3.0 Policies for Stormwater Management

3.1 Runoff Management and Flood Control

Just as watershed models are used to define problem areas within the drainage system, design criteria (standards for design) are used to define solutions to the problems. Municipal drainage systems provide service (removal of runoff water) and protection (control of flood levels). It is useful to have criteria for both the **level of service** and the **level of protection** to be provided by the drainage system. In addition, at ponds and low-lying areas it is common to add a factor of safety in the form of added elevation above the projected flood level (freeboard) or extra volume.

It is important to understand the difference between **level of service** and **level of protection** when designing and analyzing stormwater systems.

Level of service is defined as the capacity provided by a municipal drainage system to remove runoff and prevent significant interference with normal daily transportation, commerce, or access that might result from a rainstorm. For example, gutters might run full, but when the runoff arrives at a catch basin it would enter the catch basin and be carried away by the storm sewer. Intersections would not be inundated to an extent that adversely impacts driving conditions, right-of-way would be undamaged, and public infrastructure would operate normally. The modern standard of practice is usually that systems be designed for the "10-year" storm event, which means that there is roughly a 10 percent probability *in any year* that the system will be overtaxed and unable to meet these criteria. In many communities, older systems were designed for smaller storm events such as a "2-year" event or a "5-year" event. Intersection flooding is common in these areas.

Level of protection is defined as the capacity provided by a municipal drainage system to prevent property damage and assure a reasonable degree of public safety following a rainstorm. For example, runoff might bypass a catch basin and collect in low-lying areas such as intersections, but would not cause flood damage to structures. Accumulated water might temporarily interfere with traffic or access, but right-of-way should be undamaged and public infrastructure should operate normally. Safety should not be significantly threatened, assuming persons use common sense and don't drive into the standing water or try to walk or swim in fast-flowing water. The drainage system must have the capacity (in terms of pipe capacity and overland overflow capacity) to limit the flood elevation to acceptable levels for an event representing the protection criteria.

A 100-year event is usually recommended as a standard for design of ponding basins. Such an event has about a 1 percent probability of occurring *in any year*. Federal and state programs use criteria based on an event with 1 percent probability to define the floodplain along rivers and streams, and cities and other drainage authorities commonly extend this standard to other areas. A "100-year" (1 percent probability) design for a ponding area means the pond has adequate volume to hold the 1 percent probable runoff and infers that adjacent structures will be above the level of the ponded water.

However, the criterion for level of protection has broader application. In addition to ponding areas, lakes, and streams, this criterion should be applied to all locations served by the drainage system where there are depressed intersections or other areas subject to temporary, unplanned flooding.

3.1.1 Runoff Management and Flood Control Policies

The following sections present the City of Edina's policies and design standards that address runoff management and flood control. In addition to the policies discussed below, the City of Edina has entered into water resource management related agreements with adjacent cities, including Bloomington for the area of the Border Basin, Eden Prairie for the area along Washington Avenue, Richfield for the outlet from Adam's Hill Pond, Hopkins for the area east of Blake Road and along T.H. 169, St. Louis Park for Meadowbrook Golf Course, Morningside Area, and Minneapolis.. The City adopts the following general runoff management and flood control policies (Sections 3.1.1.1 and 3.1.1.2 provide specific policies and standards):

1. No flow rate increases in already overtaxed stormwater systems.

2. The City will place a high priority on providing 100-year level of protection for the City's stormwater detention and conveyance systems, where detention is provided (e.g., low point intersections). The City will require new stormwater systems to provide 100-year level of protection. Existing systems (conveyance and detention) that currently do not provide 100-year level of protection will be modified to provide 100-year level of protection when feasible. Proposed additions and modifications to the stormwater system are discussed in Sections 5 through 14 and summarized in Table 1.2.

3. The City will require new stormwater conveyance systems to provide a 10-year level of service. Existing systems that currently do not provide a 10-year level of service will be modified, as opportunities arise and as needed.

