APPENDIX C
Developer's Handout

The City of Rosemount has developed a number of policies to address storm water management within the City.

A. Water Quantity

1. For newly developing areas, no discharge or infiltration can be assumed for purposes of establishing the 100-year, 24-hour storm event high water elevation. For events with longer duration, a maximum peak stormwater discharge rate will be limited to 0.05 cfs/acre.

2. In the event that the City will not be providing a regional system, storage of the runoff from the 100-year, 24-hour storm event is required on-site.

3. The City prefers to provide rate control through the use of regional storm water retention systems versus site-by-site retention systems if regional systems are available.

4. Drainage calculations must be submitted to demonstrate adequate rate control, storage, and infiltration are provided as per the requirements of the Comprehensive Stormwater Management Plan.

5. New storm sewer systems shall be designed to accommodate discharge rates from a 10-year storm event.

6. Storm events or runoff events shall be defined as outlined below:

   a. The 2-year storm event is defined as 2.8" of rainfall in 24-hours.
   b. The 10-year storm event is defined 4.2" of rainfall over 24-hours.
   c. The 100-year storm event is defined as 6.0" of rainfall over 24-hours.
   d. The 10-day snowmelt is defined as 7.1" of runoff.

7. Development will be required to provide1/12 of an acre-foot/acre/day of infiltration for the entire site's acreage. Pretreatment of stormwater is required prior to discharge to an infiltration basin. Options available for infiltration design are included in the Comprehensive Stormwater Management Plan.

8. Infiltration rates of soils for design purposes are as follows:

   Hydrologic soil group A : 0.30 in/hour
   Hydrologic soil group B : 0.15 in/hour
   Hydrologic soil group C : 0.07 in/hour
   Hydrologic soil group D : 0.03 in/hour

Different infiltration rates will be considered (up to a maximum of 3.0 in/hour) by the City Engineer on a site-by-site basis based on percolation tests or other pertinent information conducted by a professional soil scientist or Professional Engineer.

9. The City prohibits activities within the 100-year floodplain unless compensatory floodplain mitigation is provided at a 1:1 ratio by volume and it is demonstrated that the 100-year floodplain will not be impacted. In addition, no filling within the designated floodway of a drainage channel shall be allowed. Suitable calculations must be submitted and approved demonstrating that filling in the flood fringe will not impact the 100-year flood profile.

10. The City shall restrict or prohibit uses within the floodplain that are dangerous to health, safety, or property in times of flood or which cause increase in flood elevations or velocities.

11. The City requires that for any new or redevelopment, at least 3 feet of freeboard between the anticipated 100-year high water elevation and the minimum building opening be maintained. If this 3 foot freeboard requirement is considered a hardship, standard could be lowered to 2 feet if approved by the City Engineer and the following can be demonstrated:

    a. That within the 2-foot freeboard area, stormwater storage is available which is equal to or exceeds 50% of the stormwater storage currently available in the basin below the 100-year high water elevation.

    b. That a 25% obstruction of the basin outlet over a 24-hour period would not result in more than 1 foot of additional bounce in the basin.

    c. An adequate overflow route from the basin is available that will provide assurance that 1 foot of freeboard will be maintained for the proposed low building opening.

12. The City requires that minimum basement floor elevations be set to an elevation that meets the following criteria:

    a. The basement floor elevation will be 4 feet above the currently observed groundwater elevations in the area (FHA policy).

    b. The basement floor elevation will be 2 feet above the elevation of any known historic high groundwater elevations for the area. Information

on historic high groundwater elevations can be derived from any reasonable sources including piezometer data, soil boring data, percolation testing, etc.

c. The basement floor elevation will be 1 foot above the 100-year high water elevation for the area unless it can be demonstrated that this standard creates a hardship. If a hardship is demonstrated, this requirement could be waived if a registered geotechnical engineer documents that the basement floor will be one foot above the highest anticipated groundwater elevation that could result from high surface water elevations raising the groundwater in the area during a 100-year critical duration rainfall event. The impact of high surface water elevations on groundwater elevations in the vicinity of the structure can take into consideration the site's distance from the floodplain area, the soils, the normal water elevation of surface depressions in the areas, the static groundwater table and historic water elevations in the area.

B. Water Quality

1. In the design and construction of new, or modifications to the existing storm water conveyance systems, pretreatment of storm water runoff to Nationwide Urban Runoff Program (NURP) recommendations must be provided prior to discharge to wetlands and water bodies classified as Preserve and Manage I as outlined in the City's Wetland Management Plan and infiltration basins. The NURP design guidelines for the City are as follows:

   a. A permanent pool ("dead storage") volume below the principal spillway (normal outlet), which shall be greater than or equal to the runoff from a 2.5 inch storm over the entire contributing drainage area assuming full development.

   b. A permanent pool average depth (basin volume/basin area), which shall be >4 feet, with a maximum depth of <10 feet.

   c. An emergency overflow (emergency outlet) adequate to control the one percent frequency/critical duration rainfall event.

   d. 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 one foot deep below the normal water level is recommended to enhance wildlife habitat, reduce

potential safety hazards, and improve access for long-term maintenance.

e. To prevent short-circuiting, the distance between major inlets and the normal outlet shall be maximized.

f. A flood pool ("live storage") volume above the principal spillway shall be adequate so that the peak discharge rates from 99%, 10%, and 1% chance critical duration storms are no greater than pre-development basin watershed conditions. Additional discharge restrictions may be required as outlined in the Stormwater Management Plan.

g. Retardance of peak discharges for the more frequent storms can be achieved through a principal spillway design, which may include a perforated vertical riser, small orifice retention outlet, or compound weir. Additional discharge restrictions may be required as outlined in the Stormwater Management Plan.

h. A protective buffer strip of vegetation surrounding the permanent pool at a minimum width of 15 feet.

2. Sediment and nutrient pretreatment shall be provided to the extent necessary as outlined in the City's Wetland Management Plan.

3. New developments will be required to provide mitigative measures if the development results in an increase in the phosphorus concentration of downstream water bodies that are classified as Preserve or Manage I as outlined in the City's Wetland Management Plan. Appropriate documentation must be submitted to the City that indicates the pre- and post development phosphorus concentrations of Preserve or Management I water bodies.

