TOWNSHIP OF STANFORD
POLICY ON STORMWATER DRAINAGE REQUIREMENTS

APPENDIX C: STORMWATER DRAINAGE REQUIREMENTS

Storm drainage design shall conform to Federal, State and Isanti County ordinances, codes, regulations and requirements, the requirements of Stanford Township Policy on Storm Water Drainage requirements and the Local Watershed Management Organization. In addition, the Isanti County Local Water Management Plan and Comprehensive Plan is to be utilized on projects in Stanford Township. Documents are available on the Isanti County Website: www.co.isanti.mn.us

The Township has an agreement with the Township Engineer and Isanti County to provide development reviews and site inspection services.

POLICY ON STORMWATER DRAINAGE
REQUIREMENTS

STANFORD TOWNSHIP

1.0 Purpose and Intent

This policy is intended to provide Developer's Engineers with a standardized format for submittal of drainage plans and calculations to the Town for review. A standardized format will provide the following:

- Reduce preparation time for submittals by providing direct guidelines for Developer's Engineers to follow
- Reduce review time required by the Town's Engineer by insuring a complete and comprehensive drainage plan and calculations are submitted
- Insure that the Town will receive the best possible protection of its resources, which could be adversely affected by inadequate stormwater management planning.

2.0 Incorporation by Reference

Protecting Water Quality in Urban Areas (Best Management Practices for Minnesota) prepared by the Minnesota Pollution Control Agency, Division of Water Quality, latest edition, shall be incorporated by reference into this policy.

Recommendations set forth in the above referenced manual shall be implemented by the Developer's Engineer. All recommendations set forth within the above referenced manual shall be termed "required" when applicable unless otherwise amended by this policy.

3.0 State and Federal Requirements

State and Federal Ordinances, Codes, Regulations, and Requirements shall be adhered to by the Developer.

4.0 Calculations and Considerations

A. General Hydrology

Hydrologic analysis of storm water runoff for the planning and design of flows in storm sewers, ditches, streams and channels to lakes, detention basins, and wetlands shall be made using generally accepted hydrograph methods.

Determination of total runoff volume should follow the USDA-SCS curve number method which incorporates land use and hydrologic soil groups.

Specific step-by-step process can be found in the Soil Conservation Service (SCS) publication National Engineering Handbook: Chapter 4, SCS Hydrology (1972), and Hydrology Guide for Minnesota (1992). Peak runoff rates should be determined through the use of the SCS method incorporating "time of concentration" for both pre and post development conditions.

Then the storm water should be routed through the drainage area, that is, mathematically the peaks and volumes are followed as they move in a wave progressively downstream.

"Design Storms" or storm volumes for hydrologic analyses shall be based upon Hershfield, D.M., 1961, Rainfall Frequency Atlas of the United States for Durations of 30 minutes to 24 hours and Return Periods from 1 to 100 years, Technical Publication Number 40 (TP-40) along with the supplementary documents entitled: Oberts, G. L., 1984, Surface Water Management: Precipitation Frequency Analysis for the Twin Cities Metropolitan Area, Metropolitan Council, Publication Number 10-84-007 and Fredrick, R.H., 1977, Five-to-Six-Minute Precipitation Frequency for the Eastern united States, NOAA Technical Memorandum NWS HYDRO-35, Office of Hydrology, Silver Spring, Maryland.

The rational method may be used to determine peak runoff rates for primary systems. Construction of a hydrograph should be undertaken which characterizes the movement of surface water as a function of time and precipitation. Rainfall intensity shall be determined by using the IDF curves in the Mn/DOT Drainage Manual dated August 30, 2000.

Minimum time of concentration shall be 10 minutes for drainage areas with tributary areas, 7 minutes without tributary areas. When a portion of the drainage area is highly impervious, the drainage area shall be evaluated both with and without tributary area to verify that just the highly impervious area does not result in greater peak discharge than the area evaluated as a whole.

