

ENGINEERING STANDARDS FOR PUBLIC WORKS

August 15, 2023

Byron, MN

BYRON *Minnesota*
Where Neighbors Become Family. Welcome Home.

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.



William K. Angerman, P.E.
Byron Consulting City Engineer

8/15/2023

Date

26436

License No.

Recommended for Approval
City of Byron, MN



Tom Ricke, Public Works Superintendent

8/15/2023

Date

Revision Date:

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SECTION 1
ENGINEERING STANDARDS

SECTION 1: SCOPE

2000.101 Description

In order to standardize engineering requirements for Developers and Engineers performing work within the City of Byron, it is important that certain standards be followed.

These standards state certain requirements, materials, and standards that shall be incorporated into the preparation of plans and specifications for sanitary sewer, storm sewer, stormwater treatment best management practices (BMPs), watermains, subdrain, drain tile, service connections, pedestrian facilities, street construction, and associated erosion control within the City of Byron, unless otherwise authorized by the City Engineer.

Compliance with these standards will help provide quality projects and assure uniform performance standards for the citizens of Byron.

2000.102 Engineering Requirements

As set forth in various sections of City ordinances, developers of property within the City are required to submit certain professionally prepared and signed plans and specifications for review and approval by the City. These include such items as grading plans, stormwater management plans, topographic surveys and plats, street and utility plans and specifications.

All plans and specifications shall be prepared by or under the direction of a Professional Engineer (herein after "Engineer") licensed under the laws of the State of Minnesota.

The Engineer shall be responsible for the accuracy and completeness of the plans and specifications. The Engineer shall provide the City with record drawings of the constructed improvements. The record drawings shall depict the field locations of the constructed improvements, constructed invert elevations of the sanitary sewer and storm sewer structures and constructed pipe slopes. The Engineer shall annotate on the review set and record drawings that all location and elevations of storm and sanitary have been verified. The Engineer shall be familiar with all of the reference documents listed herein.

The City Engineer will review the plans for compliance with City practice. Approval of the plans and specifications by the City does not relieve the Engineer of full responsibility for the adequacy of design or accuracy of computations and details.

Engineering obligations include preparation of plans and specifications and field staking to assure the City that the completed project is in conformance with the approved plans and specifications, and submission of record drawings.

2000.103 Definition of Terms

A. City Engineer

City Engineer as used herein is defined as the licensed engineer designated by the governing body to furnish engineering assistance for the administration of these regulations.

B. Contractor

Contractor as used herein is defined as a company that performs construction activities for the public infrastructure facilities.

C. Design Exception

The City Council may authorize a modification or exception to the design standards listed in this section as recommended by city staff based on characteristics unique to the property.

D. Developer

Developer as used herein is defined as a person, company, corporation, or limited partnership that develops property within the City of Byron.

E. Engineer

Engineer as used herein is defined as Professional Engineer licensed under the laws of the State of Minnesota.

F. Public Works

Public Works as used herein are defined as those facilities for transportation, conveyance of sanitary and storm flows and potable water that are constructed within the public right-of-way or on public easements for the use of the general public. The Public Works Department is that department of the City of Byron responsible for the management and oversight of Public Works facilities.

2000.104 Reference Documentation

The following reference documentation shall be the latest edition, including amendments and published updates.

A. Minnesota Department of Transportation (MN/DOT)

1. Standard Specifications for Construction
2. Standard Detail Plates
3. Standard Detail Plans

B. Great Lakes-Upper Mississippi River Board of State and Provincial Health and Environmental Managers (Commonly called 10 States Standards)

1. Recommended Standards for Wastewater Facilities
2. Recommended Standards for Water Works

C. Minnesota Department of Health

1. Chapter 4715 Plumbing Code
2. Chapter 4720 Public Water Supplies
3. Chapter 4715 Wells & Borings
4. Chapter 4715 Explores & Exploratory Borings

D. City of Byron

1. Standard Specifications
 2. Standard Detail Plates
 3. Checklist for:
 - a. Grading Plan
 4. Building and Fire Prevention Code
 5. Zoning and Subdivision Ordinance
- E. Byron Comprehensive Plan 2040
- F. Minnesota Pollution Control Agency (MPCA) Minnesota Stormwater Manual

SECTION 2: ROADWAY DESIGN

2000.201 Right-of-Way & Street Widths

For classification of streets and resulting widths, refer to the Street System Plan Map in the Byron Comprehensive Plan 2040 and the City of Byron Standard Detail Plate 8-01.

2000.202 Complete Streets

Per sections 151-019 and 151.024.(4) of the City of Byron Subdivision Regulations.

2000.203 Typical Cross-Section

Cross-slope – desired 2% on driving lanes (maximum with design exception request 3%), 2% to 5% on parking lanes, and 2% to 5% on boulevards.

A 2' clear zone area shall be provided from the face of curb to the face of any obstruction.

Sidewalk location – 0.5' from property line.

2000.204 Intersections

Streets shall be laid out so as to intersect as nearly as possible at right angles. A proposed intersection of two new streets at an angle of less than 75 degrees shall not be permitted. An oblique street should be curved approaching an intersection and should be approximately at right angles for at least 100 feet therefrom.

