APPENDIX D DEVELOPMENT STANDARDS

These development standards are intended to be used by developers and/or project proposers in design and layout of their site plans and water management features. These standards do not replace or supercede City ordinances, watershed district regulations, state and federal rules or permits required for the project. The standards have been updated from the original standards completed as part of the City's 1994 Surface Water Management Plan. These standards have not been adopted, but include recommendations for ordinance revisions.

All plans shall be reviewed and stamped "Approved by the City Engineer" and all applicable permits must be obtained prior to commencing construction. For all newly constructed storm water facilities (ponds, retention areas, infiltration basins, storm sewer, etc.) or existing facilities that are modified, as-built plans shall be prepared by the developer. As-built plans shall be signed and certified by a licensed professional engineer in the State of Minnesota and record drawings shall be provided to the City. The City has standard details available for many typical storm structures (e.g., storm sewer, outlet structures, catch basins, sump manholes, etc.) on the City's website (www.ci.chanhassen.mn.us).

A maintenance agreement may also be required by the City. An example agreement for ponds is provided at the end of this appendix. The agreement may be modified to address a wide range of BMPs (infiltration systems, retention areas, grit chambers, etc.) with the addition of maintenance activities and schedules specific to the selected BMP. Recommended maintenance activities may be found at number of sources including the Stormwater Manager's Research Center website http://www.stormwatercenter.net.

Standards summarized in this Plan consist of the following major sections:

- General Elements
- Facility Design Elements
- Erosion and Sediment Control
- Wetland Elements

GENERAL ELEMENTS

A. Hydrologic Analysis

1. Storm distributions and storm volumes for hydrologic analysis 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 No. 40 (TP-40).

2. Design of major facilities (e.g., ponds, detention areas, retention areas) shall be based on the U.S.D.A. NRCS methods, 100-year return period, 24-hour duration, type II distribution with average soil moisture conditions (AMC-2). The analysis of flood levels, storage volumes and

discharge rates for detention basins shall utilize the design storm/freeboard evaluation storm concept.

3. Minor drainage systems (storm sewer) shall be analyzed and designed to protect for the 10-year frequency rainfall, and shall be evaluated for the 100-year frequency rainfall. Full pipe flow analysis shall be used unless special conditions can be demonstrated to consider pressure flow.

4. The Rational Method is the accepted design method for the design of minor systems (storm sewer). The preferred method of design would be a method utilizing a hydrograph approach with factors for land use and soil moisture conditions. NRCS methodology is not acceptable for minor system design unless approved by the City Engineer.

5. Landlocked storm water basins shall be designed to hold back-to-back 100-year storms. For landlocked areas, available freeboard and infiltration capacity of in-place soils should be analyzed (if analyzed for unfrozen soil conditions).

B. Peak Discharge Rates

1. Peak storm water discharge rates and storage volumes from any drainage area, watershed, subwatershed, detention basin, wetland or conveyor shall be consistent with the values shown in this plan for the 100-year storm event.

2. No increase in peak discharge may result from the proposed project for the 1 or 2-year storm, the 10-year storm and the 100-year storm event. Variances *may* be allowed if computations can be provided which demonstrate no adverse downstream effects will result from the proposed system. Cumulative storm depths for the required events are:

    - 2-Year – 2.8-inches
    - 10-Year = 4.2 inches
    - 100-Year = 6.0 inches

C. General Facility Planning

1. Developments shall maximize preservation and use of natural detention areas and regional detention areas shall be used to the greatest practical extent. Multiple purpose detention areas are encouraged to maximize maintenance efficiency within proposed developments while providing the proper flood control and water quality features.