4. For new development and redevelopment, peak flow rates will be limited in accordance with the applicable rules of the Nine Mile Creek Watershed District and Minnehaha Creek Watershed District.

5. The City will adopt and implement a stormwater management ordinance reflecting the policies and design standards detailed in this plan.

3.1.1.1 Minimum Building Elevations

To prevent flooding of buildings, it is recommended that the City adopt the following design standards:

1. All lowest floor elevations and other permanent fixtures including heating and air conditioning ventilation systems should meet the following:

a. Be a minimum of two feet above the 100-year flood elevation for basins with pipe outlets or waterways.

b. Until an outlet is installed for landlocked basins with no low level piped outlet, the minimum building elevation should be the greater of either two feet above the level resulting from two concurrent 100-year, single event rainfall event or two feet above the 100-year 10-day snowmelt, whichever is higher. In either case, the starting elevation of the basin/waterbody prior to the runoff event should be established by one of the following:

   i. Existing Ordinary High Water level established by the Minnesota Department of Natural Resources;

   ii. Annual water balance calculation approved by the City;

   iii. Local observation well records, as approved by the City; or

   iv. Mottled soil.

Note: The 100-year landlocked basin flood elevation may be lowered by excavating an overflow swale or constructing an outlet pipe at an overflow point.

2. The lowest entry elevations (i.e., windows, window wells, walkout elevations) for buildings adjacent to overflow swales and/or conveyance channels should be at least two feet above the 100-year flow elevation of the swale or channel at the point where the swale or channel is closest to the building.

3.1.1.2 Stormwater Management Design Standards

The City adopts the following design standards for all new stormwater management systems (i.e., basins, storm sewers, etc.):

1. All ponding basins and basin outlet pipes should be designed to collectively detain and convey the flows from the critical 100-year frequency storm (100-year level of protection). The critical storm represents a storm of a given runoff duration that produces the greatest discharge or detention storage volume, as appropriate. Detention basins should be designed to contain the flows from the 100-year frequency storm without overtopping.

2. All lateral storm sewer systems, including catch basin grates, should be designed to convey flows from the 10-year frequency, ½-hour storm (10-year level of service).

3. Where practical and physically possible, regional detention areas, as opposed to individual onsite detention, are preferred to reduce flooding, to control discharge rates, and to provide necessary storage volumes whenever possible. Where regional detention areas are not in place or existing systems are already over capacity, the City will require individual onsite detention at new developments to ensure the new developments do not create additional problems in the existing systems under present watershed development conditions.

4. Stormwater retention through infiltration practices is required by both the Nine Mile Creek Watershed District and Minnehaha Creek Watershed District, where soil conditions allow and where not detrimental to groundwater supplies,

5. All new constructed slopes within the 100-year storage volume of a ponding basin should be designed in accordance with current safety design standards.

6. All ponding basins should be provided with a protected emergency overflow structure to prevent undesired flooding resulting from extreme storms or plugged outlet conditions. The emergency overflow path should be protected with permanent, nondegrading erosion control materials (i.e., riprap or geosynthetics), where feasible.

7. Each ponding basin should be provided with an all-weather access road for maintenance purposes.

3.2 Water Quality

The streams, ponds, lakes, and wetlands in the City of Edina are an important community asset. These resources supply aesthetic and recreational benefits, in addition to providing wildlife habitat and refuge. The City recognizes the need to assure adequate water quality in the water bodies within the city and will take steps to protect these resources. The City of Edina will manage the City's water resources so that the beneficial uses of lakes, streams, ponds and wetlands remain available to the community. Such beneficial uses may include aesthetic appreciation, wildlife habitat protection, nature observation, and recreational activities.

3.2.1 Background Water Quality Information

Within the City of Edina, there are over two hundred water bodies, ranging in size from lakes to small stormwater detention basins. Historically, as the city developed, these lakes and ponds have been used for stormwater runoff detention in association with flood protection efforts. Unfortunately, the urbanization of a watershed often accelerates the degradation of water bodies through a natural process known as eutrophication. Nonpoint pollution associated with stormwater runoff creates adverse impacts; the degree of impact dependent upon the water body's natural ability to remove, absorb, or process the pollutants through chemical, physical, or biological processes. Poor water quality usually indicates a situation where the resource receives more nutrients, or other pollutants, than can be processed naturally.