No more than two streets shall intersect at any one point unless specifically approved by the City Council.

Proposed new intersections along one side of an existing street shall, wherever practicable, coincide with any existing intersections on the opposite side of such street. Street jogs with center-line offsets of less than 150 feet shall not be permitted. Where local or collector streets intersect arterial streets, their alignment shall be continuous. Intersection of arterial streets shall be at least 1,000 feet apart.

Streets parallel to a railroad when intersecting a street which crosses the railroad at grade shall, to the extent practicable, be at a distance of at least 150 feet from the railroad right-of-way. Such distance shall be determined with due consideration

of the minimum distance required for future separation of grades by means of appropriate approach gradients.

2000.205 Curbing

All urban streets and private roads, with the exception of alleys, shall be constructed with concrete curb and gutter on both sides.

Curb and gutter shall be design B-624 in all commercial/industrial streets, all multi-family residential (more than 2 families per dwelling unit), all streets centerline grade of 8% or steeper, all intersection radii, at drainage structures, and on residential street sections absent of driveway entrances as directed by the City Engineer.

Minimum longitudinal slope on curbing is 0.5%. The minimum longitudinal slope on curbing for the radial portion of a cul-de-sac is 1%.

4" drive over concrete curb and gutter will be permitted at one and two family residential areas where driveway locations have not been established and street grades are less than 8%.

Pedestrian ramps, conforming to the latest version of MN/DOT Standard Plan 5-297.250, shall be placed at all intersection corners.

Where sidewalk abuts curb, the curb shall include a sill on the back on which the walk will rest.

Minimum curb radius at the intersection of two local streets shall be at least 20 feet; and minimum curb radius at an intersection involving a collector street shall be at least 25 feet. Abrupt changes in alignment within a block shall have the corners cut off in accordance with standard engineering practice to permit safe vehicular movement.

Expansion joints shall be placed at the ends of all curved sections, at the ends of the curved portions of street returns, at drainage structures, and where abutting other concrete. The spacing of joints shall not exceed 300 feet.

2000.206 Vertical and Longitudinal Alignment and Grades

Longitudinal alignment and grades shall be designed in accordance with the City of Byron Standard Detail Plate 8-01.

2% maximum longitudinal grade through intersections to within 25' of assumed stop condition or the right of way line extended whichever is greater. Intersection cross-slope crown rollover shall be 3% maximum.

Vertical alignment shall be designed utilizing K values from Chapter 3 of the latest edition of the Minnesota Department of Transportation Road Design Manual. K values shall be selected based on the design speed and curve type.

2000.207 Geotechnical Report

All projects that include Public Works improvements shall include a Geotechnical Report prepared and signed by a geotechnical professional. On City-led projects, a condensed version may be accepted at the discretion of the Engineer.

A. The report must contain the following:

1. The purpose and goals of the report.

2. The methodology used of field investigation/observation and laboratory analysis.
 3. Description of soils and geological setting.
 4. Maps showing field observation locations and findings.
 5. Soil boring log and test pit profiles.
 6. Ground water level presence and indication of past ground water.
 7. Laboratory test results and conclusions.
 8. Special/unique observations.
 9. Descriptions of rock locations and characteristics.
 10. Descriptions of unsuitable soil locations and characteristics.
 11. Descriptions of manmade features/pavements, locations and characteristics.
- B. Geotechnical Report must contain the following conclusions and recommendations as appropriate for the project:
1. Material management
 - a. Topsoil thickness and appropriate ultimate placement.
 - b. Soils that are not suitable for placement in street and disposition of those materials.
 - c. Shot rock maximum size to be suitable for placement in street and disposition of oversized rocks.
 - d. Existing pavement rubble and rubble from manmade structures.
 2. Soil placement recommendations related to structures.
 3. Utility installation geotechnical recommendations.
 4. Fill and backfill recommendations.
 5. Soil placement/compaction/maximum moisture recommendations.
 6. Slope stability recommendations.
 7. Recommendations related to retaining walls and other special structures.
 8. Trench sloping recommendations.
 9. Drainage and drain tile recommendations.
 10. Likelihood of Karst or similar conditions and recommended actions should conditions be found.
 11. Materials testing, proof roll, etc. recommendation greater than those required for normal projects.
 12. Pavement design soil factor (R-value) and explanation for recommendation.
 13. A Decorah Edge report is required for projects that potentially impact the Decorah Edge. Development projects that potentially impact the Decorah Edge are regulated per Olmsted County Ordinance Chapter 3700.

14. Other recommendations.

C. The report may include the following:

1. Pavement Design Report, as a separate section.
2. Conclusions and recommendations related to the installation of public utilities and other infrastructure.
3. Information related to the mass grading of the site, for the preparation of building pads and footings and foundations, and for the placement and compaction of private streets and parking lots.

2000.208 Pavement Design

All flexible pavements shall be designed in accordance with the procedures set forth in the Pavement Manual of the Minnesota Department of Transportation.

All projects that include street pavements, shall include a Pavement Design Report prepared and signed by a licensed professional engineer. The report shall utilize the conclusions and recommendations of the Geotechnical Report.

