



Land Disturbance Guidance Document

Mendota Heights, Minnesota

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# Land Disturbance Guidance Document

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The following requirements shall be considered as the Land Disturbance Guidance Document as defined in Chapter 6 of the Mendota Heights City code: Stormwater Management, Illicit Discharge Detection and Elimination, Soil Erosion, and Sedimentation. The requirements below are meant to serve as a general guideline and do not account for all possible site conditions or situations. Additional measures may be necessary to meet the intent of the Mendota Heights city code. It is the obligation of the owner and designer to consider all factors contributing to erosion, flooding, and water quality impairments on the project site and include appropriate Best Management Practices for minimizing erosion and providing permanent stormwater runoff management.

## **1.0 Construction Site Stormwater Runoff Control**

### **1.1 Erosion Control**

- a. The Permittee must plan for and implement appropriate construction phasing vegetative buffer strips, horizontal slope grading, and other construction practices to minimize erosion. All areas not to be disturbed shall be marked (e.g. with flags, stakes, signs, silt fence etc.) on the project site before any work begins.
- b. All exposed soil areas must be stabilized as soon as possible to limit soil erosion but in no case later than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.
- c. Additional BMPs together with enhanced runoff controls are required for discharges to special waters and impaired waters. The BMPs identified for each special or impaired water are required for those areas of the project draining to a discharge point on the project that is within one mile of a special or impaired water and flows to that water.
- d. The normal wetted perimeter of a temporary or permanent drainage ditch that drains water for the project site or diverts water around the project must be stabilized 200 lineal feet from the property edge or from a discharge point to a surface water. Stabilization must occur within 24 hours of connection to surface waters.
- e. Pipe outlet must have temporary or permanent energy dissipation before connecting to surface water.
- f. When possible, all slopes must be graded in such a fashion so that tracking marks made from heavy equipment are perpendicular to the slope.
- g. All areas disturbed during construction must be restored as detailed in these requirements. The type of permanent restoration shall be clearly shown on the plans including but not limited to sod, seed, impervious cover and structures. A minimum of 6 inches of topsoil must be installed prior to permanent restoration. Areas in which the top soil has been placed and finish graded or areas that have been disturbed and other grading or site building construction operations are not actively underway must be temporary or permanently restored as set forth in the following requirements:
  - i) Areas with slopes that area less than 3:1 must be seeded and mulched within 14 days of the area not being actively worked.
  - ii) Areas with slopes that area greater or equal to 3:1 must be seeded and erosion control blanket placed within 14 days of the area not being actively worked.
  - iii) All seeded area must be either mulched and disc anchored, hydro-mulched, or covered by erosion control blanket to reduced erosion and protect the seed. Temporary or permanent mulch must be disc anchored and applied at a uniform rate of 2 tons per acre and have 90% coverage.

- iv) If the disturbed area will be re-disturbed within a six month period, temporary vegetative cover shall be required consisting of an approved seed mixture and application rate.
  - v) If the disturbed area will not be re-disturbed within a six month period, permanent vegetative cover shall be required consisting of an approved seed mixture and application rate.
  - vi) All areas that will not have maintenance done such as mowing as part of the final design shall be permanently restored using an approved seed mixture and application rate.
  - vii) Restoration of disturbed wetland areas shall be accomplished using an approved seed mixture and application rate.
- h. All erosion control measures must be maintained for the duration of the project until final stabilization has been achieved in accordance with Section 1.7. If construction operations or natural events damage or interfere with any erosion control measures, they shall be restored to serve their intended function.
  - i. Additional erosion control measures shall be added as necessary to effectively protect the natural resources of the City. The temporary and permanent erosion control plans shall be revised as needed based on current site conditions and to comply with all applicable requirements.