Urban stormwater runoff carries a variety of pollutants that affect water quality. These contaminants are generated through the activities in different residential, commercial, and industrial land developments within a watershed. During storm or snowmelt events, these pollutants quickly wash off and are carried to downstream waters. As development increases and activities change and intensify, the concentrations and types of contaminants increase accordingly.

Phosphorus and suspended sediments are recognized as being particularly detrimental to the health of lakes and streams in Minnesota. As a result, the City's watershed management and land development policies are directed mainly at controlling the amount of phosphorus and sediment that reaches the water bodies within the city. Many other pollutants are transported by the same processes that convey phosphorus. Therefore, phosphorus reduction measures for stormwater runoff may also reduce the flow of other pollutants to water resources within the city.

Suspended sediment in runoff is a major source of phosphorus because dissolved phosphorus frequently adsorbs to small particles in the suspended sediment. Because much of the phosphorus reaching water bodies from runoff is transported with the suspended sediment load, efforts to control sediment also help to reduce phosphorus loading. Suspended sediment carried by stormwater runoff typically consists of fine particles of soil, dust, dirt, organic material, and undissolved fertilizer. Suspended sediment loads can also carry heavy metals, oils, and other pollutants. High volumes of suspended sediment reaching water bodies can be the result of:

- Runoff from city streets, buildings, parking lots, and other impervious areas, which washes accumulated sediment from those areas.
- Runoff from urban areas with higher flows and higher velocities, which in turn causes channel and swale erosion.
- Runoff from construction sites with poor erosion and sediment control or with poorly maintained sediment control facilities.

Chloride is another pollutant in stormwater runoff that can be detrimental to the health of lakes and streams in Minnesota. Chloride is a salt found in most waters; however, elevated levels of chloride in surface water can harm aquatic organisms. High chloride levels in lakes and streams usually occurs in relation to winter snowmelt due to the wide-spread application of road salt during winter-weather conditions. Nine Mile Creek and Minnehaha Creek have both been identified by the Minnesota Pollution Control Agency (MPCA) as impaired due to excessive chloride levels (see Section 15.1.3 for more details).

Stormwater can also convey harmful bacteria, often called pathogens, into local lakes and streams. Ingestion of pathogens by humans can lead to gastrointestinal illnesses such as severe diarrhea or nausea, as well as headaches and fatigue. Two bacterial groups often used as "indicator organisms" for detection of pathogenic organisms are fecal coliform and *E. coli* bacteria. Fecal coliform and *E. coli* bacteria found in lakes and streams can originate from human, pet, livestock, or wildlife waste. Minnehaha Creek has been identified by the MPCA as impaired due to excess levels of fecal coliform (see Section 15.1.3 for more details).

Lakes and streams are often monitored for the presence of specific pollutants, such as phosphorus, suspended sediment, or dissolved oxygen, to assess the quality of the waterbody. Another means to assess the health of a waterbody is through biological monitoring, which tracks the health of plant, insect, small organism, and fish communities. Several measures of a biological community related to the diversity and types of species present are assessed to develop an Index of Biological Integrity

(IBI). For fish, for example, these measures may include feeding, reproduction, tolerance to human disturbance, abundance, and condition. An IBI score can then be used to assess the health and integrity of the waterbody. Nine Mile Creek and Minnehaha Creek have both been identified by the Minnesota Pollution Control Agency (MPCA) as biologically impaired (see Section 15.1.3 for more details).

3.2.2 Water Quality Management Policies

The City of Edina adopts the following water quality policies:

1. The City will modify review, permitting, and enforcement processes for construction activities to ensure water quality goals are met.

2. The City will work to heighten community awareness of water quality management through education and training.

3. The City will manage its water resources so that the beneficial uses of streams, wetlands, ponds, and lakes remain available to the community.