4. Two foot sump catch basin inlets are required for all new or redevelopment within a street. A 3-foot sump catch basin or manhole is required within the street just prior to discharge to a wetland, lake, or stream.

5. Development plans must be in conformance with the shoreland management ordinance.

6. The City will require skimmers in the construction of new pond outlets, and add skimmers to the existing system whenever feasible and practical.

Skimmer design shall provide for skimmers that extend a minimum of 6 inches below the water surface and minimize the velocities of water passing under the skimmer to less than 0.5 feet per second for 1-year rainfall events. A skimmer detail is shown on **Appendix H.**

7. For newly developing areas, buffers as outlined in the Wetland Management Plan will be required. These buffers include:

Preserve Wetlands:	75 Ft.
Manage I Wetlands	50 Ft.
Manage II Wetlands	30 Ft.
Utilize Wetland	15 Ft. in non-agricultural areas only.

C. Wetlands

1. Prior to issuance of any city grading or building permits, all development and redevelopment activities must comply with the Wetland Conservation Act and Wetland Management Plan. A copy of the Wetland Conservation Act Rules and the Comprehensive Wetland Management Plan in included in **Appendix F**.

2. For new development, buffers around wetlands as outlined in the Wetland Management Plan will be required. These buffers include:

Preserve Wetlands:	75 Ft.
Manage I Wetlands	50 Ft.
Manage II Wetlands	30 Ft.
Utilize Wetland	15 Ft. in non-agricultural areas only.

Developers shall be responsible for the installation of monuments marking the outer edge of the buffer.

D. Erosion

1. The City will require erosion and sediment control on all construction sites to be in conformance with City ordinance and the Minnesota Pollution Control Agency's Best Management Practices.

APPENDIX D
Low Impact Development Policy Document
and
Infiltration Design Options

WSB
& Associates Inc.

June 4, 2007

Andy Brotzler, P.E.
City Engineer
City of Rosemount
2875 145th St. W.
Rosemount, MN 55068

Re: Incorporating Alternative Best Management Practices (BMP's) /Low Impact Development (LID) Programs into the City of Rosemount Surface Water Management Plan

WSB Project No. 1668-12

Dear Mr. Brotzler:

As requested by City staff, this letter has been prepared to provide the City of Rosemount with overall policy recommendations related to incorporating Alternative BMP's /LID Programs into the City's Surface Water Management Plan (SWMP).

Introduction /Background

The City of Rosemount is in the process of exploring the benefits, drawbacks, costs effectiveness and feasibility of various stormwater water management treatment methods. Several alternative stormwater management techniques have been explored to determine how these practices fit with the City's existing approach to stormwater management.

Current Stormwater Management Requirements for Development

The City of Rosemount has no defined outlet at this time to either the Mississippi River or Vermillion River and will not have one available for many years to come. The existing conditions require that new development store and infiltrate the stormwater runoff for all storms, up to the 100 year 24-hour storm (6" event), in large constructed regional stormwater ponds. The figure below further outlines the design standards for these basins. The implementation of these requirements should result in no discharge of water out of the City and an overflow at reduced rates during extreme events. This standard exceeds typical raingarden infiltration requirements by over 6 fold as they routinely require infiltration of only the first 0.5" to 1.0" of rainfall.

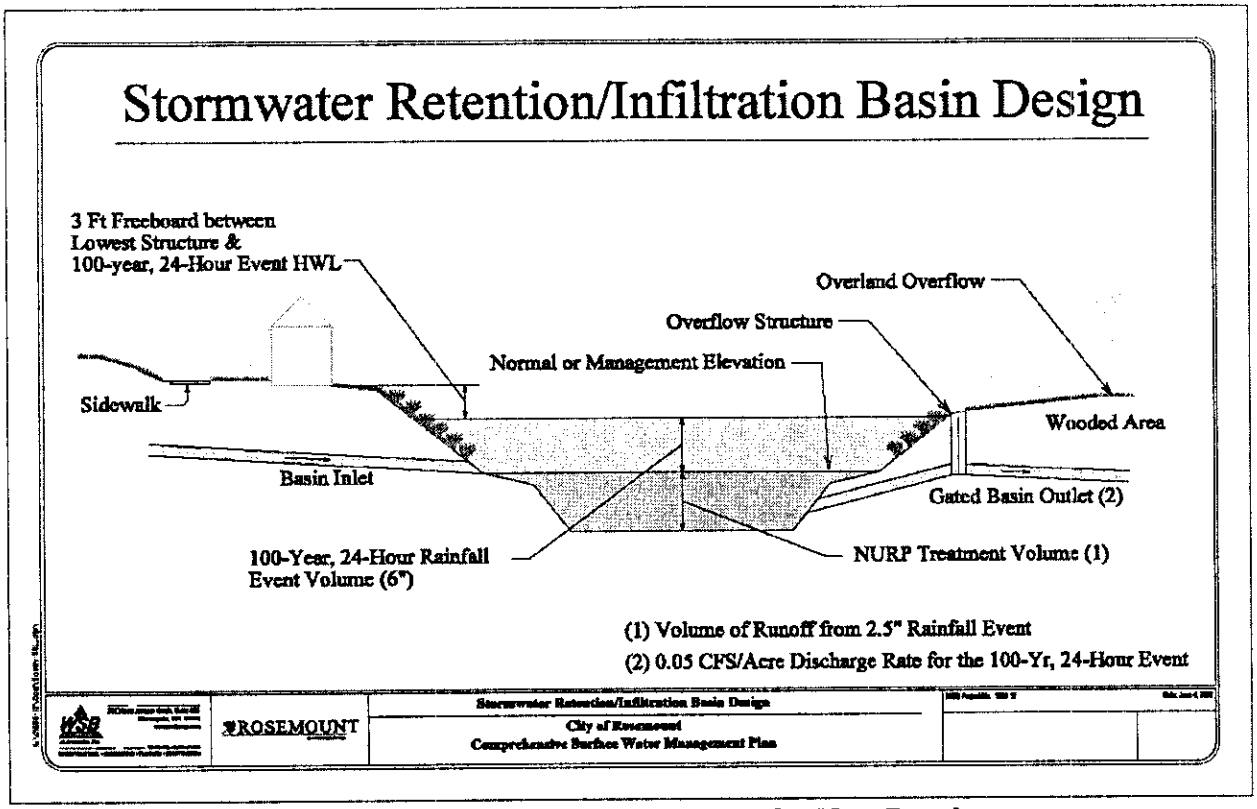


Figure 1. Current Stormwater Management Standards for New Development

Incorporating Alternative BMP's into New Development

Because of the large volumes required to be infiltrated for new development, the benefits for construction of raingardens and related practices is somewhat redundant and has less value than in communities with less stringent infiltration design standards. While these practices would provide some habitat benefits, the 100 year 24-hour design storm would quickly overflow out of these practices and discharge into the large downstream regional stormwater ponds. The requirement of a redundant system that requires both regional ponds and alternative BMP's would not result in measurable cost savings or increase in developable area for the developer and may increase the City's long-term stormwater maintenance costs.