## 1.2 Sediment Control Practices

- a. Sediment control practices must be established on all down gradient perimeters before any upgradient land disturbing activities begin. These practices must remain in place until final stabilization has been achieved in accordance with Section 1.7.
- b. If down gradient treatment system is overloaded additional up gradient sediment control practices must be installed to eliminate overloading. The SWPPP must be amended to identify the additional practices.
- c. There shall be no unbroken slope length greater than 75 feet with a grade of 3:1 or steeper.
- d. All storm drain inlets must be protected by approved BMPs during construction until all potential sources for discharge have been stabilized. These devices must be maintained until final stabilization is achieved. Inlet protection may be removed if a specific safety concern (street flooding/freezing) has been identified.
- e. Temporary stockpiles must have silt fence or other effective sediment controls on the down gradient side of the stockpile and shall not be placed at least twenty five (25) feet from any road, wetland, protected water, drainage channel, or storm water inlets. Stockpile left for more than fourteen (14) days must be stabilized with mulch, vegetation, tarps or other approved means.
- f. Vehicle tracking of sediment from project shall be minimized by approved BMPs. These shall be installed and maintained at the City approved entrances. Individual lots shall each be required to install and maintained entrances throughout the construction building until a paved driveway is install.
- g. Sediment that has washed or tracked from site by motor vehicles or equipment shall be cleaned from paved surfaces throughout the duration of construction.
- h. Silt fence or other approved sediment control devices must be installed in all areas as shown on the SWPPP.
- i. Silt fence or other approved sediment control devices shall be required along the entire curb line, except for approved opening where construction entrance will be installed or drainage flows away from curb. This device must be maintained until final stabilization is achieved.

- j. Ditch checks shall be required in ditch bottoms. Spacing for the check must be as followed: [**Height in feet** (of the sediment device used)] **X 100 / Slope Gradient**
- k. Dust control measures, such as application of water must be performed periodically due to weather, construction activity, and/or as directed by the City.
- l. Flows from diversion channels or pipes (temporary or permanent) must be routed to sedimentation basins or appropriate energy dissipaters to prevent the transport of sediment to outflow or lateral conveyors and to prevent erosion and sediment buildup when runoff flows into the conveyors.
- m. A concrete washout shall be installed on projects that require the use of concrete. All liquid and solid wastes generated by concrete washout operations must be contained in a leak-proof containment facility or impermeable liner. A sign must be installed adjacent to each washout facility to inform operators to utilize the proper facilities.
- n. All sediment control measures shall be used and maintained for the duration of the project until final stabilization has been achieved accordance with Section 1.7. If construction operations or natural events damage or interfere with any erosion control measures, they must be restored to serve their intended function.
- o. Additional sediment control measures shall be added as necessary to effectively protect the natural resources of the City. The temporary and permanent erosion control plans shall be revised as needed based on current site conditions and to comply with all applicable requirements.
- p. Restrict clearing and grading within 20 feet of an existing wetland boundary to provide for a protective buffer strip of natural vegetation.

### 1.3 Temporary Sediment Basins

- a. A temporary sediment basin (or permanent) shall be provided when 10 or more acres of disturbed soil drain to a common location prior to the runoff leaving the site or entering surface waters. The Permittee is also encouraged, but not required to install temporary sediment basins in areas with steep slope or highly erodible soils even if the area is less than 10 acres and it drains to one common area. The basins shall be designed and constructed according to the following requirements:
  - i) The basins must provide storage below the outlet pipe for a calculated volume of runoff from a 2 year, 24 hour storm from each acre drained to the basin, except that in no case shall the basin provide less than 1800 cubic feet of storage below the outlet pipe from each acre drained to the basin.
  - ii) Where no such calculation has been performed, a temporary (or permanent) sediment basin providing 3,600 cubic feet of storage below the outlet pipe per acre drained to the basin shall be provided where attainable until final stabilization of the site.
  - iii) Temporary basin outlets will be designed to prevent short-circuiting and the discharge of floating debris. The basin must be designed with the ability to allow complete basin drawdown (e.g., perforated riser pipe wrapped with filter fabric and covered with crushed gravel, pumps or other means) for maintenance activities, and provide a stabilized emergency overflow to prevent failure of pond integrity. Energy dissipation must be provided for the basin outlet.
  - iv) Temporary (or permanent) basins must be constructed and made operational concurrent with the start of soil disturbance that is up gradient of the area and contributes runoff to the pond.