A. The report must contain the following:

1. The purpose and goals of the report.
2. The Mn/DOT methodology used for the analysis.
3. Soils factor or R-value used. Recommended measures shall be provided for special conditions such as excess moisture or highly expansive soils.
4. Equivalent Single Axle Load Traffic Forecasting with volume and vehicle type distribution (6% trucks minimum) used for the recommendations. Indicate the source of the projections.
5. 50-year pavement life, including maintenance preservation schedule for overlay, seal coat, or rehabilitation.
6. Summary of calculations containing layer thickness of flexible pavement, aggregate base and granular subbase or geotextile fabric.

B. Unless otherwise directed by the City Engineer, the minimum structural sections are as follows:

1. Flexible pavements include 4" bituminous surfacing, 10" Aggregate Base, Breaker Run (as required for subgrade corrections), and Geotextile Type 7 non-woven.
2. Aggregate Subbase – Breaker Run for subgrade correction shall be in accordance with Section 200.501 of Excavation and Embankment Specifications 200 of the City of Byron.

2000.209 Private Streets

Private streets must conform to the same City design standards (except width) as public streets and the following requirements:

A. Utility Easements

A utility easement with a minimum width of the street width plus an additional 10 foot width along each side of the street shall be provided along all private streets that contain public utilities to accommodate City maintenance activities.

B. Intersection Sight Distance

Sight distance at the intersection of private and public streets shall be provided in accordance with the current version of the MN/DOT Road Design Manual section 5.2.02 Intersection Sight Distance.

The required sight corners shall be free from obstructions.

C. Storm Sewer Design

Storm sewers shall be designed for the 10-year frequency storm (Atlas 14 Intensity-Duration-Frequency (IDF) curve) without surcharging of pipes, with a safe overflow provided for the 100-year frequency storm. Sizing shall address future flows from off-site. Rational or SCS methods may be used for run-off with pipe capacity determined by Manning's formula. The minimum storm sewer pipe size shall be twelve (12) inch diameter.

Gutter spread from a 10-year frequency storm for a private street shall provide for a twelve (12) foot unobstructed travel lane within the street for emergency vehicles.

Spacing of catch basins shall be as necessary for inlet capacity and as necessary to meet the pavement water spread restriction above.

Catch basins shall be located at intersections to prevent water from flowing across intersections (no valley gutters are allowed).

D. Emergency Vehicle Access

All developments which do not have frontage on a public street shall provide access for fire vehicles and emergency apparatus from a public street as follows:

1. The street shall be designed to withstand the loads from the emergency vehicles.
2. A fire lane shall be required to provide access to any portion of any structure which is more than:
 - a. one hundred and fifty (150) feet from the nearest street right-of-way when the structure is thirty (30) feet or less in height; or
 - b. fifty (50) feet from the nearest street right-of-way when the structure exceeds thirty (30) feet in height.
3. In addition to the situations above which require a fire lane, a fire lane to provide access to any part of a building may also be required if the zoning administrator determines that the distance of a structure from the nearest hydrant, the configuration of structures on a site, or other special characteristics of the site otherwise inhibit rapid, effective fire extinguishment.
4. The Zoning Administrator in consultation with the fire chief, may determine that the public health and safety require fire lanes in addition to private fire protection facilities required by the Building Code for any

structure classified as a high hazard use; any structure to be occupied by uses which involve extreme risks of fire, smoke, explosion, or toxic gas; or structures to be used as places of assembly for large congregations of people.

2000.210 Future Side Streets

Where accesses to future subdivision of adjacent land are shown on the plans, right-of-ways and all roadway improvements including, pavement, curb and gutter, and utilities on the side street, shall be constructed and extended to the boundary of the development. Projected profiles and alignments of the future street shall be shown on the plans.

2000.211 Treatment of Dead-End Streets

A. Dead End Streets (Temporary)

Shall be per section 151.024(c)(2) of the City of Byron Subdivision Regulations and shall comply with the City of Byron Standard Detail Plates.

B. Dead End Streets (Permanent)

Shall be per section 151.024(c)(3) of the City of Byron Subdivision Regulations.

The minimum radius of a cul-de-sac to the top back of curb shall be 44 feet.

The minimum radius of the right-of-way around the cul-de-sac shall be 60 feet.

C. Dead End Street Sections

1. Temporary

- a. Minimum temporary surface section shall include 6 inches of aggregate base and 3 inches bituminous.
- b. Paved surface shall be as shown on the City of Byron Standard Detail Plates or the equivalent minimum radius according to the requirements for a cul-de-sac.
- c. Erosion and sediment control measures shall be taken to prevent soil erosion. They shall be properly maintained, according to the schedule submitted to and approved by the City, until the permanent street is constructed, or another permit holder assumes responsibility.
- d. The barricade length shall match the street width.

2. Permanent

- a. The cul-de-sac section shall match the section of the street.