Incorporating Alternative BMP's into Redevelopment Projects

For those existing developed areas constructed before the onset of the above mentioned requirements, the City should encourage use of on-site alternative BMP's, such as rain gardens and vegetative swales, to meet the City's infiltration and rate control requirements. For many existing developed areas of the City, stormwater may discharge directly into public waters or wetlands and it is not always feasible to retrofit large ponds into existing neighborhoods to meet the City's existing standards. In these cases, the use of raingardens and related practices is a cost –effective and practical alternative to improving water quality and reducing discharge volumes over existing conditions.

Policy Recommendations

Continue to utilize current standards in new developed areas. Additional low impact measures are not required given that the overall standards and goals for low impact development are already exceeded within the existing SWMP polices identify below:

- In the event that the City will not be providing a regional system, storage and infiltration of the runoff from the 100 year 24 hour storm event is required on site.

- Infiltration rates of soils for design purposes are as follows:
  Hydrologic soil group A : 0.50 in/hour
  Hydrologic soil group B : 0.25 in/hour
  Hydrologic soil group C : 0.10 in/hour
  Hydrologic soil group D : 0.03 in/hour

For redevelopment projects in developed areas, alternative BMP's, such as rain gardens and vegetative swales, would comply with City standards provided it can be demonstrated that :

- The site drains to a public water or wetland prior to discharge to a regional basin (built to existing stormwater standards);
- The landowner agrees to a maintenance agreement **(see attached)**. This maintenance identifies that the landowners will be responsible for all ongoing weeding and maintenance;
- The projects adheres to City specifications **(see draft raingarden specifications – Attached)**.

Thank you for the opportunity to provide you with this initial information related to these important issues. We look forward to continuing to implement many of these programs in the near future. If you have any questions, please feel free to give me a call at (763) 541-4800.

Sincerely,

WSB & Associates, Inc.

Pete Willenbring
Vice President

Attachments:

- Draft Maintenance Agreement
- Draft Rain garden Design and Maintenance Specifications

DRAFT

City of Rosemount
Rain Garden / Infiltration Swale Agreement

The undersigned is the owner of property at _____ within the City of Rosemount. The owner has agreed to the construction of a rain garden or infiltration swale that is partially within the City's right-of-way and partially within private property at this location.

As part of the agreement, the owner agrees to:

1. Construct the rain garden or Infiltration Swale; and
2. Install the plantings per an agreed upon landscaping plan; and
3. Maintain the entire rain garden as outlined in the Rain Garden Information Fact Sheet.

If the rain garden is no longer being maintained or the owner can no longer maintain the rain garden, the owner hereby agrees that the City can enter private property to maintain or to fill in the rain garden. The City will provide the owner with 30-days notice if the rain garden is proposed to be filled or maintained.

Dated this _____ day of _____ 2007.

PROPERTY OWNER:

_____

_____

ADDITIONAL CONDITIONS AGREED TO:

_____

_____

AGENT FOR THE City of Rosemount

_____

-DRAFT -
City of Rosemount Rain Garden Projects
-- Technical Specifications --

General

- Rain garden plantings may include nursery cultivars selected for the site conditions, provided that no plants identified as invasive or prohibited species by the Department of Natural Resources or University of Minnesota Extension Service may be used.
- Keep a record of the species planted, number of plants, and source of the plants or seed.
- The landowner is responsible for obtaining all required local and state permits, including the Department of Natural Resources permit for planting native plants in shoreland areas (see http://www.dnr.state.mn.us/shorelandmgmt/apg/permits.html for permit application form). Only plants native to Minnesota may be used for shoreland and streambank restoration plantings.

Installation/Planting

- Locate any utilities in the area before you dig (Gopher One-Call: 651-454-0002).
- Seedlings can be planted from mid-May to mid-September. The ideal time frame for seeding is between April 15 and July 20 or September 20 to October 20. Summer plantings may require frequent watering.
- Remove the existing vegetation by smothering with heavy black plastic for several months, or applying a herbicide containing glyphosate, such as Round-Up®. If herbicide is used, follow all manufacturers' directions. If working near a water body, be sure to use a herbicide formulation specifically designated for use near water, such as Rodeo®. Also note that a Department of Natural Resources (DNR) permit is required for applying herbicide below the ordinary high water level (OHW) of a lake, stream or DNR-protected wetland.
- Do not till the soil once the vegetation has been killed. The dead roots will help prevent erosion.
- If herbicides have been used during site preparation, wait two weeks before planting/seeding. Additional treatments may be necessary if eradicating persistent species such as reed canary grass.
- Follow the approved planting plan with respect to plant spacing and planting/seeding methods.
- If exposing bare soil on a slope, install an erosion blanket or use another sediment control method to prevent soil from moving off site or into the adjacent water body.
- Do not fertilize the planting area.
- Plantings must be protected from erosion with mulch or erosion control blanket.
    - Place erosion control blanket on any areas with bare soils or that are below the OHW.
    - Spread 2" of shredded hardwood mulch over the upland planting areas down to the ordinary high water level. Wood chips tend to float and should be avoided.
- If necessary, protect the new plants from disturbance by carp or geese by fencing off the planting area for one growing season (wire mesh or other temporary fencing works well).
- Water the plants immediately after planting.

Maintenance (see also summary table below)

- Do not fertilize.