- v) Where the temporary sediment basin is not attainable due to site limitations, equivalent sediment controls such as smaller sediment basins, and/or sediment traps, silt fences, vegetative buffer strips or any appropriate combination of measures are required for all down slope boundaries of the construction area and for those side slope boundaries deemed appropriate as dictated by individual site conditions. In determining whether installing a sediment basin is attainable, the Permittee must consider public safety and may consider factors such as site soils, slope, and available area on site. This determination must be documented in the SWPPP.
- vi) The Permittee shall maintain the sedimentation basins and will remain functional until an acceptable vegetative cover is restored to the site, resulting in a pre-development level rate of erosion. The city will not issue building permits for lots containing sediment basins until they have been removed or relocated based on the projects restoration progress.
- vii) Basins designed to be used for permanent stormwater management shall be brought back to their original design contours as defined in Section 1.7.

#### 1.4 Dewatering and Basin Draining

- a. If water cannot be discharged into a sedimentation basin before entering a surface water it must be treated with the appropriate BMPs, such that the discharge does not adversely affect the receiving water or downstream landowners. The Permittee must make sure discharge points are appropriately protected from erosion and scour. The discharge must be dispersed over riprap, sand bags, plastic sheeting or other acceptable energy dissipation measures. Adequate sediment control measures are required for discharging water that contains suspended soils.
- b. All water from dewatering or basin draining must discharge in a manner that does not cause nuisance conditions, erosion in receiving channels, on down slope properties, or inundation in wetlands causing significant adverse impact to wetlands.

#### 1.5 Inspections and Maintenance

- a. The Permittee shall be responsible for inspecting and maintenance of the BMPs
- b. The Permittee must routinely inspect the construction project once every 7 days during active construction and within 24 hours of a rainfall event of 0.5 inches or greater in 24 hours.
- c. All inspections and maintenance conducted during construction must be recorded in writing and must be retained with the SWPPP. Records of each inspection and maintenance activity shall include
  - i) Date and time of inspection.
  - ii) Name of person(s) conducting the inspections.
  - iii) Findings of inspections, including recommendations for corrective actions.
  - iv) Corrective actions taken (including dates, times, and the party completing the maintenance activities).
  - v) Date and amount of all rainfall events 0.5 inches or greater in 24 hours.
  - vi) Documentation of changes made to SWPPP.
- d. Parts of the construction site that have achieved final stabilization, but work continues on other parts of the site, inspections of the stabilized areas can be reduced to once a month. If work has been suspended due to frozen ground