4. The City will work with the adjacent municipalities to encourage upstream pollutant reduction in areas closer to the source of such pollutants.

5. The City will encourage use of regional detention areas as opposed to individual on-site detention to reduce flooding, control discharge rates, and provide for water quality management.

6. As required by the Nine Mile Creek Watershed District and Minnehaha Creek Watershed Districts, stormwater retention is required in locations where soil conditions permit and where groundwater supplies will not be impacted. The rules of the Nine Mile Creek Watershed District and Minnehaha Creek Watershed District are adopted by reference and can be found on the appropriate watershed district website.

7. The City will adopt and implement a stormwater management ordinance reflecting the water quality management standards and the erosion and sediment control policies detailed in this plan.

8. The City will work with the MPCA, Nine Mile Creek Watershed District, and Minnehaha Creek Watershed District to implement the recommendations and/or requirements of existing or future TMDL(s) throughout the city.

3.2.3 Water Quality Management Standards

3.2.3.1 Stormwater Retention/Detention Systems

Stormwater detention facilities must be designed according to the most current technology as reflected in the MPCA publication *Protecting Water Quality in Urban Areas*, March 2000, or more current version, and the Nine Mile Creek Watershed District and Minnehaha Creek Watershed District rules and must contain, at a minimum, the following design factors:

1. An average permanent pool depth of 4 to 10 feet for wet detention basins.

2. Wet storage volume for wet basins, or the extended detention volume for modified dry basins, equal to or greater than the runoff from a 2-inch rainstorm event from the entire drainage area tributary to the basin and sediment storage adequate to hold at least 25 years of sediment accumulation.

3. A permanent pool length-to-width ratio of 3:1 or greater.

4. A minimum protective shelf extending 10 feet into the permanent pool with a slope of 10H:1V, beyond which slopes should not exceed 4H:1V (5H:1V or flatter is preferred).

5. A protective buffer strip of vegetation surrounding the permanent pool at a minimum width in accordance with the buffer requirements of the Nine Mile Creek Watershed District or Minnehaha Creek Watershed District, whichever is applicable.

6. All stormwater detention facilities must have a device ("skimmer") to prevent oil, grease, and other floatable materials from moving downstream as a result of normal operations.

7. Stormwater detention facilities for new development and redevelopment must be sufficient to limit peak flows in each subwatershed to those that existed before the development for the 2-, 10-, and 100-year storm events. All calculations and hydrologic models/information used in determining peak flows must be submitted to the City along with the stormwater management plan.

8. All stormwater detention facilities must have a forebay to remove coarse-grained particles prior to discharge into a watercourse or storage basin.

9. All overflow swales designed to pass runoff flows from part or all of the 100-year event that have a channel slope of 2 percent or steeper, or other 100-year discharge velocities that will exceed 4 feet per second must be armored with permanent, non-photo-degrading erosion control materials.

The City requires that the following design standards also be applied:

1. The distance between the major inlets and normal outlet should be maximized to provide the greatest flow distance for flow through the basin.

2. The design should include effective energy dissipation devices that reduce outlet velocities to 3 feet per second or less. These outlets should consist of stilling basins or other such devices that prevent erosion at all stormwater outfalls into the detention basin, and at the basin outlet.

3.2.3.2 Construction Site Standards

The requirements of the National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer Systems (MS4) General Permit and the City's Stormwater Pollution Prevention Program (SWPPP) are applicable (see Section 15.1 for more details).

3.3 Erosion and Sediment Control

The City's goals regarding erosion and sediment control are to protect the capacity of the City's stormwater management system, prevent flooding, maintain water quality by preventing erosion and sedimentation from occurring, and correct existing erosion and sedimentation problems.

3.3.1 Erosion and Sediment Control Policies

The following policies are adopted by the City of Edina:

1. The City requires erosion and sediment controls and submittal of erosion and sediment control plans for proposed construction activities.
2. Erosion and sediment controls shall conform to the requirements of the Nine Mile Creek Watershed District or Minnehaha Creek Watershed District, depending on project location.
3. The City will direct that entities proposing construction projects that disturb more than 1 acre of land will need to apply for coverage under the MPCA's General NPDES Construction Stormwater Permit.