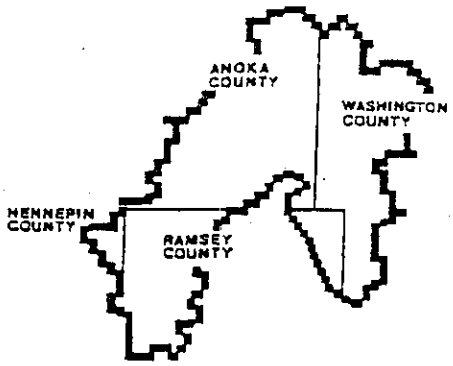
- Ensure that your planting receives at least one inch of water per week for the first 2 months. If watering is needed, give your plants one good soaking per week. After establishment, watering should not be needed except in periods of extreme drought.
- Hand weed the planting area once a month, paying special attention to any invasive species such as purple loosestrife and reed canary grass. Leaving plant tags next to your plugs or purchasing a plant ID book may help in determining which plants are undesirable. After the first growing season, weeding once or twice each year should be sufficient.
- If invasive species, such as reed canary grass, present a problem, plants can be kept in check through hand removal or by carefully sponging/painting herbicide on the individual plants. Avoid spraying herbicide in the planting area to prevent damage to adjacent native plants.
- Dead plant material can be left standing at the end of the growing season, to provide wildlife habitat and visual interest during the winter. Dead plant material can be removed in the spring to allow more room for new growth.
- Once the restoration is well established, mow (spring) or burn (spring or fall, but first check local and state ordinances) to prevent encroachment by invasive weeds and woody shrubs/trees.

Table 1: General maintenance requirements for shoreland/rain garden plantings

Maintenance Item	Year 1	Year 2	Year 3 and beyond
Watering (transitional and upland plants)	Daily-weekly	Only if drought	Only if drought
Fertilizing (this only encourages problem plants)	None	None	None
Weed control	Weekly-monthly	Monthly	Biannually to annually; also mow or burn every 3 to 5 years.
Plant replacement (Replant or anchor uprooted aquatic plants. Once established, aquatics require little or no long-term maintenance)	None	Spring or fall as necessary	Spring or fall as necessary.
Erosion control structure repair	Ongoing inspection, repair as necessary	Inspect after storm, repair as necessary	Inspect after storm, repair as necessary
Fencing/enclosure	Critical if geese or carp are a problem	Use as necessary	Use as necessary
Tree & shrub pruning	None	Remove dead/ diseased branches in late winter	Remove dead/ diseased branches in late winter, prune to shape

*** (Information Above Adapted from Rice Creek and Prior Lake Spring Lake Watershed District publications)**

STORMWATER INFILTRATION GUIDANCE



Published by Rice Creek Watershed District
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Introduction

This document presents guidance for infiltration practices in the Rice Creek Watershed District. Historically, stormwater management in the District focused on controlling peak runoff rates. However, scientists and engineers now understand the need to also manage the volume of runoff. Management of runoff volume benefits developers, residents, cities, and the natural environment.

Developers benefit from reduced pipe size and cost. Cities and residents benefit from reduced frequency and duration of flooding and improved water quality. This is particularly important in basins with restricted outlets. Controls targeting peak runoff rates may decrease flood stages in these areas, but without volume control, flood inundation is longer and storage volumes fill increasing the risk of flooding from the next rainfall.

The environment benefits because infiltration duplicates "natural" rainfall adsorption mechanisms, better mimics natural groundwater stream baseflow relationships, traps pollutants, slows runoff velocities, sustains base flows, and protects aquatic organisms from high turbulent flows.

The Rice Creek Watershed District's goals with respect to infiltration are straightforward:

- To reduce runoff
- Infiltrate runoff which occurs

These will be accomplished by:

- Maximizing pervious surfaces and minimizing impervious surfaces from development.
- Retaining the condition of landlocked basins.
- Promoting practices that minimize soil compaction during construction and maximize post-construction infiltration.
- Promoting construction of infiltration Best Management Practices.

Rules and Regulations

Development resulting in the creation of impervious surfaces will be required to explicitly address the feasibility of Best Management Practices to first, limit the loss of pervious area and second, to infiltrate runoff which occurs from impervious areas.

Documentation of the feasibility will need to address the extent to which items in the checklist on the last page of this guide are included or excluded from the final plan.

Design Parameters

This section of the guide presents design parameters for infiltrating runoff which occurs from impervious surfaces. Note that design parameters apply to runoff from impervious areas and there is a direct benefit in terms of reduced infiltration system sizing from minimizing the loss of pervious surfaces.

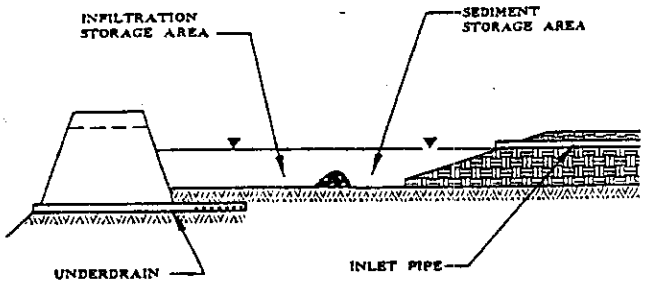
Documentation of feasibility must be completed showing systems are capable of infiltrating site runoff from the Minneapolis-St. Paul median storm of 0.34 inches in 72 hours. Infiltration volume shall be calculated using the appropriate Hydrologic Soil Group Classification and saturated infiltration rates from the following table unless specific rates are measured by a Registered Soil Scientist. Permanent pool areas of wet ponds tend to lose infiltration capacity and will not be accepted as an infiltration practice.

Hydrologic Soil Group	Infiltration Rate	Soil Textures
A	0.50 in/hr	Sand, loamy sand, or sandy loam
B	0.25 in/hr	Silt loam or loam
C	0.10 in/hr	Sandy clay loam
D	0.03 in/hr	Clay loam, silty clay loam, sandy clay silty clay, or clay

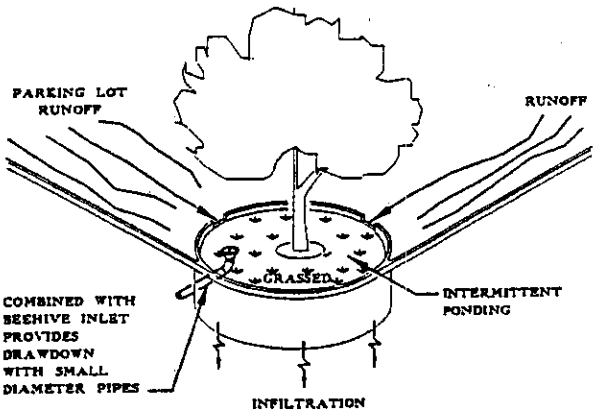
Source: Urban Hydrology for Small Watersheds, SCS, June 1986.