- conditions, the required inspections and maintenance must take place as soon as runoff occurs or prior to resuming construction, whichever happens first.
- e. All erosion and sediment BMPs shall be inspected to ensure integrity and effectiveness. All nonfunctional BMPs shall be repaired, replaced or supplemented with a functional BMP. The Permittee shall investigate and comply with the following inspection and maintenance requirements.
  - f. All silt fences must be repaired, replaced, or supplemented when they become nonfunctional or the sediment reaches 1/3 of the height of the fence. These repairs shall be made within 24 hours of discovery, or as soon as field conditions allow access.
  - g. Temporary and permanent sedimentation basins must be drained and the sediment removed when the depth of sediment collected in the basin reaches 1/2 the storage volume. Drainage and removal must be completed within 72 hours of discovery, or as soon as field conditions allow access.
  - h. Surface waters, including drainage ditches and conveyance systems, must be inspected for evidence of sediment being deposited by erosion. The Permittee shall remove all deltas and sediment deposited in surface waters, including drainage ways, catch basins, and other drainage systems, and restabilize the areas where sediment removal results in exposed soil. The removal and stabilization shall take place within 7 days of discovery unless precluded by legal, regulatory, or physical access constraints. The Permittee shall use all reasonable efforts to obtain access. If precluded, removal and stabilization shall take place within 7 calendar days of obtaining access. The Permittee is responsible for contacting all local, regional, state and federal authorities and receiving any applicable permits, prior to conducting any work.
  - i. Construction site vehicle exit locations shall be inspected for evidence of off-site sediment tracking onto paved surfaces. Tracked sediment shall be removed from all off-site paved surfaces, within 24 hours of discovery, or if applicable, within a shorter time.
  - j. The Permittee is responsible for the operation and maintenance of temporary and permanent water quality management BMPs, as well as all erosion prevention and sediment control BMPs, for the duration of the construction work at the site. The Permittee is responsible until another Permittee has assumed control over all areas of the site that have not been finally stabilized or the site has undergone final stabilization, and a NOT has been submitted to the MPCA.
  - k. If sediment escapes the construction site, off-site accumulations of sediment shall be removed in a manner and at a frequency sufficient to minimize off-site impacts (e.g., fugitive sediment in streets could be washed into storm sewers by the next rain and/or pose a safety hazard to users of public streets).
  - l. All infiltration areas shall be inspected to ensure that no sediment from ongoing construction activities is reaching the infiltration area and these areas are protected from compaction due to construction equipment driving across the infiltration area.

#### 1.6 Pollution Management Measures/Construction Site Waste Control

- a. The Permittee must implement the following pollution prevention management measures on the site.
  - i) Solid Waste- Collected sediment, asphalt and concrete millings, floating debris, paper, plastic, fabric, construction and demolition debris and other wastes must be disposed of properly and must comply with MPCA disposal requirements.
  - ii) Hazardous Materials such as oil, gasoline, paint and any hazardous substances must be properly stored, including secondary containment,

to prevent spills, leaks or other discharge. Restricted access to storage areas shall be provided to prevent vandalism. Storage and disposal of hazardous waste shall be in compliance with MPCA regulations.

- iii) External washing of trucks and other construction vehicles must be limited to a defined area of the site. Runoff shall be contained and waste properly disposed of. No engine degreasing is allowed on site.
- iv) The City of Mendota Heights prohibits discharges of any material other than storm water, and discharges from dewatering or basin draining activities. Prohibited discharges include but are not limited to vehicle and equipment washing, maintenance spills, wash water, and discharges of oil and other hazardous substances.

### 1.7 Final Stabilization

- a. The Permittee must ensure final stabilization of the project. Final stabilization can be achieved in one of the following ways.
- b. All soil disturbing activities at the site have been completed and all soils will be stabilized by a uniform perennial vegetative cover with a density of at least 70 percent over the entire pervious surface area, or other equivalent means necessary to prevent soil failure under erosive conditions and;
  - i) All drainage ditches, constructed to drain water from the site after construction is complete, must be stabilized to preclude erosion; and
  - ii) All temporary synthetic, and structural erosion prevention and sediment control BMPs (such as silt fence) must be removed as part of the site final stabilization; and
  - iii) The Permittee must clean out all sediment from conveyances and from temporary sedimentation basins that are to be used as permanent water quality management basins. Sediment must be stabilized to prevent it from washing back into the basin, conveyances or drainage ways discharging off-site or to surface waters. The cleanout of permanent basins must be sufficient to return the basin to design capacity.
- c. For residential construction only, final stabilization has been achieved when:
  - i) Temporary erosion protection and down gradient perimeter control for individual lots has been completed and the residence has been transferred to the homeowner.
  - ii) The Permittee must distribute the MPCA "homeowner factsheet" to the homeowner so the homeowner is informed for the need, and benefits, of final stabilization.

### 1.8 Training: Training is required for those that are responsible for preparation of the SWPPP, management of the construction site and inspections.

- a. The SWPPP must provide a chain of command showing who prepared the SWPPP, who is responsible for the management of the construction site and inspections.
- b. The training shall consist of a course developed by a local, state or federal agency, professional organization, water management organization, or soil and water conservation district and must contain information that is related to erosion prevention, sediment control, or permanent stormwater management and must relate to the work that you are responsible for managing.