2000.212 Location of Utilities

The general criteria for placement of utilities within the right-of-way is as follows:

Material	Horizontal Alignment	Vertical Depth
Sanitary Sewer*	Center of street or, maximum 5.5' from center on curvilinear streets	7 ft over top
Watermain*	10' clear and parallel, to sanitary sewers and 10' clear and parallel, to storm sewers.	7ft over top
Storm Sewer*	5' - 10' clear and parallel, to sanitary Sewer.	2ft over top
Subdrain	Parallel to the sanitary sewer and 2' below the sanitary sewer to allow for services.	9 ft over top
Electric Telephone Cable TV, Gas	Easement adjacent to ROW	Per MN Statutes

* Sanitary Sewer, watermain, storm sewer, and subdrain are generally to be kept within the paved street area. In no case shall the sewer or watermain be placed within 3 feet of the lip of gutter. Public sewer and watermain outside the public right-of-way are to be located in dedicated public easements. When narrow roadway width cannot accommodate alignment spacing, the storm sewer may be placed closer to the curb. Landscaping features should be kept outside utility easement areas in order to facilitate future utility maintenance activity.

2000.213 Utility Conduit Crossings

Utility ducts shall be constructed according to the City of Byron Standard Detail Plates and placed across streets at locations provided by the Electric, Telephone, Gas, and Cable TV companies. The Engineer shall include the ducts on the plans and special provisions. The utility shall make arrangements with the developer to cover the costs of the ductwork.

2000.214 Utility Easements

Where public sanitary sewer, watermain, storm sewer, or subdrain is outside of platted ROW, the horizontal distance from the pipe to the edge of the easement shall be at least 10' or at least equal to the depth of the pipe, whichever is greater. The minimum easement width shall be 20'.

2000.215 Pedestrian and Bicycle Facilities

A. Sidewalks

Sidewalks shall conform to FHWA "Accessible Sidewalks and Street Crossings" information guide and the following:

All streets shall be finish graded to provide for future boulevard and sidewalk on both sides. Pedestrian curb ramps shall be constructed at all quadrants of intersections and shall conform to the latest version of MN/DOT ADA Standards and MN/DOT Standard Plan 5-297.250. All driveways shall be constructed with a sidewalk section. Where sidewalks do not allow for sufficient boulevard width to maintain vegetation, boulevards shall be paved with materials approved by the City Engineer.

Sidewalks shall be 5' wide and sloped to drain toward the drainage way or gutter.

B. Bicycle Facilities

Bicycle facilities shall conform to latest version of the *Minnesota Department of Transportation Bicycle Facility Design Manual* and State Aid Standards.

Shared use paths or sidepaths shall be 10' wide with 2' recovery area on both sides and be sloped to drain toward the drainage way or gutter.

SECTION 3: ENGINEERED FILL

2000.301 General

The Developer shall perform testing and observation of all engineered fill areas within the right-of-way and on the residential lots. All engineered fill areas shall be depicted on the plans.

2000.302 Definition

The placement of fill 12 inches in depth and greater over existing native soils to achieve proposed finished grade elevations.

2000.303 Fill Material

Fill material shall be common embankment complying with MN/DOT 2106.2.B.1.

2000.304 Placement and Compaction

The existing top soil shall be stripped and the project Geotechnical Engineer shall observe the striped area to ensure that all top soil has been removed prior to the placement of engineered fill. The engineered fill shall be placed in 12 inch maximum lifts and compacted with a sheeps foot roller to 95 percent of maximum density.

2000.305 Testing

The project Geotechnical Engineer shall perform density testing on the compacted material every 2 vertical feet of fill placed. Density testing shall be performed at the following locations:

- A. Within each residential lot at the anticipated dwelling locations including the garage.
- B. Within the right-of-way

2000.306 Test Results

The Developer shall submit test results and observation records to the City. The test results should be formatted based on the following:

- A. Testing performed on residential lots should note the lot and block number and the elevation of the testing.
- B. Testing performed within the right-of-way should note the road centerline stationing and the elevation of the testing.

SECTION 4: SANITARY SEWER DESIGN

2000.401 Sanitary Sewer Sizing

The minimum sanitary sewer main pipe size shall be eight (8) inch diameter.

All sewers shall be designed to have sufficient slope to provide mean velocities of not less than 2 fps based on Manning's formula using an N factor of 0.013. Sizing to be reviewed by the City Engineer prior to final plan preparation.

The Engineer shall verify elevations downstream and upstream prior to any connection and notify the City of any inconsistencies in the system.

Sanitary sewers shall be extended to the boundaries of new subdivisions, and other developments, to facilitate future sanitary sewer extensions, unless the City Engineer determines otherwise.

2000.402 Pipe Material

Sanitary Sewer shall comply with the City of Byron Sanitary Sewer and Storm Sewer Specifications 600.

2000.403 Manhole Structures

Manholes and other special access structures shall be constructed at designated locations as required by the Plans and in accordance with any standard detail drawings or special design requirements given therefor.

Unless otherwise specified or approved, manholes shall be constructed on a precast or cast-in-place concrete base and the barrel riser sections, and cone section shall all be of precast concrete. All units shall be properly fitted and sealed to form a completely watertight structure.

All sanitary structures shall be waterproofed per the City of Byron Standard Detail Plates.