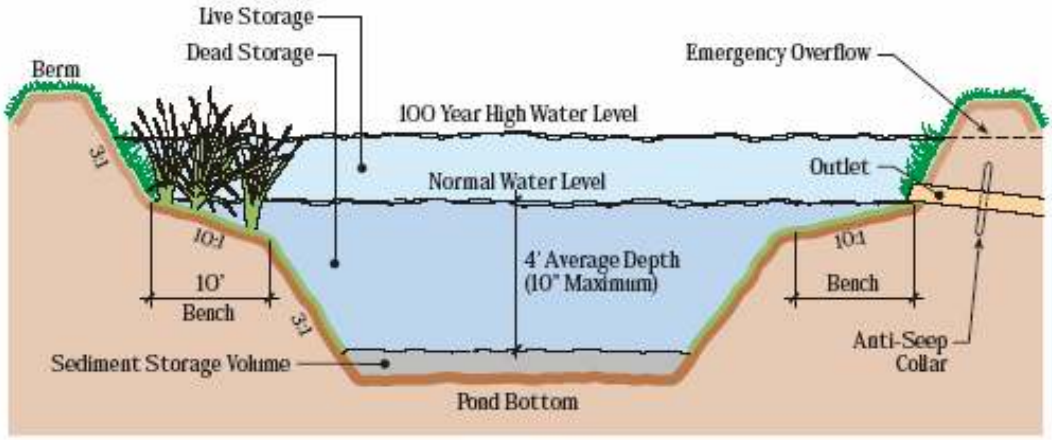
2. The construction of detention basins will involve the direct participation of individual developers. Where regional basins serve multiple properties and may lie outside of the ownership of the specific development, the City and WDs will take an active role on implementing policy. Because the basis for the hydrology is based on the developer's grading plan, the developer is required to obtain and submit the certification of a licensed engineer that the detention areas are constructed to the specifications of the approved design.

MAJOR FACILITY DESIGN ELEMENTS

A. Facility Design Criteria

1. For design or modification of storm water facilities, the following criteria shall be followed:

    a. All hydrologic data and computations shall be based on NRCS (formerly SCS) methodology. Computer modeling may be completed using HydroCAD, TR20/TR55, SWMM or comparable City-approved modeling software.
    b. Hydraulic computations shall be completed using the rational method for storm sewer design, or in commonly used software packages including FHWA HY-8, Geopack, Eagle Point or SWMM compatible software.
    c. Water quality modeling shall be completed using Pondnet, P8 Urban Catchment Model, SLAMM or comparable software.
    d. Outlet structure designs shall provide rate controls that limit post-project rates to not exceed existing rates for 1 or 2-year, 10-year, 100-year events and 100-year/10-day snowmelt.
    e. An emergency overflow spillway shall be identified and designed to convey storm flows from events greater than the 100-year event. Extreme events (*on the order of a 10.0 inch event*) shall be analyzed to ensure the emergency overflow spillway will function as designed. An emergency overflow shall be set an elevation at least 1.5 feet below the lowest adjacent low building elevation.
    f. Maximum 3:1 (H:V) side slopes (see diagram that follows).
    g. 10:1 (H:V) safety bench from normal water level (see diagram that follows).
    h. For basins intended to have permanent water levels, a minimum of four feet of standing water (dead storage depth) and a maximum of ten feet shall be provided.
    i. Proper allowance shall be made for future access and maintenance. Easements shall be greater than or equal to 20 feet wide.
    j. Separation between the inlet(s) and outlet shall be maximized to prevent short-circuiting.



- Bench areas promote growth of emergent vegetation.
- Maximize distance between the outlet and all inlets to prevent short circuiting of flows.

2. The facility design shall provide adequate live storage to provide protection from the design storm, consistent with lowest building elevation standards. Lowest building elevation is defined as the lowest slab elevation for a home or building, including basements and crawl spaces. The lowest building elevation for structures adjacent to wetlands and water bodies shall be an elevation three feet above the 100-year high water level.