## 2.0 Stormwater Management Design Standards

### 2.1 Storm Sewer

- a. Provide for overflow routes to drain low points along streets or lot lines to ensure a freeboard of 2' from the lowest ground adjacent to building and the

- calculated 100-year storm HWL elevation. Design criteria verifying the adequacy of the overland drainage route capacity is required.
- b. The storm sewer alignment shall follow the sanitary sewer and watermain alignment where practical with a minimum of 10' of separation. Storm sewer placed along the curb alignment shall be along the curb opposite the watermain to maintain the 10' separation.
  - c. Catch basins shall be located on the tangent section of the curb at a point 3' from the point of curve. Mid-radius catch basins will not be allowed. Also, catch basins shall be designed to collect drainage on the upstream side of the intersection.
  - d. The maximum spacing between manholes is 400'.
  - e. Manhole steps will be aligned and over the downstream side of the manhole. Steps within manholes will be:
    - i) 1" +/- Horizontal Alignment
    - ii) 1" +/- Vertical Alignment per latest OSHA Standards
  - f. Any connections to existing manholes or catch basins shall be core drilled or the opening cut out with a concrete saw. No jack hammering or breaking the structure with a maul is permitted. Also, all connections to an existing system will require a manhole for access.
  - g. To the greatest extent possible, manholes shall be placed in paved surfaces outside of wheel paths, (3' and 9' off centerline) or other readily accessible areas.
  - h. Minimum pipe size shall be 12" diameter.
  - i. Aprons or flared end sections shall be placed at all locations where the storm sewer outlets a ponding area. All inlet/outlet flared end sections shall be furnished with hot dipped galvanized trash guards. All trash guard installations will be subject to approval by the City Engineer. The last three pipe joints from the flared end section shall be tied together.
  - j. Riprap and filter blanket shall be placed at all outlet flared end sections.
  - k. The placement of the riprap shall be by hand. The minimum class of riprap shall be MnDOT 3601.2, Class III. A design criterion justifying the size and amount of riprap is required. Geotextile material is not allowed for filter aggregate where ice action along the shore line may tear the geotextile.
  - l. The invert elevations of the pond inlet flared end sections shall match the NWL of the pond. Submerged outlets will only be allowed at the discretion of the City Engineer.
  - m. If the storm sewer is to be installed less than 10' deep within private property, the easement shall be a minimum of 20' wide with the pipe centered in the easement. If the storm sewer is 10' deep or greater, then the easement shall be twice as wide as the depth or as required by the City.
  - n. Junction manholes should be designed to limit the hydraulic head increase by matching hydraulic flow lines and by providing smooth transition angles.
  - o. In the development of any subdivision or ponding area, the developer and/or property owner is responsible for the removal of all significant vegetation (trees, stumps, brush, debris, etc.) from any and all areas which would be inundated by the designated controlled Normal Water elevation (NWL) of any required ponding easement as well as the removal of all dead trees, vegetation, etc., to the High Water Level (HWL) of the pond.
  - p. Outlet control structures from ponding areas are required as directed by the City. Location and appearance of outlet structures shall be subject to City approval and may require landscape screening.
  - q. Sump manholes with 3-foot sumps shall be constructed as the last structure that is roadway accessible prior to discharge to any waterbody.

- r. Inlets should be placed and located to eliminate overland flow in excess of 1,000 feet on minor streets, or a combination of minor streets and swales, and 600 feet on collector streets and arterials. Additionally, inlets should be located such that 3 cfs is the maximum flow at the inlet for the 10-year design storm.