All structures located as parts of forcemain systems and immediately downstream and other specific areas subject to high concentrations of corrosive materials (i.e. hydrogen sulfide) shall be fully lined with a protective coating, by a Licensed or Certified Contractor performing the special work.

2000.404 Spacing and Alignment

Sanitary sewers shall be placed on tangent alignment with manholes at changes in pipe size, horizontal alignment and/or vertical alignment. Spacing of manholes shall not exceed 400 feet for pipelines 8-15" diameter, 500' for pipelines 18-30" diameter, and 800' for pipelines 36-84" (unless approved by the City Engineer).

Outside drop manholes shall be constructed at locations where the difference in inlet and outlet elevations exceeds 2 feet.

Changes in flow direction at manholes shall not exceed 90 degrees.

4" and 6" service connections to the sewer main shall only be considered at locations in-between two manholes. 8" or larger services should be connected at a manhole. Lamp holes shall not be installed at the end of sanitary sewers unless the sanitary sewer is planned to be extended.

SECTION 5: WATERMAIN DESIGN

2000.501 Sizing Watermains

The standard watermain size for water distribution system design is eight (8) inch diameter.

Looping of watermains is required in all cul-de-sacs and dead-end streets unless topographic conditions make it impractical. Watermains shall be extended to the boundaries of new subdivisions, and other developments, to facilitate future water system extensions and looping, unless the City Engineer determines otherwise. Six (6) inch diameter watermains may be allowed for short (less than 150 feet long) unavoidable dead-ends or short looped areas if the design will provide minimum required fire flows at minimum allowable pressure.

2000.502 Pipe Material

Watermain shall comply with the City of Byron Watermain Specifications 700.

2000.503 Spacing and Alignment

Watermains must comply with Minnesota Department of Health (herein after "Health Department") and the latest version of 10 States Standards Recommended Standards for Waterworks. All such watermain plans and specifications are to be reviewed and approved by the Health Department prior to construction. Review and approval of these plans and specifications by the City of Byron is also required (before plan submission to the Health Department).

- A. Vertical Alignment: Generally 7' minimum and 10' maximum bury from finished grade. A 6' bury may be allowed in certain unpaved areas such as stream crossings, narrow ditch crossings, etc. Future finished grade lines in unimproved areas must be determined and shown on the construction plans.
- B. Sewer Crossings: Watermains crossing sewers shall be kept to a minimum. The crossings shall be aligned to be as nearly perpendicular as possible. Watermains are preferred to be located over the sanitary sewer with a minimum vertical edge-to-edge separation of 18". One full length of watermain pipe shall be located so that both joints of the watermain will be as far as possible away from the storm or sanitary sewer crossing.
 1. Allowed Exceptions From Gravity Sewers (No exceptions allowed from sanitary force mains):

Only where deemed impossible to maintain vertical separation and or full pipe length restriction.
 2. Exception Procedure: The Engineer must submit to the Minnesota Department of Health supporting data and a request for the alignment exception along with the required plan and specification submittals and fees.
 3. Exception Details:

Watermain quality pressure pipe sewer is required and must be pressure tested to ensure water tightness.
- C. Surface Water Crossings: Watermains crossing under surface waters greater than 15' in width must be provided with restrained joints from top of bank to top of bank. The restrained joints are to be called out on the plan sheet and are to be considered an incidental pay item. Valves shall be located at both sides of the crossing within an accessible area above the water table not subject to flooding. No service connections are allowed between the isolation valves. A

fire hydrant shall be located between the isolation valves in an accessible area to allow for pressure testing of the crossing to determine leakage.

- D. Fire Hydrants: Fire hydrants shall be located no more than 400 feet apart and within 200 feet of any structure and shall be approved by the applicable fire department. To eliminate future street openings, all underground utilities for fire hydrants, together with the fire hydrants themselves and all other supply improvements, shall be installed before any final paving of a street shown on the subdivision plat. Fire hydrants must be located at all street intersections, at the sides of all cul-de-sacs, at the end of all temporary or permanent dead-ends that include service connections, at the end of all dead-ends that are longer than 150' that do not have service connections and at all dead-ends created between water system pressure zones.
- E. System Valves: Valves must be located at all temporary dead-ends past the last service and a minimum distance of 20' before the temporary hydrant or if the end hydrant is permanent just past the hydrant tee, at all stub-outs, on loops at both ends where the watermain exits the paved area.

At the split between pressure zones, a valve shall be placed at both sides of the flushing hydrant to allow flushing from both directions.

Generally valves shall be located at intersections in line with the curb returns for safer operation and located to allow a maximum 4-valve shutdown to isolate watermain sections. Valves located mid-block shall be near a fire hydrant tee for reference and adequate flushing of the main. In non-developed areas, valves shall be located at anticipated intersections and or at intervals to allow for proper flushing and testing of the main.

SECTION 6: STORM SEWER DESIGN

2000.601 Stormwater Management Plan

All development with the exception of the construction of a single family dwelling on an existing lot of record, shall incorporate adequate provisions for stormwater runoff consistent with the City of Byron Standard Detail Plates, City of Byron Subdivision Regulations, and this chapter. A Stormwater Management Plan comprising of a written narrative and drainage plans shall be prepared for each development with the exception of the construction of a single family dwelling on an existing lot of record. The report shall address the impact on existing facilities and provide the basis of design for the stormwater management systems and/or facilities.