3. Newly constructed or modified detention basins shall provide storage volume below the outlet (dead storage) to allow for water quality treatment in accordance with the following, whichever is most restrictive:

    a. Water quality features meeting the MPCA NPDES construction permit for Permanent Storm Water Management Systems;
    b. Water quality treatment consistent with NURP criteria (90% removal of TSS and 60% removal of TP for a standard NURP particle size distribution); and/or
    c. For proposed projects in a watershed that directly discharges to a 'Preserve' water feature (Table 20 of SWMP), NURP plus enhanced treatment is required as listed below:
        1. Storm water ponds are required to include a sediment forebay at the inlet. The volume of the sediment forebay should be 5 – 15% of the permanent pool surface area. The sediment forebay shall be a minimum of 3 feet plus the depth for sediment storage.

        2. Projects in watersheds that discharge directly to Assumption Creek must incorporate BMPs as outlined in Appendix A C.1, C.2, C.3 and C.5 of the MPCA NPDES Construction General Permit, and as listed below:
            1. During construction.
                a. All exposed soil areas with a slope of 3:1 or steeper, that have a continuous positive slope to a special water must have **temporary erosion protection** or **permanent cover** within 3 days after the area is no longer actively being worked. All other slopes that have a continuous positive slope to a special water must have **temporary erosion protection** or **permanent cover** within 7 days after the area is no longer actively being worked.
                b. Temporary sediment basin requirements described in Part III.B.1-5 must be used for common drainage locations that serve an area with five (5) or more acres disturbed at one time.

            2. Post construction. The **water quality volume** that must be treated by the project's permanent **storm water** management system described in Part III.C. shall be one (1) inch of runoff from the new **impervious surfaces** created by the project.

            3. Buffer zone. An undisturbed buffer zone of not less than 100 linear feet from the special water (not including tributaries) shall be

maintained at all times. Exceptions from this requirement for areas, such as water crossings or limited water access, are allowed if the **Permittee** fully documents in the **SWPPP** the circumstances and reasons that the buffer encroachment is necessary. All potential water quality, scenic and other environmental impacts of these exceptions must be minimized and documented in the **SWPPP** for the project.

4. Temperature Controls. The permanent **storm water** management system must be designed such that the discharge from the project will minimize any increase in the temperature of trout stream receiving waters resulting from the 1, and 2-year 24-hour precipitation events. This includes all tributaries of designated trout streams within the section that the trout stream is located. Projects that discharge to trout streams must minimize the impact using one or more of the following measures, in order of preference:
    a. Minimize new **impervious surfaces**.
    b. Minimize the discharge from connected **impervious surfaces** by discharging to vegetated areas, or grass swales, and through the use of other non-structural controls.
    c. Infiltration or evapotranspiration of runoff in excess of pre-project conditions (up to the 2-year 24-hour precipitation event).
    d. If ponding is used, the design must include an appropriate combination of measures such as shading, filtered bottom withdrawal, vegetated swale discharges or constructed **wetland** treatment cells that will limit temperature increases. The pond should be designed to draw down in 24 hours or less.
    e. Other methods that will minimize any increase in the temperature of the trout stream.

d. For proposed projects in a watershed that directly discharges to an 'Improve 1' (Table 20 of SWMP) water feature NURP plus enhanced treatment is required as listed below:
    1. Storm water ponds are required to include a sediment forebay at the inlet. The volume of the sediment forebay should be 5 – 15% of the permanent pool surface area. The sediment forebay shall be a minimum of 3 feet plus the depth for sediment storage.
    2. Projects in watersheds that discharge directly to Riley or Bluff Creeks must analyze the downstream system to ensure there is no increase in runoff rates. One way to determine the downstream effects is to extend the analysis downstream to a point where the proposed development represents less than ten percent of the total watershed draining to that point.

B. Skimmers and Outlets

1. Skimming devices should be designed to remove oils and floatable materials up to a one-year frequency event. The skimmer should be set 12 inches below the normal surface water elevation and should control the discharge velocity to 0.5 fps.

2. Outlets shall be evaluated for the need to dissipate energy so as to reduce velocities to permissible levels as allowed by the soil and vegetation. At a minimum, flared end sections should be provided with riprap consistent with Mn/DOT standards. For areas with high flows or where excessive erosion occurs or is anticipated, energy dissipation per Federal Highway Administration standards shall be followed.