B. Rainfall

Usually the standard 24-hour SCS rainfall distribution will be used to calculate the peak discharge rates and levels. The following rainfall values shall be used in calculations for Stanford Township:

Event	Rainfall (inches)
1 year, 24 hour	2.30
2 year, 24 hour	2.70
10 year, 24 hour	4.10
25 year, 24 hour	4.70

50 year, 24 hour	5.25
100 year, 24 hour	5.85

C. Curve Numbers

Table 1 lists the minimum allowable Curve Numbers (CN) which shall be used for design. Hydrologic soil groups shall be determined based upon the Soil Survey for Isanti County, Minnesota as published by the United States Department of Agriculture Soil Conservation Service in Cooperation with Minnesota Agricultural Experiment Station.

D. Flood Protection

Consistent with state and federal regulations, Stanford Township requires that the level of flood protection along all ditches, detention basins, lakes, streams and wetlands be established based upon the 1 percent (100-year frequency) flood. Land use within floodplains shall be regulated in accordance with state floodplain zoning regulations.

The following freeboard values are required for Stanford Township:

• Landlocked Basins (no outlet) water,	3 feet	(Established high see 4.E.8.)
• Non-landlocked basins	1.5 feet	(100-year frequency)

E. On-Site Detention Basins

It is the policy of Stanford Township to require developments to control storm water quantity and quality through a management approach of detention basins. Detention basins, whether on-site or regional in nature, shall be designed to incorporate the following:

1. A permanent pool ("dead storage") volume below the normal elevation which shall be greater than or equal to the runoff from a 2.5-inch rainstorm over the entire contributing drainage area assuming full development. This modified NURP criteria includes a 25 percent increase in basin storage to permit routine sediment accumulation over a 20-year design period, assuming the drainage area is protected with proper erosion and sedimentation control practices. The runoff volume shall consider the entire area contributing to the pond, however, the minimum permanent pool volume must be greater than or equal to the volume produced from 0.5 inches of runoff from all impervious area in the contributing watershed.

2. A permanent pool average depth (basin volume/basin area) which shall be greater than 4 feet with a maximum depth of less than 10 feet.

3. An emergency spillway (emergency outlet) adequate to control the one percent frequency/duration rainfall event (usually 100-year, 24-hour).

4. Basin side slopes above the normal water level should be no steeper than 4:1, and preferably flatter. A basin shelf with a minimum width of 10 feet and a slope of 10:1 starting at the normal water level.

5. To prevent short-circuiting, the distance between major inlets and the normal outlet shall be maximized. The ratio of maximum length to maximum width of the permanent pool should be at least 3:1.

6. To protect downstream channels and structures, the following flood control criteria are required for basin design:

    a. A flood pool ("live storage") volume above the normal elevation shall be adequate so that the peak discharge rates from the 2-year and 100-year frequency, critical duration storms (usually the 24-hour) are no greater than predevelopment basin watershed conditions.

    b. Storage volumes and discharge rates have been established for the 100-year event for certain portions of the township. In these areas the established storage volumes and discharge rates shall be used for post development design.

    c. Dead storage volume may not be utilized as live storage.

7. Skimming structures shall be utilized for each basin. The skimming structure shall be in accordance with the Standard Plates. Skimming structures shall be shown on the plans.

8. Where discharge from the basin is not possible, the permanent basin must be sized for two 100 year events back-to-back. In this situation the free board above the established high water level shall be a minimum of three (3) feet. The high water level shall be established as follows:

    a. Assume the water surface is at the normal water surface elevation of the basin.
    b. Above the assumed water surface elevation store the volume of runoff equal to two 100-year, 24-hour storm events over the entire drainage area to the landlocked basin.
    c. The established high water level is the elevation the water would rise to from the above steps "a" and "b".

9. Discharge must be made to a receiving stream, ditch, or another pond or an approved discharge route as shown in the Storm Water Management Plan.

F. Storm Sewer

1. Storm sewer sizing shall use the Mn/DOT Drainage Manual with design based upon the 10 year storm event utilized. Inlet capacities and roadway spread at each inlet shall be determined. The maximum allowable roadway spread at any inlet shall be one-half of the traveled lane.

   Storm sewer inlets shall be spaced to insure that not more than ½ of the traveled lane is inundated during the 10 year storm event. Manning's equation shall be utilized to determine the flow in the street at each catchbasin for verification of actual spread. A manning's n of 0.016 shall be utilized for asphalt pavement. Additionally, grate inlet capacities shall be verified at the maximum allowable depth of flow to verify that the proposed grates will pass the 10 year flows. When appropriate, by-pass flows shall be considered in calculations.