Specific items to be addressed in the report include: present and future flows from off-site which will impact on the drainage systems, location and inlet capacity of the catch basins, sizing of the systems, design of ponds, capacity of downstream systems, etc. The Stormwater Management Plan shall be signed by the Engineer.

The drainage plans shall include a depiction of all existing and proposed drainage areas referenced in the report. An on-site plan or map showing drainage areas for each catch basin or other collector shall be prepared at 1" = 100' or larger with finished contours at two (2) foot intervals; the storm sewer system shall be depicted, with pipe sizes labeled and structure numbering corresponding to

numbering used in the design calculations. Existing and proposed drainage areas shall be depicted.

Stormwater Management Pond designs shall be modeled with computer software incorporating Atlas 14, Volume 8, SCS Technical Release 20 (TR-20) or US EPA's Surface Water Management Model (SWMM). All printouts shall clearly indicate the respective location, storm event, and existing verses developed. The Engineer's report shall include: derivation of times of concentration and curve numbers, sizing of the pond permanent pool/water quality design, a table of the pond stage-storage-discharge information from the pond bottom up to the top of dam or 100-year high water level (whichever is higher), and derivation of the pond discharge verses stage data.

The report shall include a prepared summary of all computer printouts.

2000.602 Sizing Storm Sewer

Storm sewers shall be designed for the 10-year frequency storm (Atlas 14 Intensity-Duration- Frequency (IDF) curve) without surcharging of pipes, with a safe overflow provided for the 100-year frequency storm. Sizing shall address future flows from off-site. Rational or SCS methods may be used for run-off with pipe capacity determined by Manning's formula. The minimum storm sewer pipe size shall be twelve (12) inch diameter.

2000.603 Pipe Material

Storm sewer shall comply with the City of Byron Sanitary Sewer and Storm Sewer Specifications 600.

Storm sewers crossing watermains or sanitary sewers shall be constructed with adequate structural support to prevent excessive deflection of joints or settling on the watermains or sanitary sewer.

2000.604 Manhole and Catch Basin Structures

Manholes, catch basins, and other special access structures shall be constructed at designated locations as required by the Plans and in accordance with any standard detail drawings or special design requirements given therefor.

Unless otherwise specified or approved, manholes and catch basins shall be constructed on a precast or cast-in-place concrete base and the barrel riser sections, and cone section shall all be of precast concrete. All units shall be properly fitted and sealed to form a completely watertight structure.

Wherever special designs so require or permit, and as otherwise may be approved by the Engineer, a structure may be constructed with solid sewer brick or block units or with cast-in-place concrete. Any combination of cast-in-place concrete and brick or block mortar construction will be allowed and may be required where it is impossible to complete the construction with standard precast manhole sections. These structures shall be further reinforced to prevent grout degradation and structural deformation.

2000.605 Inlet Aprons

All inlet aprons less than or equal to (\leq) 48 inches in circular equivalency shall have trash guards or, if located within the roadway clear zone, appropriate safety apron and grate. Inlet aprons greater than ($>$) 48 inches in circular equivalency shall have trash guards only if the outlet is required to have one. Sewers outside

the clear zone, in which daylight is visible from end to end do not need a trash guard.

2000.606 Outlet Structures

Outlet aprons located within the roadway clear zone require a safety apron and grate. Trash guards will only be required if specified by the Engineer.

Permanent erosion control in the form of mats, riprap, and/or energy dissipaters shall be required for all pipe sizes to reduce outlet velocities and prevent erosion.

2000.607 Spacing and Alignment

Storm sewers shall typically be placed on alignments parallel with sanitary sewer, with manholes at changes in horizontal and/or vertical alignment. Manhole spacing shall not exceed 400 feet for 12"-15" pipes, and 500 feet for 18"-30" pipes. Change in flow direction at structures shall not exceed 90 degrees.

Gutter spread from a 10-year frequency storm for public and private streets shall provide for a twenty (20) foot travel lane within the street.

Spacing of catch basins shall be as necessary for inlet capacity and as necessary to meet the pavement water spread restriction above.

Catch basins shall be located at intersections to prevent water from flowing across intersections (no valley gutters are allowed).

2000.608 Sizing Drainage Way, Open Channels

The widths of a constructed waterways shall be sufficiently large to channel runoff from a 100-year storm. Adequacy shall be determined by the expected runoff when full development of the drainage area is reached. Constructed waterways should be designed so that the time of concentration of stormwater flows remains unchanged or is lengthened unless a licensed professional engineer or hydrologist certifies that any decrease in the time of concentration will not cause an increase in downstream flood elevations or velocities due to the location of the development in the watershed. In addition, the resultant new waterway, when replacing an existing natural drainageway, shall have less velocity or shall provide measures which will reduce streambank erosion.

The banks of the waterway should not exceed five feet horizontal to one foot vertical.