3. Riprap shall be provided below the channel grade and above the outfall or channel bottom to insure that riprap will not be underminded by scour or rendered ineffective by displacement. Riprap consisting of natural angular stone suitably graded by weight shall be designed for anticipated velocities. Riprap shall be placed over a suitable filter material or filter fabric to insure that soil particles do not move through the riprap and reduce its stability.

4. For outlets through berms or roadway embankments and all culverts under public traveled streets, anti-seepage collars shall be used (see diagram in this section). The collars shall be installed so as to increase the creep distance or seepage line along conduit by 15 percent. The locations for the use of collars include:

    a. All water and pond structures with a pool depth of two feet and two-day duration.
    b. 250 Acre watershed or more.
    c. Design head of 10 feet or more.

EROSION AND SEDIMENT CONTROL

A. Erosion and Sediment Control Plans

1. An erosion and sediment control plan shall be created for any land disturbing activity. Erosion and sediment control elements shall be implemented before any grading can begin. A schedule of significant grading work will be required as part of the erosion and sediment control plan.

2. The MPCA's most recent version of the NPDES Construction Storm Water Permit shall be used to develop sediment and erosion control plans. Where the NPDES permit conflicts with City standards, the more stringent standard will apply.

3. Site access roads (entrances to construction sites) shall be graded or otherwise protected with silt fences, diversion channels or dikes and pipes to prevent sediment from exiting the site via the access road. Primary site access roads shall be surfaced with crushed rock or wood chips. The rock entrance shall extend for a distance of 75 feet (150 for wood chips) beginning at existing paved surface. All construction traffic shall utilize the entire length of the rock entrance.

4. Soil tracked from the site by motor vehicles shall be cleaned from paved roadway surfaces at least daily or as needed throughout the duration of construction. Roadway cleaning shall be the responsibility of the party or parties having a permit with the City.

5. Streambank stabilization and stream bed control structures shall be designed based on the unique site conditions present including soil conditions, flow rate, slope, and flow velocity.

6. Where inadequate natural vegetation exists or where it becomes necessary to remove existing natural vegetation, both temporary vegetative and permanent vegetative cover shall be addressed in the plans and specifications and be consistent with the provisions of the NPDES Construction permit.

B. Sediment Basins

1. Detention basins may be used as temporary sediment retention during the construction phase. The design should include providing permanent storage volume for construction and restoration phase sediment accumulation or the removal of the sediment to restore the required permanent pool volume in the detention area.

2. Detention areas intended to permanently trap sediments shall provide excess dead storage beyond the required water quality volume, to allow for sediment accumulation. Sediment basins shall be capable of removing coarse suspended sediment from storm water for all runoff events and the greatest practical grain size (#40 typically). Sediment storage volume should be estimated by the universal soil loss equation and 0.5 tons per watershed acre per year. Volume below the outlet can be estimated by using the runoff volume resulting from a 2.5" rainfall.

WETLAND ELEMENTS

A. Wetland Alteration

1. Wetland alteration will only be allowed with the approval of and receipt appropriate permits from the City, the water management organization, watershed district, the Department of Natural Resources, and the U.S. Army corps of Engineers. Mitigation efforts shall be determined by the review agencies.

2. Water level fluctuations (peak elevation and duration) for wetlands shall be limited to two feet and duration not to exceed 48 hours so as to prevent the destruction of wildlife habitat and wetland vegetation.

3. Mitigation for WCA approved impacts is required within the same watershed. In the areas of the City that is within the Minnehaha Creek Watershed District, 1:1 mitigation is required for excavation within wetlands. This will be addressed during ordinance adoption for the Wetland Ordinance.

4. Sedimentation basins or sediment removal devices must be provided prior to discharge into wetlands.

5. Variable bottom contours should be considered to provide deeper holes and flat shallow benches. This feature will provide habitat for diversity of plants and wetland inhabitants for wetland mitigation sites and storm water basins.