Design Parameters

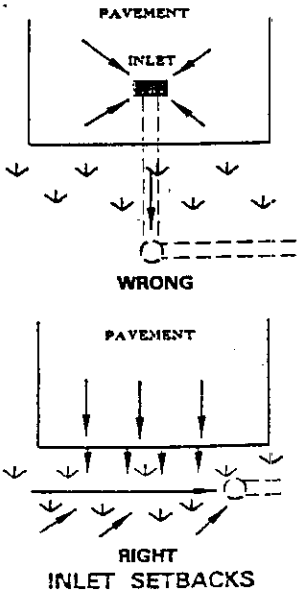
Potential practices are provided in the checklist on the last page with selected practices detailed below.



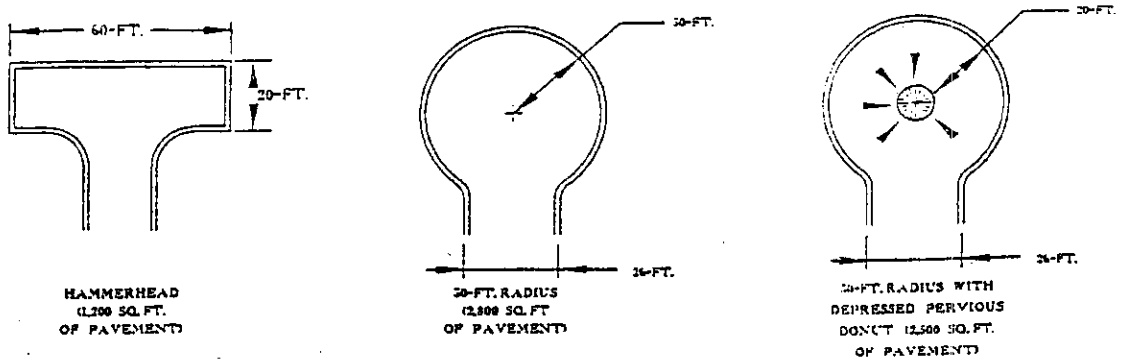
INFILTRATION BASIN



DEPRESSED PERVIOUS AREA

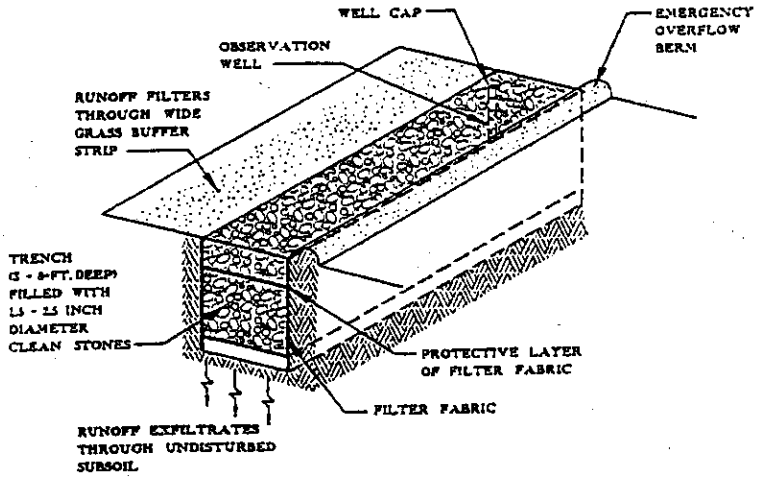


INLET SETBACKS



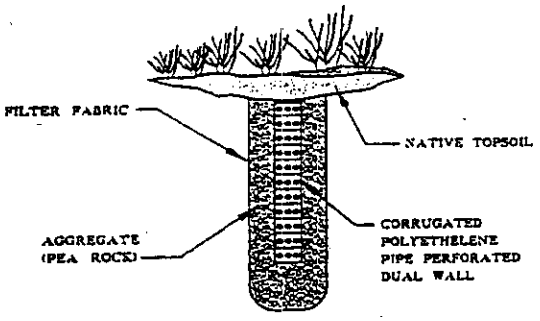
ALTERNATIVE CUL-DE-SAC TURNAROUNDS

(SOURCE: METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS, 1995)



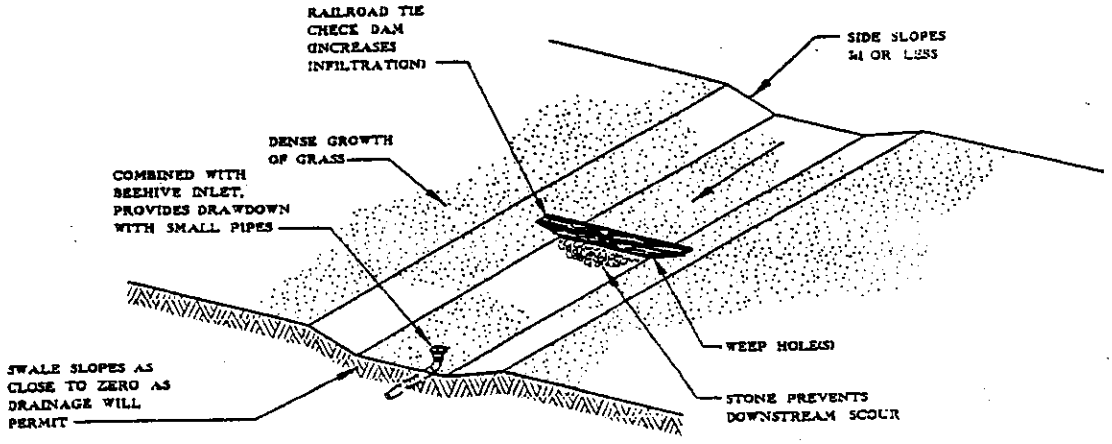
INFILTRATION TRENCH

(SOURCE: SCHUELER, 1995)



INFILTRATION TUBE

(SOURCE: CITY OF MAPLEWOOD)



GRASSED SWALE

(SOURCE: SCHUELER, 1995)

INFILTRATION CHECKLIST

All development in the District needs to document the feasibility and extent to which the following items are included or excluded from plans.