Channels may generally be seeded where 100-year frequency storm velocities are below the scouring velocity for the types of soils in the channel and where continuous flows do not exist. Lined low flow channels or storm sewers shall be provided for continuous flows or where the channel velocities exceed the scouring velocity.

Linings through developed or soon to be developed areas shall generally be concrete or riprap channels. Permanent turf reinforcement may be considered where there is both adequate light and continuous flows do not exist.

Concrete lining or some other appropriate measure, may be required by the City Engineer in residential areas where the channel slope is less than 1.5%.

2000.609 Stormwater Treatment Facilities

- A. Design of permanent stormwater treatment facilities shall conform to the latest version of Minnesota Pollution Control Agency (MPCA) permit requirements, Minnesota Stormwater Manual, and the following:
 - 1. Ponds shall incorporate multi-stage outlets as necessary to limit the 2-year, 10-year and 100-year peak discharges to less than the pre-development discharge.
 - 2. The 100-year frequency storm shall be contained within the pond.
 - 3. An emergency spillway shall be provided for each pond. The spillway shall be designed to pass the 100-year frequency storm with a minimum of one (1) foot of freeboard from the top of the water surface over the spillway to the top of the berm.
 - 4. The post-development drainage plan shall include a tabulation of the following data for each pond: Watershed Area (ac) [*total pond watershed including watershed of any upstream ponds*]; NWL Normal Water Level (ft); NWL Pond Surface Area (ac); NWL Pond Volume (cf); 100-Yr High Water Level (ft); 100-Yr Peak Discharge (cfs); 10-Yr Peak Discharge (cfs); 2-Yr Peak Discharge (cfs).

2000.610 Grading Plan Checklist

The City of Byron “Grading Plan Checklist” is incorporated herein by reference.

2000.611 Subdrains

Shall be installed in all developments as directed by the City Engineer in accordance with the City of Byron Sanitary Sewer and Storm Sewer Specification 600 and the City of Byron Standard Detail Plate.

Subdrains shall be extended to the boundaries of new subdivisions, and other developments, to facilitate future sanitary sewer extensions, unless the City Engineer determines otherwise.

2000.612 Subsurface Edge Drains

Shall only be utilized in areas with wet subgrade as recommended by the Geotechnical Report and as directed by the City Engineer. Subsurface edge drains shall not be used in lieu of subdrains. When subsurface edge drains are required, they shall be utilized in conjunction with subdrains and constructed in accordance with the City of Byron Standard Detail Plate.

SECTION 7: EROSION AND SEDIMENT CONTROL

2000.701 Required Documentation

- A. A Stormwater Pollution Prevention Plan (SWPPP) shall be incorporated into the construction plans and specifications and/or grading plan. The plan shall conform to the applicable Minnesota Pollution Control Agency (MPCA) permit requirements, and Best Management Practices (BMPs) as published by the MPCA. The plan shall include adequate temporary and permanent erosion and sediment control measures.
- B. The Owner and Contractor shall obtain an NPDES Stormwater Construction Activity permit from the MPCA, and any other permits required.

2000.702 Construction Requirements

- A. The construction shall comply with the project SWPPP and applicable MPCA permit requirements, as necessary to prevent off-site erosion and/or sedimentation and tracking and shall include final stabilization.
- B. Best Management Practices for erosion and sediment control shall be established on all down-gradient perimeters before grading is commenced and shall be regularly maintained and remain in place until final stabilization.
- C. The NPDES permit holder shall be responsible for cleaning and maintenance of the storm sewer system (including ponds, pipes, catch basins, culverts, and swales) within the subdivision and the adjacent off-site storm sewer system that receives stormwater from the subdivision. If erosion and sediment control measures taken are not adequate and result in downstream sediment, the NPDES permit holder shall be responsible for cleaning out or dredging downstream storm sewers and ponds as necessary, including associated restoration. The NPDES permit holder shall follow all instructions it receives from the City Engineer concerning the cleaning and maintenance of the storm sewer system. The NPDES permit holder and/or the Developer's obligations under this paragraph shall end once the request for Release of Infrastructure has been completed and the site is stabilized per the permit.
- D. The NPDES permit holder shall be responsible for cleaning all streets in the subdivision and adjacent to the subdivision from silt and dirt from the subdivision until the request for Release of Infrastructure has been completed and the site is stabilized per the permit.
- E. After the site has been finally stabilized, all permanent stormwater ponds shall be cleaned to original plan cross-section, all temporary sediment control measures (such as silt fence) shall be removed, and temporary sediment basins shall be re-graded and stabilized, prior to final acceptance by the City Engineer and the NPDES Notice of Termination (NOT).

2000.703 Temporary Erosion and Sediment Control

Temporary erosion and sediment control shall conform to the requirements in the SWPPP to prevent soils and sediment from entering public waters, sewers, streets, and adjacent properties.

These temporary control measures shall also include their eventual removal after conditions stabilize.

2000.704 Permanent Erosion and Sediment Control

Permanent erosion and sediment control shall conform to the requirements in the SWPPP to prevent soils and sediment from entering the public waters, sewers, streets, and adjacent properties.