## 2.2 Outlet and Inlet Pipes

- a. Inlet and outlet pipes of stormwater ponds should be extended to the pond normal water level whenever possible.
- b. Outfalls with velocities less than 4 feet per second (fps) that project flows downstream into the channel in a direction 30 degrees or less from the normal channel axis generally do not require energy dissipators or stilling basins, but do require riprap protection.
- c. Where an energy dissipator is used, it should be sized to provide an average outlet velocity of less than 4 fps, unless rip rap is also used. In the latter case, or when discharge occurs at NWL of a pond, the average outlet velocity should not exceed 6 fps.
- d. Where outlet velocities exceed 6 fps, the design should be based on the unique site conditions present. Submergence of the outlet or installation of a stilling basin approved by the City is required when excessive outlet velocities are experienced.
- e. In the case of discharge to channels, rip rap should be provided on all outlets to an adequate depth below the channel grade and to a height above the outfall or channel bottom. It should be placed over a suitably graded filter material and filter fabric to ensure that soil particles do not migrate through the rip rap and reduce its stability. Rip rap should be placed to a thickness at least 2.5 times the mean rock diameter so as to ensure that it will not be undermined or rendered ineffective by displacement. If rip rap is used as protection for overland drainage routes, grouting may be recommended.

## 2.3 Channels and Overland Drainage

- a. Overland drainage routes where velocities exceed 6 fps should be reviewed by the City Engineer and approved only when suitable stabilization measures are proposed.
- b. Open channels and swales are recommended where flows and small grade differences prohibit the economical construction of an underground conduit. Open channels and swales can provide infiltration and filtration benefits not provided by pipe.
- c. Whenever possible, a minimum slope of 2% should be maintained in unlined open channels and overland drainage routes. Slopes less than 2% and greater than 1% are difficult to construct and maintain and may require an underdrain system. Slopes less than 1% are not allowed for lot drainage and channels designed primarily for conveyance.
- d. Minimum grade for lot drainage swales and lot grading shall be 2% or greater.
- e. Maximum length for drainage swales shall be 300 feet or a total of eight lots draining to a point, or as approved by the City Engineer.
- f. Channel side slopes should be a maximum of 4:1 (horizontal to vertical) with gentler slopes being desirable. Where space permits, slopes should be cut back to match existing grade.
- g. Rock rip rap should be provided at all points of juncture between two open channels and where storm sewer pipes discharge into a channel.
- h. The design velocity of an open channel should be sufficiently low to prevent erosion of the bottom. Rip rap or concrete liners should be provided in areas where high velocities cannot be avoided.

- i. Periodic cleaning of an open channel is required to ensure that the design capacity is maintained. Therefore, all channels should be designed to allow easy access for equipment.

#### 2.4 Ponds

- a. Maximum allowed pond slopes are 3:1, though 4:1 slopes are preferred. Pond slopes steeper than 4:1 shall have erosion control blanket installed immediately after finish grading. In residential areas slopes no steeper than 4:1 shall be allowed. 3:1 slopes may be allowed in "maintained" areas as approved by the City Engineer. 3:1 slopes are not allowed for road fill sections adjacent to water bodies.
- b. All constructed ponds and wetland mitigation areas shall have an aquatic or safety bench around their entire perimeter. The aquatic bench is defined as follows:
  - i) Cross slope no steeper than 10:1
  - ii) Minimum width 10 feet
  - iii) Located from pond NWL to one foot below pond NWL
- c. All constructed ponds and wetland mitigation areas shall have a maintenance access bench around sufficient perimeter to provide access to all inlets and outlets. At a minimum the maintenance bench should extend around 50% of the basin perimeter.
- d. Elevation separations of buildings with respect to ponds, lakes, streams, and storm water features shall be designed as follows:
  - i) The lowest ground elevation adjacent to homes and buildings must be a minimum of two feet above the calculated 100-yr HWL or 1.5 feet above the EOF, whichever criteria leads to the higher elevation.
  - ii) Landlocked lakes and wetlands require either 1) a five-foot separation between basin HWL and lowest ground elevation adjacent to building or 2) a three-foot separation between basin HWL for back to back 100-year storms and the lowest ground elevation adjacent to building or 3) three-foot separation between the highest known or recorded basin elevation in the case of large wetlands and lakes and lowest ground elevation adjacent to building. Whichever of the three methods yields the highest allowable ground at building elevation should be the one used.
- e. Drainage easements for ponds, lakes, wetlands, streams etc. shall encompass an area to one foot (vertical) above the calculated 100-year HWL.
- f. Maximum pond wet volume depth is 8 feet; minimum wet volume depth is 3 feet.
- g. Flood bounce is defined as the vertical difference between pond NWL and pond HWL. Flood bounce shall not exceed 6 feet except in the case of regional basins, as defined by the City Engineer.
- h. All ponds shall have outlet skimming for up to the 5-year event.
- i. All ponds shall be graded to one-foot below design bottom elevation. This "hold down" allows sediment storage until such time as site restoration is complete.
- j. The top berm elevation of ponds shall be a minimum of 1.5 feet above the 100-year pond HWL.
- k. Grading shall not block or raise emergency overflows from adjoining properties unless some provision has been made for the runoff that may be blocked behind such an embankment.
- l. Seeding around ponds should be MnDOT standard mix 328 or BWSR equivalent.