Runoff Prevention

- ☐ *Upper limit of 80% impervious surface*
- ☐ *Street widths ≤26 feet and appropriate for projected traffic load*
- ☐ *One side parking, one side sidewalk ≤4 feet*
- ☐ *Parking stalls (9 feet by 18 feet)*
- ☐ *Joint/shared parking*
- ☐ *Parking waiver (demonstrated need)*
- ☐ *Pervious overflow parking (pavers, turf, porous pavement)*
- ☐ *Natural vegetation covenant*
- ☐ *Cul-de-sac terminus (hammerhead, 30-foot diameter, pervious center)*
- ☐ *Vegetated swales*
- ☐ *Depressional storage*
- ☐ *Prevention of compaction during construction*
- ☐ *Mitigate disrupted soil structure*
- ☐ *Short, crowned driveways (less than 40 feet)*

Infiltration Systems

- ☐ *Depressional storage incorporated in landscaped areas*
- ☐ *Retention pond/dead storage*
- ☐ *Storm sewer inlets set back from curb inlets/pavement*
- ☐ *"Rural" section road which minimize curb and gutter*
- ☐ *Swales (wet and dry) in place of storm sewer pipe*
- ☐ *Roof drains directed to pervious areas*
- ☐ *Depressed pervious areas (below parking lot or street grade)*
- ☐ *Infiltration galleries/basins/trenches*

Maintenance

- ☐ *Snow storage areas*
- ☐ *Sand management areas*
- ☐ *Sweeping interval (vacuum trucks)*
- ☐ *Swale maintenance*
- ☐ *Pond maintenance*
- ☐ *Routine inspection(s)*
- ☐ *Sediment traps, inspection, and clean-out*

4.60 Filtration Practices: FILTRATION DEVICE WARNINGS

INTRODUCTION

The topic of infiltration can be divided into two categories: management practices and devices. Management practices in this context means reducing impervious surfaces, discharging impervious surfaces over pervious areas, disconnecting roof drains from the storm water system or other measures. These are encouraged and essentially noncontroversial practices. But as noted below, they may require special considerations in industrial areas or other unusual cases.

The other category of activity is called infiltration devices. This is everything from filter strips and swales to large infiltration ponds or infiltration trenches, tubes or other devices that conduct the runoff into the ground. In *most* cases the types of devices that are of most concern are devices that bypass the vados zone and conduct surface runoff directly into the ground. For example, swales and ditches are generally of less concern, while devices that conduct into deep aquifers are generally of greater concern. Note that these are generalizations that need to be evaluated on a site-specific basis. A site analysis should be conducted before implementing infiltration on your project or for your community.

Filtration devices -- especially infiltration devices, such as basins and trenches -- are controversial as BMPs for storm water management. Literature indicates that operation of infiltration devices is a concern for two reasons: (1) failure to operate, and (2) concerns for ground water contamination. These concerns are made greater or diminished depending on site circumstances, and must be compared to the benefits that infiltration can provide for reducing stormwater flows in surface waters and replenishing ground water through recharge. Therefore, infiltration devices should be used only after thorough, site-specific evaluation of these concerns and of the pros and cons of other stormwater management options. Infiltration should also be used in conjunction with other measures, such as avoidance and pretreatment practices to protect ground water quality and the function of the infiltration device. Sound judgment; good design, including a detailed site evaluation; and proper construction techniques should alleviate the operational problems with these systems.

RESTRICTIONS

Class 5 wells. Under federal laws, "Class 5 wells," which are essentially any storm water infiltration device that is deeper than it is wide, are required to be inventoried by reporting to the EPA and the MPCA. There are no other regulations at the present time, but future regulation is anticipated.

Minn. R. ch. 7060. Minnesota State laws (M.R.7060) prohibit the direct discharge of untreated storm water to the saturated zone if the discharge threatens ground water from potential pollutants. There could be liability if it is determined that a discharge has introduced contaminants into ground water in violation of state law. Treatment before infiltration is a suggested means to discourage the possible introduction of pollutants into the ground water.

Wellhead Protection Plans. For stormwater systems located in defined wellhead-protection areas, the local unit of government must develop a "Wellhead Protection Plan" in accordance with state

laws and requirements. Special attention should be given to injection wells or infiltration basins and trenches which may pose a high risk to the wellhead, especially for drinking water wells classified by the Minnesota Department of Health as vulnerable to contamination.

GOALS

The goal for stormwater-runoff systems should be "to maintain after development, as nearly as possible, the predevelopment runoff conditions." "Maintain" means that the pre- and postdevelopment quantity, quality and rate of flows to surface and ground water should be kept the same. It also means that the beneficial uses of ground and surface water should be unchanged before and after development.

The *Maryland Storm Water Design Manual* (Schueler,1998) discusses recharge volume requirements to preserve the hydrology of streams and wetlands during dry weather. This approach is not adopted in this manual, but may be an approach that could be useful in specific jurisdictions. Recharge is an important factor that will need to be looked at more carefully in the future if urban natural resources are to be preserved.

We recommend that communities restrict peak and total flows to predevelopment levels or less. Peak control has often been done as part of the classic flood-control requirements, but we also recommend that the volume of runoff be controlled so that pre- and postdevelopment total flows are equal. For urban areas, the greatest volume of runoff over an average year comes from events under 1 inch in depth. Also, the increase in flow from urban development, as a percent of predevelopment flow, is greatest for the more frequent, smaller-storm events. At minimum, the two-, 10- and 100-year events should be evaluated. Here are some of the reasons we feel this is important:

Surface Flow Effects

- **Pollutant Loads.** Pollutant loads are more proportional to the total flow than the peak flows; therefore, increased flow volume increases the pollutant loading. For example, as the percent impervious surfaces within a watershed to a lake increases, so does the phosphorus loading to the lake. Phosphorus loading causes increases in algae production, which in turn decreases the clarity of the water, can deplete oxygen levels and cause other impacts.
- **Wetland Habitat.** We are also concerned about changes in stormwater discharges to wetlands. Wetland plant and animal communities are dependent on hydrologic conditions, such as the frequency and duration of inundation. They can be very sensitive to hydrologic changes, especially the more frequent events. Wetland bounce, or change in elevation from storm runoff events, criteria have been developed to provide suggested guidance in order to maintain the wetland vegetation in its current condition.
- **Erosive Stream Flows.** Flows that are reduced in peak but extended in length can be very erosive. We are especially concerned at the bankfull level, which is often about the one and one-half-year recurrence frequency in natural systems. But urbanization causes dramatic increases in frequency at which these flows occur or are exceeded. Ponds can reduce peaks, but without infiltration they extend the duration of flow in developed areas.
- **Ground Water Recharge.** One of the more important considerations is that ground water recharge must continue to be sustained for the various functions that ground water provides.

