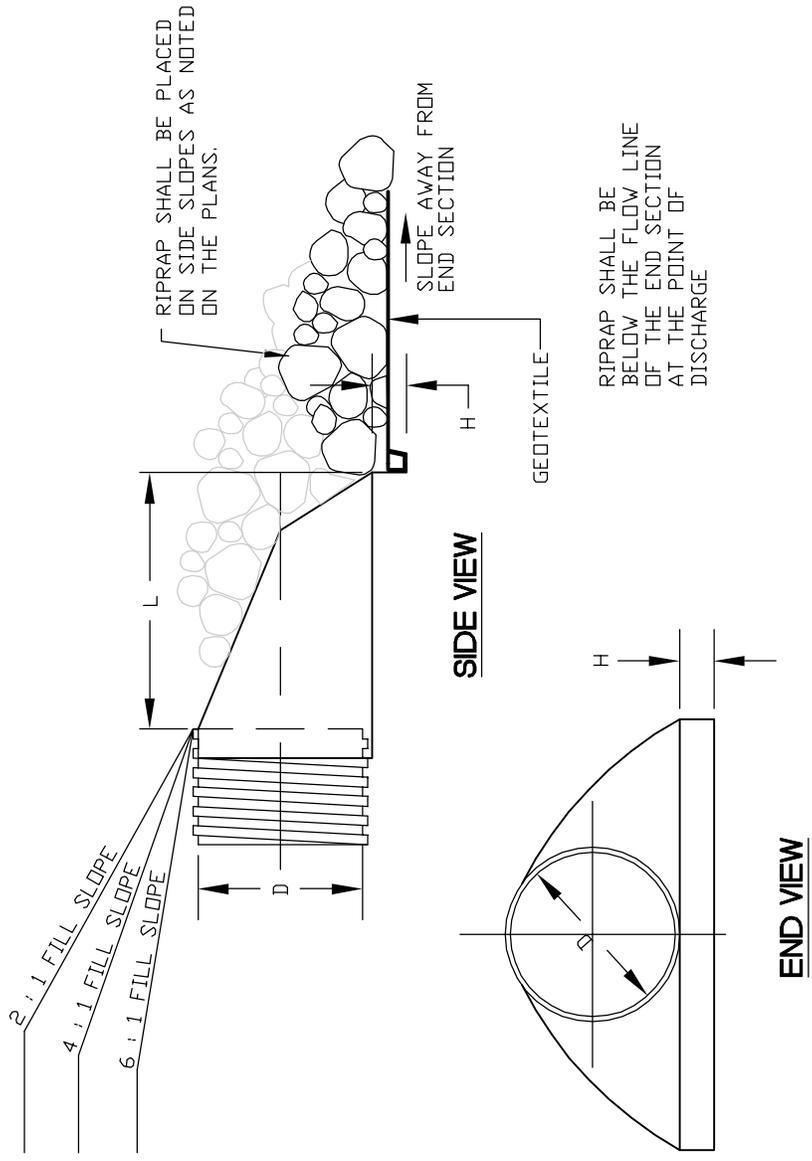
**OUTLET DESIGN:**

1. All outlets will be designed to be easily accessible for heavy equipment required for maintenance purposes.
2. All outlets will be designed to discharge at an elevation within two feet of the 100-year floodplain elevation for the receiving water body. Discharging at the "crest" of slopes will not be permitted.
3. Backwater on the outlet structure from the downstream drainage system shall be evaluated when designing the outlet.

## PROFILE VIEW

No Scale

Proprietor responsible for outlet flow rate assurance



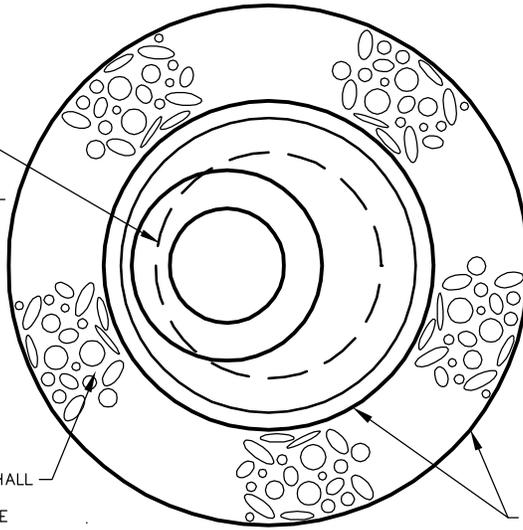
DIMENSIONS IN INCHES

D=PIPE DIA.	A	B MAX	H	L	V
12-15	6.5	10	6.5	25	29
18	7.5	15	6.5	32	35
24	7.5	18	6.5	36	45
30	10.5	NA	7.0	53	68
36	10.5	NA	7.0	53	68