### 3.0 Stormwater Management Performance Measures

### 3.1 Volume Management

- a. For development projects, the performance benchmark for runoff volume reduction, otherwise known as abstraction, is a volume equivalent to 0.5 inches of runoff off all new impervious surfaces. Allowable BMPs for abstracting runoff volume and methods for calculating abstraction are:
  - i) Infiltration benches adjacent to constructed ponds
  - ii) Rainwater gardens or infiltration areas separate from ponds such as depressed medians or grassed areas adjacent to parking lots and buildings
  - iii) Pervious pavement or pavers
  - iv) Vegetated swales
  - v) Constructed wetlands
  - vi) Underground storage with infiltration
  - vii) Underground storage with water recycling for irrigation
  - viii) Green roofs
- b. For linear projects these standards shall apply only to newly created impervious surfaces.
- c. For all infiltration calculations the following infiltration rates shall be assumed. As an alternative, percolation tests can be conducted and submitted to determine the actual rate of infiltration after subgrading is complete.

Table 3.1 Infiltration Rates (Source: Minnesota Stormwater Manual)

Hydrologic Soil Group	Soil Textures	Corresponding Unified Soil Classification	Infiltration Rate (inches/hour)
A	Gravel, sand, sandy gravel, silty gravel, loamy sand, sandy loam	GW – Well-graded gravel or well-graded gravel with sand	1.63
		GP – Poorly graded gravel or poorly graded gravel with sand	0.8
B	Loam, silt loam	SM – Silt sand or silty sand with gravel	0.6
		ML – Silt OL – Organic silt or organic silt with sand or gravel or gravelly organic silt	0.3
C	Sandy clay loam	GC – Clayey gravel or clayey gravel with sand SC – Clayey sand or clayey sand with gravel	0.2
D	Clay, clay loam, silt clay loam, sandy clay, silt clay	CL – Lean clay or lean clay with sand or gravel or gravelly lean clay CH – Fat clay or fat clay with sand or gravel or gravelly fat clay OH – Organic clay or organic clay with sand or gravel or gravelly organic clay MH – Elastic silt or elastic silt or elastic silt with sand or gravel	<0.2

- d. Infiltration areas shall be designed to infiltrate water in 48 hours.
- e. Infiltration areas shall not be constructed in karst or fractured bedrock areas, nor should they be constructed adjacent to steep slopes.
- f. Infiltration practices shall be left off-line until the upgradient drainage areas are stabilized.