Infiltration and the Potential for Ground Water Pollution

The potential for ground water pollution is a concern when planning an infiltration device. The effects of infiltration basins on ground water have been studied as part of the Nationwide Urban Runoff Program (NURP). The NURP study was conducted on infiltration basins in the Fresno, California, area and on Long Island, New York. That study found that the soil beneath the basins was effectively trapping the pollutants studied and there was no significant contamination of ground water from the basins.

Because the NURP studies concluded that there was minimal evidence of ground water contamination from the basins, the NURP final report did not recommend any change in the use of those practices (USEPA, 1983). However, this does not mean that ground water cannot be adversely affected by infiltration basins. More recent studies conducted by Robert Pitt and others (Pitt *et al.*, 1994a) discuss the risk of ground water contamination being a function of a compound's relative mobility, concentration and solubility. Pitt suggests guidelines on using infiltration practices along with using adequate pretreatment devices to support infiltration practices.

It is important to consider monitoring the ground water quality and capacity of the infiltration device its long-term operation.

Excluded Discharges

Discharges that should generally be excluded from infiltration devices include construction sites, spills, industrial discharges, and other discharges.

Construction Sites. Construction sites do not generally contain toxics that pose a threat to ground water, but high sediment levels will quickly clog infiltration facilities.

Spills. All reasonable measures should be taken to assure that spills do not enter infiltration areas. Pretreatment ponds with skimmers and shut-off measures are one method of dealing with potential spills.

Industrial Discharges. Untreated storm water from industrial and manufacturing areas has a high potential for elevated concentrations of metals and organic compounds. Industries under the storm water permit program are required, and other industries should be responsible enough, to:

- evaluate sources of potential contamination,
- prevent storm water contact with contaminated areas and where prevention is not possible, and
- treat runoff from their sites.

Other Discharges. Other discharges should be investigated for exclusion. These include potentially illegal discharges, such as dry-weather sewer flows, which could be illegal industrial discharges or combined sewer flows. Heavily salted runoff from streets and parking areas should also be evaluated carefully for potential impacts, since infiltration does not treat high concentrations of chlorides.

Site-sensitivity Analysis

Before an infiltration system can be designed, a site-sensitivity analysis should be performed. This evaluation may eliminate an infiltration practice from consideration or determine appropriate ways to avoid potential effects on ground water. Because of varying geologic settings, a site evaluation needs to be tailored to the specific site conditions. A team approach to this evaluation is recommended where various disciplines, such as engineering, hydrogeology and soil science, are represented.

When performing a site evaluation, the following items should be considered:

- **Runoff water quality.** If runoff water will contain any significant concentration of soluble pollutants that could degrade ground water quality, such as runoff from industrial sites or even from heavily salted parking lots and roadways, a careful review of the pretreatment systems is necessary to assure that the pollutants of concern do not simply pass through.
- **Uses of the ground water** -- Is the ground water a sole-source aquifer, in a wellhead-protection area or a significant natural resource? If not, are there current or likely future drinking water supply wells tapping the receiving aquifer in the vicinity?
- **Geologic (ground water) sensitivity.** A site with a highly sensitive geology, such as those with carbonate or karst features, may eliminate these areas from consideration.
- **Depth to water table.** The water table must be far enough below the bottom of the structure to allow the structure to function hydraulically.
- **Soil permeability.** Soil permeability must be great enough to drain the system in a reasonable amount to time, generally 72 hours or less.
- **Soil characteristics.** Evaluate the soil's ability to trap or treat pollutants expected at the given site and also provide the required infiltration rate.

OBJECTIVES

Our objectives should be to avoid impacts, minimize impacts, and mitigate impacts.

MEASURES TO BE TAKEN

Avoid Impacts

Avoid sensitive areas, which *may* mean careful zoning or exclusions for development in highly sensitive geology, or wellhead protection areas. Preservation of forested urban areas is one of the best ways to avoid runoff increases.

Education for pollution prevention, should be a top priority for consideration, in order to avoid pollution problems related to infiltration.

Minimize Impacts

Reduced Impervious Surface. Development policies that reduce impervious surface area should be the first BMP for controlling the pre- and postdevelopment hydraulic conditions. Measures, such as cluster development, should be considered to reduce the volume of runoff. After the increase in

runoff has been minimized, infiltration should be considered to reduce the volume of runoff to predevelopment rates.

Pretreatment. Dissolved materials, settleable solids, floating materials and grease and oil should be removed from runoff to the maximum extent feasible before it enters the infiltration device. If these materials enter the device, they can pass through to ground water, or clog the device, take up storage volume, and cause the system to fail. Detention ponds with skimmers, vegetative filters, sand filters, peat sand filters, grassed swales, biofilters, bioretention, filter strips or oil/grit separators are measures that can be used to remove these materials before they enter the infiltration device. It may be feasible to allow limited amounts of these materials to enter the device if their effects are considered during the design. One method of planning for this is to rely upon infiltration out of the sides of the device, or in extended-detention areas of the system, rather than the bottom.

Mitigate Impacts

A mitigation plan should be developed for all reasonably anticipated contingencies. A mitigation plan could involve ground water monitoring, and policies of preparedness for ground water cleanup.

INSTALLATION AND MAINTENANCE

System Design

Bypass. After considering runoff flow and concentration, and the nature of the aquifer, materials that are highly soluble and can impact ground water may need to be kept from being discharged to the infiltration system. The ability to direct contaminated flows so that they bypass infiltration devices may be an important of the system design.

Off-line Systems. Infiltration devices can be constructed as "off-line" systems where a regulated volume of flow is directed from treatment ponds to infiltration devices. High flow volumes would continue to be routed through the treatment ponds but the majority of high flow could be discharged downstream so the infiltration systems are not overloaded.