**TYP END SECTION ( HDPE )**  
NO SCALE

ACCESS TO MANHOLE SHALL LINE UP WITH RUNGS ON THE WALL OF THE MANHOLE AS SHOWN.

6-A WASHED STONE SHALL BE PLACED TO 2'-0" BEYOND THE STRUCTURE COMPLETELY AROUND THE STRUCTURE.



**PLAN VIEW**

**GENERAL NOTES:**

1. ALL BACKFILL TO BE IN 12" LAYERS AND EACH LAYER TO BE MECHANICALLY TAMPED. SUPPLY AND INSTALLATION OF BACKFILL INCIDENTAL TO STRUCTURE COST.
2. BRICK UNDER CASTING TO BE LAID RADIALLY AND ALL VOIDS TO BE FULLY MORTARED USING TYPE R-2 MORTAR (SEE TABLE 7.02-1 1990 MDT STANDARD SPECIFICATIONS); CASTING TO REST ON A BED OF MORTAR (8" MIN. & 12" MAX. BRICK & BEDDING); USE GRADE A BUILDING BRICK; MINIMUM 2500 LBS. COMPRESSIVE STRENGTH.
3. ALL CONCRETE TO MEET MDT STANDARDS AND SPECS. FOR DRAINAGE STRUCTURES.
4. RUNGS MUST BE CAPABLE OF SUPPORTING 300 lbs.
5. THE BELL SHALL BE REMOVED FOR THE FIRST LENGTH OF OUTLET PIPE
6. SPACING BETWEEN OPENINGS FOR PIPES SHALL NOT EXCEED 6".

**STORM SEWER NOTES:**

1. EAST JORDAN "7045" w/M2 GRATE EAST JORDAN "1020" w/ TYPE M2 GRATE
2. ALL JOINTS TO BE CEMENT, MASTIC, "O" RING JOINT OR EQUAL.
3. CATCH BASINS AND LEACHING BASINS MUST HAVE A MINIMUM 2' SUMP
4. ALL PIPING AND COUPLING DEVICES USED TO CONNECT EX. PIPES INTO THE NEW STRUCTURE IS INCIDENTAL TO THE CONSTRUCTION OF THE NEW STRUCTURE.

4NP SUPAC GEOTEXTILE SHALL BE PLACED COMPLETELY AROUND THE OUTSIDE OF THE STRUCTURE AND PLACED BETWEEN THE STONE AND NATURAL SOIL, ALSO AROUND THE TOP AND SIDES OF THE STONE. ALL JOINTS SHALL HAVE A MINIMUM OVERLAP OF 12 INCHES.

MANHOLE CASTING TO IN ACCORDANCE WITH LOCAL MUNICIPAL STANDARDS.