SECTION 8: CONSTRUCTION OBSERVATION

2000.801 Pre-Construction Conference

As soon as possible after the project has been approved, the Owner and/or Owners Engineer should arrange a meeting for the purpose of reviewing contract requirements, construction details, work schedules, and any items peculiar to the project. The meeting should be face-to-face conference.

Prior to this meeting the attendees should study the plans and become familiar with the project site to be well informed as to the requirements and existing conditions.

A. Required attendees

1. City Engineer or their representative
2. City Public Works Superintendent
3. Owner or their representative
4. Construction phase consulting engineer
5. City construction observer
6. Geotechnical professional
7. Contractor –project superintendent and on-site foremen

B. Recommended attendees

1. City staff – Administrator and Planning Coordinator
2. County Engineer representative for County road work
3. Contractor’s safety officer, others as appropriate for the specific project
4. Utility company representatives (invitation required, attendance optional)
5. Subcontractor representatives
6. Other stakeholders with whom construction coordination would benefit the project

C. Material available for the meeting

1. Required:

- a. Approved construction plans and specifications
- b. Permits including DNR, NPDES, MPCA, MDH, or others appropriate for the project
- c. Geotechnical Report
- d. Pavement Design Report
- e. List of subcontractors and material suppliers
- f. Contacts for project personnel
- g. Traffic control plan
- h. Construction schedule

2. Recommended:

- a. Shop drawings
- b. Other materials appropriate for the project

- c. Material Certifications/QC tests
- 3. Discussion Topics:
 - a. Project staging and schedule; Anticipated date of notice to proceed; Proposed starting date; Completion date
 - b. Status of contract and bond
 - c. Street closings and traffic control
 - d. Construction observation/inspection requirements for each phase of work
 - e. Public utilities (electric, natural gas, telephone, cable tv)
 - f. Material testing and supplier certifications
 - g. Progress reports
 - h. Partial payments
 - i. Extra work orders
 - j. Pre-pour conference
 - k. Safety (Safety is the sole responsibility of the Contractor)
 - l. Right-of-way
 - m. Survey staking requirements/coordination
 - n. Lot grading verification

2000.802 Construction Progress Meetings

The meeting should be held on-site. A common schedule for the meeting is weekly during the full-time construction activity. During intermittent construction and during winter project shut-down, less frequent meetings are appropriate.

A. Required attendees:

- 1. City Engineer or their representative
- 2. City Engineer or their representative
- 3. City Public Works Superintendent
- 4. Construction phase consulting engineer
- 5. City construction observer
- 6. Contractor – project superintendent and on-site foremen

B. Recommended attendees:

- 1. Geotechnical professional – when appropriate for work being conducted
- 2. If the project work indicates the need, additional City staff, Public Works representative, County Engineer representative for County road work
- 3. Contractor's safety officer, others as appropriate for the specific project
- 4. Utility company representatives (invitation required, attendance optional)
- 5. Owner's representative

6. Subcontractor representatives
 7. Other stakeholders with whom construction coordination would benefit the project
- C. Material available for the meeting:
1. Required:
 - a. Approved construction plans and specifications
 - b. SWPPP
 - c. Shop drawings
 - d. Field diary records
 2. Recommended:
 - a. Other materials appropriate for the project
 3. Discussion Topics for phase of work under way or planned for the near future:
 - a. Project staging and schedule; Completion Date
 - b. Construction observation/inspection requirements for each phase of work
 - c. Materials testing
 - d. Traffic control
 - e. Installation of underground utilities
 - f. Trench backfill and compaction
 - g. Street grading, base, aggregate, and pavement operations
 - h. NPDES requirements and construction sequencing; erosion and sediment control/restoration
 - i. Special Provisions
 - j. Execution of work
 - k. Required stage inspection; attendees, schedule, responsibilities, methodologies
 - l. Supplemental Agreements
 - m. Utility conflicts and accommodations
 - n. Weekly construction meeting day/time
 - o. Clean-up/trash removal
 - p. Work site safety
 - q. Construction workforce private vehicle parking
 - r. Respect for others
 - s. Security
 - t. Hazardous materials

- u. Project close out requirement; materials certifications, testing results, record drawings

2000.803 Schedule of Materials Control

The table below outlines the minimum required rate of sampling and testing for major construction items:

Material	Spec. No.	Minimum Required Acceptance Testing	Test Taken
Backfill Materials	500, 800	1/Source	Gradation
Embankment	2106	1/4000 cu yds (CV)	Moisture, Relative Density
Subgrade	2112	1/500' Block	Moisture, Relative Density
Utility Trenching	500, 800	1/400 ft/2' depth	Moisture, Relative Density
Service Trenching	500, 800	10% of trenches/2' depth	Moisture, Relative Density
Aggregate Base	2211, 3138	1/Source	Quality (LAR, Insoluble Residue)
		1/1000 ton or 500 cu yd (CV)	Gradation
		1/500 ft Block	Relative Density
Concrete Air Content		1/100 cu yd/Day	(% Air Voids)
Concrete Slump		1/100 cu yd/Day	Inches
Concrete Cylinders		1/100 cu yd/Day	Compression (psi)