- g. The volume management standard is waived in areas of known soil contamination or for developments where the potential for spills makes infiltration inadvisable.
- h. Infiltration areas shall not have a 100-year design storm flood bounce that exceeds 3 feet.
- i. Pretreatment, in the form of forebays or filter strips, shall be considered for all infiltration areas.
- j. For infiltration benches adjacent to ponds the following standards apply:
  - i) Benches shall have slopes no steeper than 6:1 over the proposed infiltration zone. A slope of 10:1 is preferred.
  - ii) Benches may be excavated and backfilled with sand or sandy topsoil to provide additional storage volume for infiltration without violating the 3 foot flood bounce requirement.
- k. Porous pavement or pavers shall be considered pervious surface for the purposes of infiltration calculations.
- l. Porous pavement or pavers are considered sufficient to infiltrate water off impermeable surfaces at a ratio of 5:1 (impermeable surface area to porous pavement area).

### 3.2 Water Quantity

- a. At a minimum, detention basins should maintain existing flow rates for the 2, 10, and 100-year 24-hour rainfalls.

Table 3.2. Storm Events

Event	Rainfall/Snowmelt depth (inches)
2-year, 24 hour	2.8
10-year, 24 hour	4.2
100-year, 24 hour	5.9
100-year, 10 day snowmelt	7.2

- b. Detention basins shall be designed with capacity for the critical 100-year event, which is defined as the 100-year event that produces the highest water level among a 2-hour, 6-hour, 12-hour, or 24 hour rainfall events or the 10-day, 7.2-inch snowmelt runoff event.
- c. The maximum duration for rainfall critical event analysis shall be 24 hours except in cases where basins are landlocked, where back to back 24-hour events and the 10-day 7.2-inch snowmelt runoff event shall also be used. In all cases a hydrograph method of analysis should be used. For the 24-hour rainfall event, or back to back 24-hour rainfall events, an SCS Type II distribution should be used. For shorter duration critical events other distributions may be used with the approval of the City Engineer.
- d. All drainage system analyses and designs shall be based on proposed full development land use patterns.
- e. Development adjacent to a landlocked basin and the basin is not provided an outlet, freeboard should be determined based on one of three methods (whichever provides for the highest freeboard elevation):
  - i) Three feet above the HWL determined by modeling back to back 100-year, 24-hour events,
  - ii) Three feet above the highest known water level, or
  - iii) Five feet above the HWL determined by modeling a single 100-year, 24-hour event.

- f. When modeling landlocked basins, the starting water surface elevation should be the basins Ordinary High Water elevation, which can be determined through hydrologic modeling or, in the case of a DNR regulated basin, from a DNR survey.
- g. For basins with a suitable outlet, freeboard will be 2-feet above the HWL determined by modeling the 100-year critical event. Emergency overflows a minimum of 1.5 feet below lowest ground elevation adjacent to a structure should also be provided.
- h. Adjacent to channels, creeks, and ravines freeboard will also be 2 feet to the 100-year critical event elevation.

### 3.3 Water Quality

- a. Storm water detention facilities constructed in Mendota Heights shall be designed according to the standards reflected in the MPCA publication Protecting Water Quality in Urban Areas, the State of Minnesota Stormwater Manual, and the design criteria from the National Urban Runoff Program.
- b. For sites where volume management standards are not obtainable due to soil type, high groundwater or distance to bedrock is less than 3 feet, the wet volume shall be sized according to the calculated runoff from the 2.5-inch, 24 hour rainfall event unless the requirements in Table 3.3 call for increased treatment capacity.
- c. For the case of discharges to wetlands a level of pretreatment will be required. Table 3.3 summarizes the pretreatment requirements. BMPs can be used to accomplish the pretreatment requirements given in Table 3.3.

Table 3.3 Stormwater Protection Standards

Management Category	Stormwater Phosphorus Pretreatment Requirement
Highly Susceptible <sup>1</sup>	150 ppb <sup>2</sup>
Moderately Susceptible	200 ppb
Slightly Susceptible	200 ppb
Least Susceptible	250 ppb

1) Includes lakes, creeks, streams, and rivers (as defined by the USGS).

2) A multi-cell configuration with lower cell being a constructed wetland or infiltration basin is recommended to achieve these levels of removal.

- d. In any case, the standard identified above that leads to the highest treatment capacity is the one required of any specific development.