COVER AS SPECIFIED. BRICK TO GRADE; SEE GENERAL NOTE #2

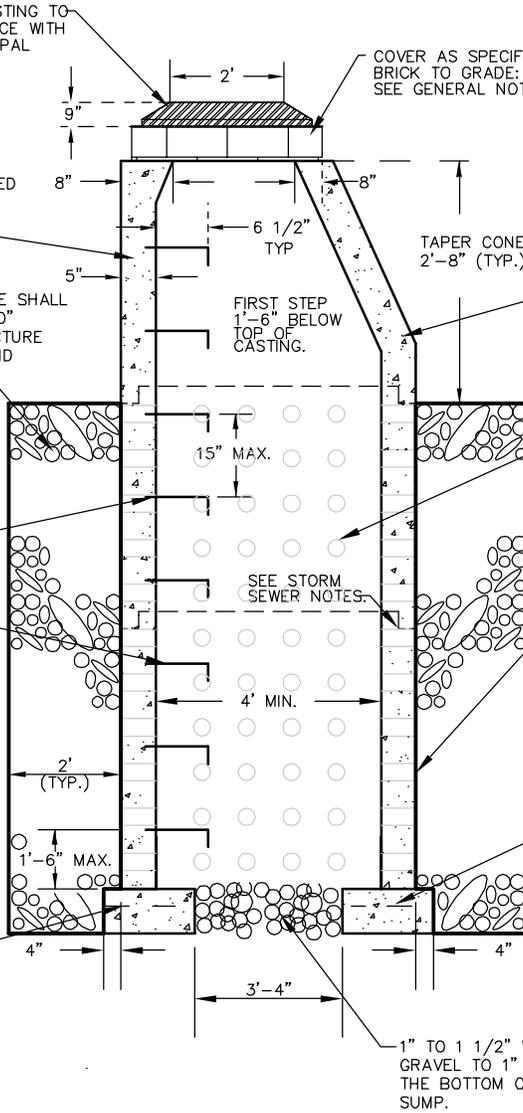
PRECAST REINFORCED CONCRETE CONICAL MANHOLE SECTION (A.S.T.M. C-478).

6-A WASHED STONE SHALL BE PLACED TO 2'-0" BEYOND THE STRUCTURE COMPLETELY AROUND THE STRUCTURE.

MIN. 3" EMBEDMENT INTO WALL.

ALUMINUM WITH FOOT RECESS AND SUITABLY SCORED AS TO PROVIDE A NON-SLIP SURFACE. EAST JORDAN MANHOLE STEP E.J. #8501 OR APPROVED EQUAL.

STEEL REINFORCING (IN TOP OF FOOTING)



TAPER CONE 2'-8" (TYP.)  
CONE SECTION NOT PERFORATED

1-1/2" DIA. HOLES, 12" ON CENTER, BOTH DIRECTIONS, COMPLETELY AROUND THE STRUCTURE.

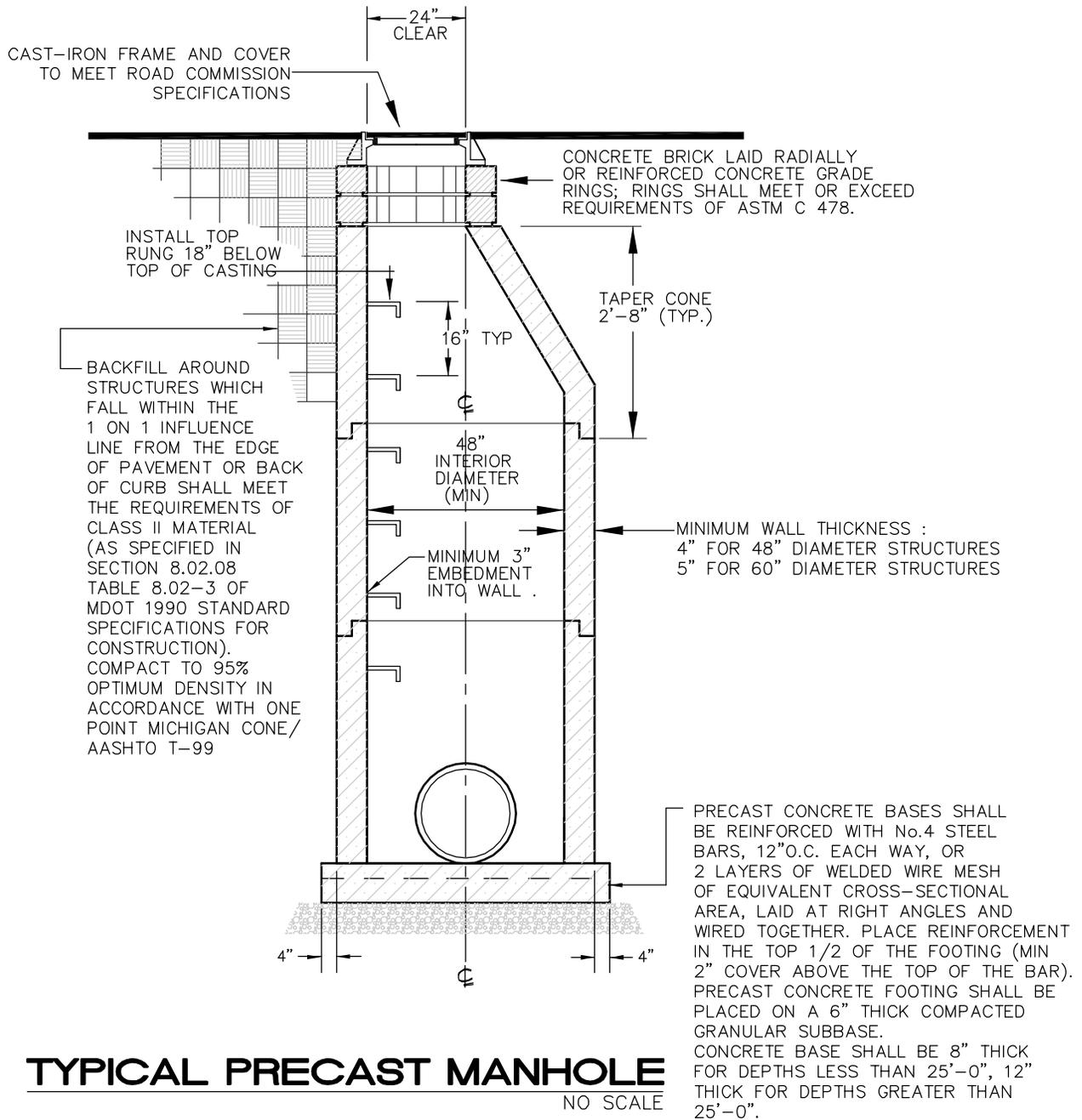
4NP SUPAC GEOTEXTILE SHALL BE PLACED COMPLETELY AROUND THE OUTSIDE OF THE STRUCTURE AND PLACED BETWEEN THE STONE AND NATURAL SOIL, ALSO AROUND THE TOP AND SIDES OF THE STONE. ALL JOINTS SHALL HAVE A MINIMUM OVERLAP OF 12 INCHES.