3.4 Wetlands

The City of Edina's goal is to achieve no net loss of wetlands, including acreage, functions, and values. Due to the developed nature of the city, all of the wetlands within the city are used for storm water management purposes. Where practical, opportunities to improve the functions, values, biological diversity, and acreage of existing wetlands should be sought.

3.4.1 Wetlands Policies

The City adopts the following policies relating to wetlands within the city:

1. The City discourages wetland alteration. Unavoidable wetland alterations must be mitigated in conformance with the Wetland Conservation Act (WCA) requirements and the requirements of the Nine Mile Creek Watershed District or Minnehaha Creek Watershed District, and must be guided by the following principles, in descending order: avoid the impact, minimize the impact, rectify the impact, reduce or eliminate the impact over time, and compensate for the impact.
2. The Nine Mile Creek Watershed District and the Minnehaha Creek Watershed District are the local government units (LGU) responsible for administering the Wetland Conservation Act in the City of Edina. The City will work in conjunction with the Nine Mile Creek Watershed District and the Minnehaha Creek Watershed District on issues pertaining to wetland alterations within the city boundary.
3. The City will maintain and periodically update the wetland inventory data and the wetland management classifications provided in this plan.
4. The City will seek to restore previously existing wetlands and enhance existing wetlands.
5. The City will involve the appropriate regulatory agencies (MPCA, U.S. Army Corps of Engineers, and the DNR) in the planning of any proposed water quality or flood control facilities identified in this plan that may be located within a wetland.
6. Provide buffer zones of native vegetation, where feasible, around ponds and wetlands to provide habitat The City will work with the Nine Mile Creek Watershed District and Minnehaha Creek Watershed District to educate the public regarding wetland protection and the importance of creating and maintaining vegetative buffers. Land use and property ownership may limit the ability to provide buffer zones.
7. The City encourages the minimization of water level fluctuations (bounce), where feasible, in wetlands or detention basins to prevent adverse habitat changes.

3.5 Floodplain

The floodplain of a stream can be defined as that area adjacent to a stream which is inundated during times of flood. More specifically, the Minnesota Floodplain Management Act of 1969 defines the floodplain as that area adjoining a watercourse which is subject to inundation by a flood of 100-year frequency. Under the provisions of this act, local governmental units are required to adopt floodplain management ordinances which will include “the delineation of floodplains and floodways, the preservation of the capacity of the floodplain to carry and discharge regional floods, minimization of flood hazards, and the regulation of the use of land in the floodplain.” Under the provisions of the required ordinances, no major alteration to existing structures, no new fill and no floodplain use which would unreasonably constrict flood flows will be allowed in the floodplain unless further provisions are made to fully compensate any detrimental effects.

The following policies regarding floodplain regulation with the City of Edina have been adopted:

1. The floodplain of Nine Mile Creek is defined as that area lying below the 100-year flood elevations as shown in the *Nine Mile Creek Watershed Management Plan*, March 2007. The floodplain of Minnehaha Creek is defined as that area lying below the 100-year flood elevations as shown in the *National Flood Insurance Program Flood Insurance Study for the City of Edina,* May 1980.

2. The floodplain requirements of the Nine Mile Creek Watershed District and the Minnehaha Creek Watershed District are applicable.

3.6 Recreation and Habitat

The City's goals are to protect and enhance fish and wildlife habitat and recreation opportunities. To accomplish this objective, the City adopts the following policies:

1. Cooperate with other units of government to complete habitat and recreation corridor connections (trails and greenways).

2. Maintain, enhance, or provide new habitat as part of wetland modification, stormwater facility construction, or other appropriate projects.

3. Encourage alternative landscape designs that a) increase beneficial habitat, wildlife and recreational uses; promote infiltration and vegetative water use; and that b) decrease detrimental wildlife uses (such as beaver dams, goose overabundance), that damage water control facilities, shoreline vegetation, water quality or recreational facilities.