2. Storm sewer systems shall also meet the following requirements:

   a. Maintain a minimum velocity of 3 fps for 10-year storm event.

   b. Maintain a minimum cover of 2 feet from top of pipe to top of casting, conveyance flow elevation.

   c. Maintain a minimum of 3 feet of final cover over corrugated high density polyethylene (HDPE) pipe. See engineering guidelines to determine when HDPE is allowed.

   d. Maintain a minimum of 1.5 feet of final cover over RCP in areas not used for vehicle traffic.

   e. Storm sewers inverts, which outlet to detention basins, shall be placed at the normal water elevation of the basin. Storm sewers may be submerged a maximum of 1/2 the pipe diameter below the basin normal water elevation.

5.0 General Requirements - Grading, Drainage, and Erosion Control Plan

Grading, Drainage, and Erosion Control Plans shall be provided by the Developer in accordance with this manual. Several items critical to the review of the drainage system must be adequately depicted on the plan by the Developer's Engineer. The following key elements must be depicted on the plan:

A. Existing and proposed contours at a minimum of 2-foot intervals. A 1-foot contour interval or proposed spot elevations shall be used where conditions

dictate. The determination of contour interval shall be made based upon clarity and readability of the plans.

B. Basin locations as depicted by the proposed contours. Normal level and 2 year, 10 year and 100 year flood water levels shall be depicted on the plan for each basin. Detention basins are required at each ditch and storm sewer outfall point from the proposed plat. Perimeter berm elevation and width shall be clearly labeled on plan sheets.

Permanent detention basins may be utilized as construction detention basins, provided they are cleaned after permanent erosion control measures are established. Design features of the detention ponds shall be as described in the BMP Manual.

C. Locations of silt fence, bale checks, erosion control blanket, rock construction entrances, storm drain inlet protection, outlet projection, rip rap, temporary seeding, permanent seeding, sod, mulch, or other erosion control features proposed to be implemented for the project.

D. Storm sewer facilities, when utilized, shall be adequately depicted on the drawings. As a minimum, the following must be shown on the plan:

1. Storm sewer pipe length, grade, type of material, and size between each catch basin and manhole.

2. Catchbasin and manhole structural data including size or diameter, and depth. A typical section depicting each different type of catchbasin or manhole used shall be shown on the drawing. Type of casting utilized shall be referenced for each catchbasin or manhole. Elevations for the top of inlet and each invert shall be referenced on the drawing.

3. A typical curb section for urban design streets shall be shown on the drawing.

4. If ditch sections are used, a typical section shall be shown on the drawing depicting bottom width and side slopes of the ditch.

5. Details of skimming structures utilized.

E. Individual lot grading shall insure positive drainage. Lot grading shall clearly depict a minimum design slope of 2%. Slopes of 1% to 2% may be allowed on a case by case basis with approval from the Town Engineer. Under no circumstances will slopes less than 1% be allowed.

6.0 Storm Drainage System Submittal Requirements

A. The stormwater drainage report shall be comprised of the following sections to provide the Town Engineer with adequate base information for which to review the report. The following data must be included in the report:

1. Title Page. The title page shall list the project name, project location, date prepared, and preparer's name, title, and company.

2. Signature Page. The report shall be signed by a licensed professional engineer.

3. Table of Contents. The table of contents must provide a description of the major categories of the report and also list each hydrograph and reservoir report presented in the report.

4. Stormwater Summary. The summary must provide descriptions of items critical to the review of the entire report. Assumptions and results of the calculations shall be included in the summary. As a minimum, the following items must be discussed in the summary:

    a. Pre–development site conditions (Existing)
        i. Total site area
        ii. Delineation of sub-drainage areas, as appropriate.
        iii. For each drainage area, or sub–drainage area, provide the following information:
            1. Area in acres
            2. Curve number (with justification)
            3. Time of Concentration (with justification)
            4. Runoff rate and runoff volume

    b. Post Development Site Conditions (Proposed)
        i. Total site area
        ii. Delineation of sub-drainage areas, as appropriate.
        iii. For each drainage area, or sub–drainage area, provide the following information:
            1. Area in acres
            2. Curve number (with justification)
            3. Time of Concentration (with justification)
            4. Runoff rate and runoff volume

    c. Comparison of pre-development to post-development runoff rates and volumes.

    d. Discussion of temporary and permanent erosion control measures utilized.

e. A discussion of the storm sewer system, if applicable, to include a summary of flows to each catchbasin and the depth of water over each catchbasin during the ten year event.