MAINTENTANCE AGREEMENT (EXAMPLE)
REGARDING STORM WATER MANAGEMENT PRACTICES: WATER QUALITY AND QUANTITY TREATMENT POND

I. THIS AGREEMENT made this _____ day of _____, 200__ by and among the City of Chanhassen, Minnesota (hereinafter referred to as the "City") and, _____, a _____ [corporation, individual] (hereinafter referred to as "_____") with reference to the following facts and circumstances:

A. (*)_____ is the fee owner of certain real property situated in the City of _____, legally described as follows: (Legal)_____, (*) CAPS_____(_____) (hereinafter referred to as the "Subject Property").

B. As a condition of its approval of the development for the Subject Property, the City has required that the parties hereto enter into an agreement, which makes provision for the maintenance of the Storm Water Management Practice located within the boundaries of the Subject Property as the same is described and depicted in those certain construction plans drawn by _____, approved by the City and constructed by _____. The Storm Water Management Practice is located in the platted drainage and utility easement in_____ _____.

1. The parties hereto desire to set forth their agreement with respect to the maintenance of the Storm Water Management Practice and the costs of such maintenance.

II. NOW THEREFORE, in consideration of the foregoing facts and circumstances, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto hereby agree as follows:

A. For the purposes of this Agreement, maintenance of the Storm Water Management Practice shall mean the annual inspection and certification by a qualified individual that the pond, including the pond outlet, is functioning in accordance with the approved plans and, if necessary, the periodic removal of the buildup in the Storm Water Management Practice as necessary to maintain function, as established for the Storm Water Management Practice in the construction plans and to maintain the proper operation of the treatment function of the Storm Water Management Practice.

B. (*)_____ shall be solely responsible for the maintenance of the Storm Water Management Practice, and shall bear all costs of such maintenance, until such time as _____ (hereinafter referred to as the "Association") is activated pursuant to Article _____, Section _____, of the Declaration of Covenants for _____, whereupon the Association shall bear the sole responsibility for such maintenance and shall bear all costs of such maintenance. If (*)_____, or after its incorporation, the Association, does not undertake the necessary maintenance within 30 days of notification by the City, or within 30 days provide the City with a schedule for

undertaking the necessary maintenance, the City may undertake such maintenance, and the costs reasonably incurred by the City for performing such maintenance shall be reimbursed to the City within 30 days by the party responsible for such maintenance and, if the responsible party does not timely reimburse the City, then the City may recover its costs by levying a special assessment against all single family house lots in the Subject Property, each lot to bear an equal share.

C. (*)_____, as present owner of the Subject Property, for itself and respective successors and assigns, hereby waives any statutory right which it may have to contest any such assessment by the City of its maintenance costs on the basis of the benefit to portions of the Subject Property.

D. Notwithstanding anything contained in this Agreement to the contrary, in the event the City shall establish a policy for maintenance by the City of Storm Water Management Practices located elsewhere in the City of Chanhassen, under which policy the costs of such maintenance are to be paid either out of general City revenues or by collection of utility or service fees or charges, then any owner of any portion of the Subject Property shall be entitled to petition the City for the inclusion of the Storm Water Management Practice under such maintenance program, and the City shall consent to such request and thereupon authorize the termination of this Agreement. The recording of a certified copy of the Resolution of the City Council of the City which sets forth the consent and authorization described in the foregoing sentence shall serve the terminate this Agreement, without further action on the part of any party hereto.

E. The terms and conditions of this Agreement shall be binding upon, and shall insure to the benefit of, the parties hereto and their respective successors and assigns.

III. IN WITNESS WHEREOF, the parties hereto have caused this document to be executed as of the day and year first above written.

_____ _____
Date

Title _____
for the City of Chanhassen, Minnesota

_____ _____
[Corporation/individual] Date

THIS INSTRUMENT DRAFTED BY _____