3.7 Groundwater

The City's goal is to protect the quality and quantity of groundwater resources. The City adopts the following groundwater policies:

1. The City will encourage groundwater recharge and protect recharge areas from potential sources of contamination. The City will provide increased greenspace, native vegetation, and pond "dead" storage wherever possible and appropriate to allow for the infiltration of stormwater runoff and promote groundwater recharge.

2. The City will encourage use of grassed waterways to maximize infiltration where not detrimental to groundwater supplies.

3. The City will promote awareness of groundwater resource issues through public education and information programs.

3.8 Education Program

The City of Edina believes public education is an important and effective method to control non-point source pollution since it emanates from broad reaches of the landscape. A public education program raises citizen awareness regarding pollutant sources in everyday life from all types of property. The City will educate its residents, businesses, industries and staff concerning pollutant reduction, best management practices, the link between daily housekeeping activities and the condition of the City of Edina's water resources, and awareness of natural resources in general. The City will also seek to inform its residents, businesses, industries and staff of initiatives, projects, etc. completed by the community that address the City's education goals.

Education and housekeeping practices are especially important in urban settings since there is limited land available to provide water quality treatment facilities. The City of Edina will develop and distribute educational materials to the general public and targeted groups regarding:

- Natural resources within and adjacent to the city
- Importance of pollutant reduction in stormwater runoff
- City ordinances, policies and programs pertaining to water resources
- Reducing fertilizer/herbicide use
- Lawn care practices that prevent organic debris from reaching storm sewer systems
- Household and automobile hazardous waste disposal
- Problems with pet waste and proper disposal
- Litter control
- Recycling and trash disposal
- Composting, leaf collection, and grass clippings
- Residential stormwater drainage
- Native vegetation
- Public area maintenance
- Alternative landscaping methods
- Plantings in buffer zones along wetlands, lakes, and streams
- Car washing

Information will be distributed via the City's newsletter, the City Extra email notification service, local newspapers, cable television and any other appropriate media.

3.9 NPDES Considerations

Under the federal 1987 Clean Water Act revision, discharges of pollutants into waters of the United States are prohibited without a permit under the National Pollutant Discharge Elimination System

(NPDES) program. Traditionally, this program concentrated on discharges from industries and publicly owned treatment plants. In 1990, the EPA promulgated rules establishing Phase I of the NPDES Stormwater Program in an effort to reduce the water quality impact of stormwater drainage systems on receiving water bodies. Phase I of the program regulates stormwater runoff from municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, construction activities disturbing five acres of land or greater, and various industrial activities. In 1999, the Phase II Rule of the NPDES Stormwater Program extended the coverage of the NPDES program to operation of "small" MS4s in urbanized areas and operation of small construction sites. Through the use of NPDES permits, these operations are required to implement programs and practices to control polluted stormwater runoff.

Because the City of Edina is located in an "urbanized area", as defined by the Bureau of the Census, it is covered under the Phase II NPDES Stormwater Program. Operators of Phase II small MS4s in Minnesota were required to apply for coverage under the Small Municipal Separate Storm Sewer Systems (MS4s) General Permit by March 10, 2003. Under this permit, MS4s are required to develop and implement a Storm Water Pollution Prevention Program (SWPPP), which must contain the following six control measures, at a minimum:

1. Public education and outreach on stormwater impacts.
2. Public involvement and public participation.
3. Illicit discharge detection and elimination.
4. Construction site stormwater runoff control.
5. Post-construction stormwater runoff control in new development and redevelopment.
6. Pollution prevention and good housekeeping for municipal operations.

The SWPPP must include Best Management Practices (BMPs) and measurable goals for each of the six control measures. An annual report detailing the implementation of the control measures for the previous calendar year must be submitted to the MPCA by June 30 of each year. Additional information on the City's NPDES Phase II MS4 General Permit and SWPPP is provided in Section 15.1.