5. Drainage maps depicting pre-development and post-development conditions. The maps may be 22"x34" plans, but shall also be provided on 11"x17" reductions. The plans shall delineate drainage area and sub-drainage area boundaries. All areas shall be labeled and referenced to those presented in the report.

6. Easement areas to encompass the 100 year water surface elevation for all retention and detention areas.

7. Computer printouts of all hydrograph and reservoir files shall be included at the back of the report for reference.

7.0 Glossary

Critical Storm

Critical Storm means that rainfall event whose distribution and duration results in a runoff volume and rate establishing the appropriate level of protection.

Freeboard

Is the vertical difference between the lowest floor of proposed buildings and the critical 100-year storm event elevation or established high water level.

Level of Protection

The amount of secondary storm water runoff capacity required to avoid flood damage and provide for public safety.

Level of Service

The amount of primary storm water runoff capacity required to avoid unusual hardship or significant interference with normal public activities (transportation, sanitary, or utilities).

Normal Level

For basins, that water elevation maintained by a natural or man-made outlet.

NURP

Nationwide Urban Runoff Program (USEPA, 1983).

100-Year Storms

Rainstorms of varying duration (e.g. 2-, 6-, 24- or 48-hour) and intensities expected to recur on the average of once every one hundred years (1% frequency probability).

On-Site Detention

A method of temporarily storing storm water runoff at a development site in the form of wet basins.

Primary Capacity

The volume and/or rate of storm water runoff defined as that level of service provided by the primary system.

Primary System

The primary system conveys runoff from the more frequent events such as the 2 to 10-year events. In general, the system is composed of swales, ditches, gutters, and storm sewers.

Secondary Capacity

The volume and/or rate of storm water runoff in excess of the primary capacity and defined as that level of protection provided by the secondary system.

Secondary System

The system is composed of all the pathways that runoff takes when the capacity of the primary system is exceeded and in general is composed of streets, swales, ditches, stormsewers, detention basins, creeks, streams and rivers.

Storm Water Runoff

The flow on the surface of the ground, resulting from precipitation in the form of rainfall or snowmelt.

Table 1
Stanford Township Minimum Runoff Curve Numbers

Cover Description	Curve numbers for hydrologic soil group			
Cover type and hydrologic condition	**A**	**B**	**C**	**D**
Fully developed urban areas (vegetation established)				
Open space (lawns, parks, golf courses, cemeteries, etc.				
Grass Cover > 75%	39	61	74	80
Grass Cover < 75%	49	65	77	82
Impervious areas:				
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)	98	98	98	98
Streets and roads:				
Paved; curbs and storm sewers (excluding right-of-way)	98	98	98	98
Paved; open ditches (including right-of-way)	83	89	92	93
Gravel (including right-of-way)	76	85	89	91
Dirt (including right-of-way)	72	82	87	89
Water Surface:	100	100	100	100
Urban Districts:				
Commercial and business	NA[1]	92	94	95
Industrial	NA[1]	88	91	93
Residential districts by average lot size:				
1/8 acre of less (town houses)	NA[1]	85	90	92
1/4 acre	NA[1]	75	83	87
1/3 acre	NA[1]	72	81	86
1/2 acre	NA[1]	70	80	85
1 acre	59	68	79	84
2 acres and greater	55	65	77	82
Developing Urban Areas				
Newly graded areas (pervious areas only, no vegetation)	77	86	91	94
Undeveloped areas				
Agricultural land (all current uses)	55	65	77	82
Pasture, grassland, or range – continuous forage for grazing	49	65	77	82
Meadow – continuous grass, protected from grazing and generally mowed for hay	30	58	71	78
Brush – brush-weed-grass mixture with brush the major element	35	56	70	77
Woods – grass combination (orchard or tree farm)	43	65	76	82
Woods	36	60	73	79

[1]Use of Type A soil is not allowed for this hydrologic condition.