CONC. FOOTING 8" THICK IF DEPTH IS LESS THAN 25' AND 1' THICK IF DEPTH IS GREATER THAN 25'. PRECAST REINFORCED CONCRETE BASE (A.S.T.M. C-478) OR GRADE 40S CONCRETE WITH REINFORCEMENT RODS, UNLESS OTHERWISE SPECIFIED. REINFORCEMENT SHALL BE #4 STEEL BARS SPACED AT 1' BOTH WAYS.

1" TO 1 1/2" WASHED GRAVEL TO 1" ABOVE THE BOTTOM OF THE SUMP.

**TYPICAL PRECAST LEACHING BASIN**

NO SCALE



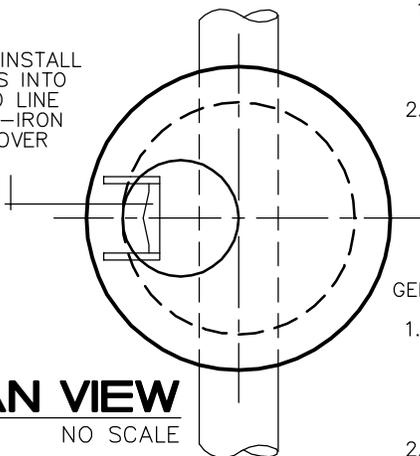
SEWER NOTES :

1. ALL JOINTS SHALL BE "O" RING TYPE WITH REQUIRED LUBRICANT TO MEET THE REQUIREMENTS OF ASTM C 443 JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE WITH RUBBER GASKETS.
2. ALL PIPES FLOWING IN TO THE MANHOLE STRUCTURE SHALL BE CHANNLED INTO ONE OUTFLOW BY USE OF CONCRETE BENCHES AS SHOWN IN THIS DETAIL .

GENERAL NOTES :

1. WHERE BRICK IS USED UNDER CASTINGS IN LIEU OF GRADE RINGS, USE GRADE "A" CONCRETE BUILDING BRICK (MIN 2500 PSI COMPRESSIVE STRENGTH ) LAID RADIALLY WITH ALL VOIDS FULLY MORTARED . PLACE CASTING ON A FULL BED OF MORTAR . MAXIMUM THICKNESS OF BRICK AND BEDDING SHALL NOT EXCEED 12" OR BE LESS THAN 8" .
2. SPACING BETWEEN PIPE ENTRANCE OPENINGS INTO MANHOLE SHALL BE A MINIMUM OF 6 INCHES.

FURNISH AND INSTALL ACCESS RUNGS INTO STRUCTURE TO LINE UP WITH CAST-IRON FRAME AND COVER AS SHOWN.



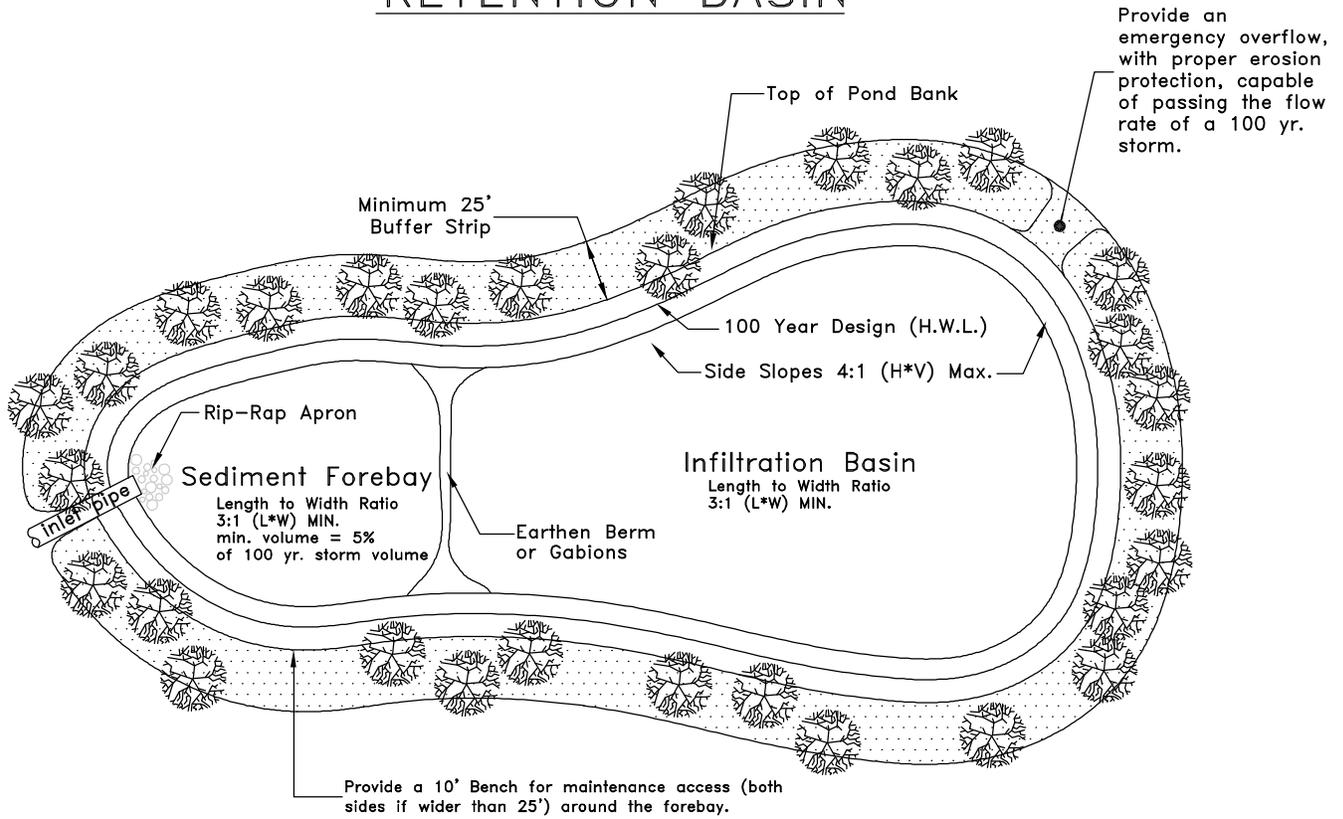
ASTM STANDARDS AND STANDARD SPECIFICATIONS:

- (1) C 443 JOINTS FOR CIRCULAR CONCRETE SEWER AND CULVERT PIPE WITH RUBBER GASKETS
- (2) C 478 PRECAST REINFORCED CONCRETE MANHOLE SECTIONS.
- (3) C 877 EXTERNAL SEALING BANDS FOR NON-CIRCULAR CONCRETE SEWER, STORM DRAIN AND CULVERT PIPE
- (4) C 891 STANDARD PRACTICE FOR INSTALLATION OF UNDERGROUND PRECAST CONCRETE UTILITY STRUCTURES
- (5) C 923 RESILIENT CONNECTORS BETWEEN REINFORCED CONCRETE MANHOLE STRUCTURES AND PIPES.
- (6) D 449 ASPHALT USED IN DAMPPROOFING AND WATERPROOFING

PRECAST MANHOLE PRODUCT SPECIFICATIONS

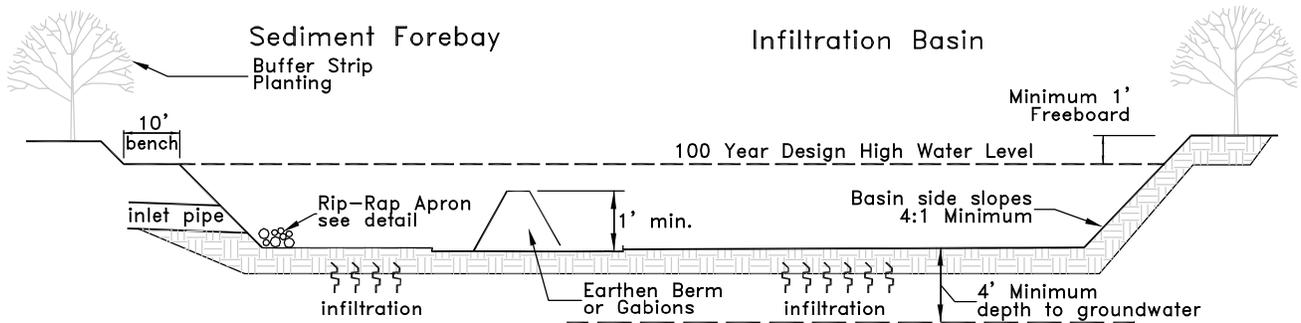
- A) PRECAST CONCRETE MANHOLES: ASTM C 478, PRECAST REINFORCED CONCRETE, OF DEPTH INDICATED ON THE PLANS, WITH PROVISION FOR RUBBER GASKET JOINTS, AND AS FOLLOWS:
  - (1) BASE SECTION: 6-INCH MINIMUM THICKNESS FOR FLOOR SLAB AND 4-INCH MINIMUM THICKNESS FOR WALLS AND BASE RISER SECTION, AND HAVING A SEPARATE BASE SLAB OR BASE SECTION WITH INTEGRAL FLOOR.
  - (2) RISER SECTIONS: 4-INCH MINIMUM THICKNESS; 48-INCH DIAMETER, AND LENGTHS TO PROVIDE DEPTH INDICATED.
  - (3) TOP SECTION: ECCENTRIC CONE TYPE, UNLESS CONCENTRIC CONE OR FLAT-SLAB-TOP TYPE IS INDICATED. TOP OF CONE TO MATCH GRADE RINGS.
- B) GRADE RINGS: PROVIDE 2 OR 3 REINFORCED CONCRETE RINGS, OF 6 TO 9 INCHES TOTAL THICKNESS AND MATCH 24-INCH DIAMETER FRAME AND COVER.
- C) GASKETS: ASTM C 443, RUBBER.
- D) CONCRETE: PORTLAND CEMENT MIX, 3000 PSI.
  - (1) CEMENT: ASTM C 150, TYPE II.
  - (2) FINE AGGREGATE: ASTM C 33, SAND.
  - (3) COARSE AGGREGATE: ASTM C 33, CRUSHED GRAVEL.
  - (4) WATER: POTABLE.
- E) REINFORCEMENT: STEEL CONFORMING TO THE FOLLOWING:
  - (1) FABRIC: ASTM A 185, WELDED WIRE FABRIC, PLAIN.
  - (2) REINFORCEMENT BARS: ASTM A 615, GRADE 60, DEFORMED.
- F) MANHOLE STEPS: CAST INTO BASE, RISER, AND TOP SECTIONS SIDEWALL AT 12-TO 16-INCH INTERVALS, AND SHALL BE WIDE ENOUGH FOR A MAN TO PLACE BOTH FEET ON ONE STEP, DESIGNED TO PREVENT LATERAL SLIPPAGE OFF THE STEP. INSTALLED RUNGS SHALL SUPPORT A MINIMUM CONCENTRATED LOAD OF 300 LBS AT ANY POINT ON THE STEP.
  - (1) EAST JORDAN IRON WORKS #8501 CAST ALUMINUM, OR APPROVED EQUAL.

# RETENTION BASIN



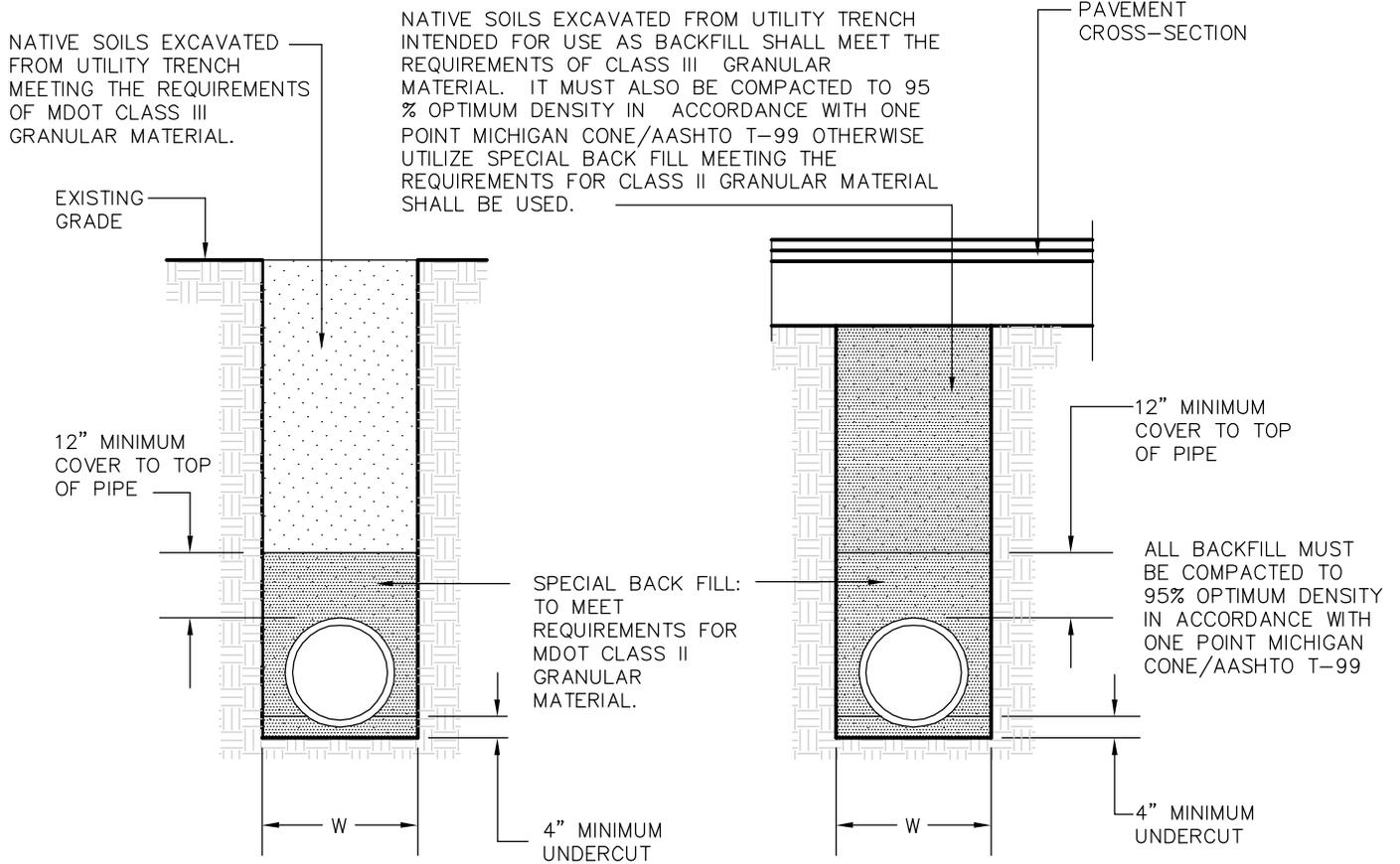
## PLAN VIEW

No Scale



## PROFILE VIEW

No Scale

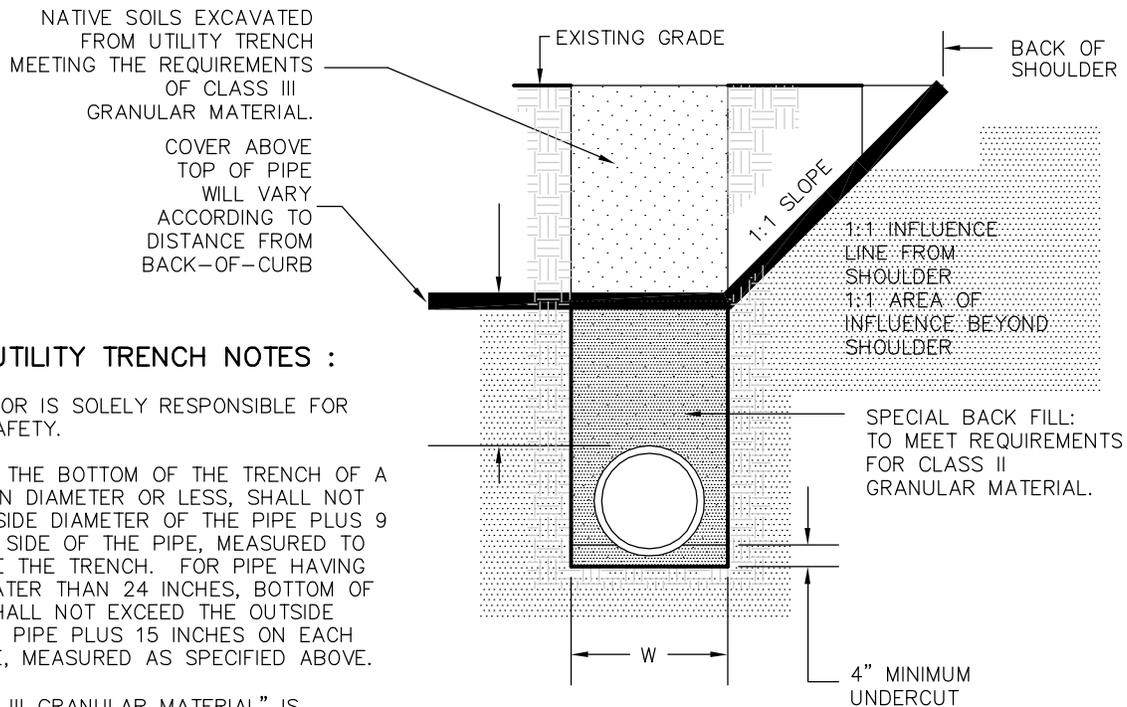


**TRENCHES NOT UNDER ROADBED**

NO SCALE

**TRENCHES UNDER ROADBED**

NO SCALE



**TRENCHES WITHIN INFLUENCE OF ROADBED**

NO SCALE

**GENERAL UTILITY TRENCH NOTES :**

1. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR CONSTRUCTION SAFETY.
2. THE WIDTH AT THE BOTTOM OF THE TRENCH OF A PIPE 24 INCHES IN DIAMETER OR LESS, SHALL NOT EXCEED THE OUTSIDE DIAMETER OF THE PIPE PLUS 9 INCHES ON EACH SIDE OF THE PIPE, MEASURED TO THE FACE OF THE TRENCH. FOR PIPE HAVING A DIAMETER GREATER THAN 24 INCHES, BOTTOM OF TRENCH WIDTH SHALL NOT EXCEED THE OUTSIDE DIAMETER OF THE PIPE PLUS 15 INCHES ON EACH SIDE OF THE PIPE, MEASURED AS SPECIFIED ABOVE.
3. "CLASS II AND III GRANULAR MATERIAL" IS DEFINED IN SECTION 902 OF MDOT'S 1996 STANDARD SPECIFICATIONS FOR CONSTRUCTION.

**UTILITY TRENCHES - RIGID PIPE DETAIL**