Professionals should do the hydrologic design of infiltration basins in accordance with accepted and appropriate procedures. Flood routing is recommended for all infiltration devices, and a system of bypasses or overflow devices should be considered.

Water Table and Bedrock Separation

We recommend ***a minimum 3-ft distance should be provided below the bottom of the system and bedrock or the water table***. Adequate depth to the water table, impeding layers or bedrock is required to prevent a water table mound from intersecting the bottom of the infiltration practice or affecting the hydraulic capacity of the practice. *We recommend that the distance be 10 ft to fractured bedrock because of higher hydraulic conductivity.*

INSTALLATION

Proper installation and maintenance of infiltration devices and their pretreatment measures is critical. Soils in the infiltration area should not be disturbed, or the infiltration capacity may need to be restored after construction.

MAINTENANCE

Infiltration devices and pretreatment measures should be maintained with a regular monitoring- and-inspection schedule and a regular maintenance schedule. Sediment accumulation is greatest with the most efficient of infiltration devices. Therefore, it is most important to regularly inspect and maintain these systems to maximize their efficiency and longevity. Sediment removal within the basin should be performed when the sediment is dry. This prevents smearing of the basin floor and allows sediment to more readily separate from the basin floor.

Vegetation should be maintained as needed. Devices with healthy vegetation tend not to clog. The use of low-maintenance varieties, which are flood and drought resistant, will minimize maintenance needs. Native vegetation may be an important option for some sites. Consider using professionals familiar with plantings used specifically for these design methods.

Be certain that the devices are cycled so that they are periodically dry over a season. This helps the soil re-establish its structure, as well as helping plants to become established.

DESIGN CRITERIA

Design for filtration devices is usually controlled by velocity of flow in the system for treatment and maximum flows. The design criteria for several devices are included in Table 4.60-1.

PLANNING CONSIDERATIONS

For all filtration devices, controlled flow volume, such as diversion of low flows to the system or bypass of higher flows, should be provided.

These projects may need state, federal or local permits, so check with the appropriate agencies for their requirements.

Table 4.60-1 Bioretention and ponds

	Buffer Zone (not a treatment, but performs treatment functions)	Filter Strip	Swales and Enhanced Swales *	Infiltration Basins and Enhanced or Bioretention Basins	Infiltration Trenches	Ponds
Location	Usually adjacent to aquatic systems	Small-volume, low-velocity area	1-3 ft above water table	3 ft above water table, 10 ft above fractured bedrock	3 ft above water table, 10 ft above fractured bedrock	No specific requirements
Pretreatment	No concentrated flow	No concentrated flow	A sediment forebay is desirable	** Sediment and debris removal desired	** Sediment and debris removal desired	No specific requirements
Runoff from 1.25-inch event (water quality volume)	No specific requirement	0.5 ft/sec 0.5 inches Depth 10-minute flow time	Vel ≤ 1.0 ft/sec Depth ≤ 0.5 ft*	Discharge through soil in 24 hours or less	Discharge through soil in 24 hours or less	Outflow rate
Runoff from 1-yr. event ~ 2.4-inch event	No specific requirement	≤ 2 ft/sec	≤ 2 ft/sec $\tau \leq 1$ lb/ft^2	Discharge through soil in 48 hours or less	Provide bypass to other systems	Velocity ≤ 2 ft/sec
Runoff from 2-yr. event ~ 2.8-inch event	No specific requirement	≤ 3 ft/sec.	≤ 3 ft/sec $\tau \leq 1.5$ lb/ft^2	Discharge through soil in 72 hours or less	Provide bypass to other systems	Velocity ≤ 3 ft/sec. Discharge rate ≤ 50% of the predevelopment rate
Runoff from 10-yr. event ~ 4.0-inch event	No specific requirement	≤ 5 ft/sec	≤ 5 ft/sec $\tau \leq 2.5$ lb/ft^2	Provision for bypass at high flows	Provide bypass to other systems	Velocity ≤ 5 ft/sec and Discharge rate = predevelopment
Runoff from 100-yr. event ~ 6.0-inch event	No specific requirement	≤ 5 ft/sec	≤ 5 ft/sec $\tau \leq 2.5$ lb/ft^2	Provision for bypass at high flows	Provide bypass to other systems	Velocity ≤ 5 ft/sec and Discharge rate = predevelopment

* For enhanced swales, insert retaining dikes to retain water quality volume of runoff behind filter dikes.

** No industrial or highly contaminated sources without appropriate pretreatment.

τ = shear stress

4.61 Filtration Practices: FILTER STRIPS

DESCRIPTION

Filter strips are vegetated sections of land designed to accept runoff as overland sheet flow from upstream development. When conditions are appropriate, they may be adapted to natural vegetated forms, from grassy meadow to small forest. Dense vegetative cover facilitates pollutant removal. Filter strips cannot treat high-velocity flows. Therefore, they have generally been recommended for use in small drainage areas with a low percentage of impervious surface.

Filter strips can differ from natural buffers in that strips are often designed and constructed specifically for pollutant removal. Natural features may be incorporated into the treatment system; a filter strip can be an enhanced natural buffer where the pollutant-removal capability of the natural buffer is improved through engineering and maintenance activities, such as land grading, the installation of a level spreader or the enhancement of vegetation.

Filter strips also differ from grassed swales in that swales are concave, channelized, vegetated conveyance systems, whereas filter strips provide treatment by sheet flow over level-to-gently-sloped surfaces.

PURPOSES

Filter strips are one way to alleviate the impact of human activities, and should be an important part of comprehensive site planning. This practice may be applied as part of a resource management system to:

- reduce sediment and other pollutants from runoff.
- pretreat runoff before discharge to other treatment systems (*e.g.*, infiltration basins or trenches).
- reduce total volume of surface water runoff.
- reduce deposition of windborn pollutants into surface waters.
- enhance biological diversity by creating habitat between upland and surface waters.

PLANNING CONSIDERATIONS

Ordinarily, forests and other natural areas should not be destroyed to create a filter-strip system. They may already be functional or may only need to be enhanced to become properly functioning treatment systems. Upstream spreaders and flow-control measures, repair of eroded and bare spots and/or vegetative enhancements may often be all that is required to have a functional system. Figure 4.61-1 shows both a grassed and wooded filter strip.

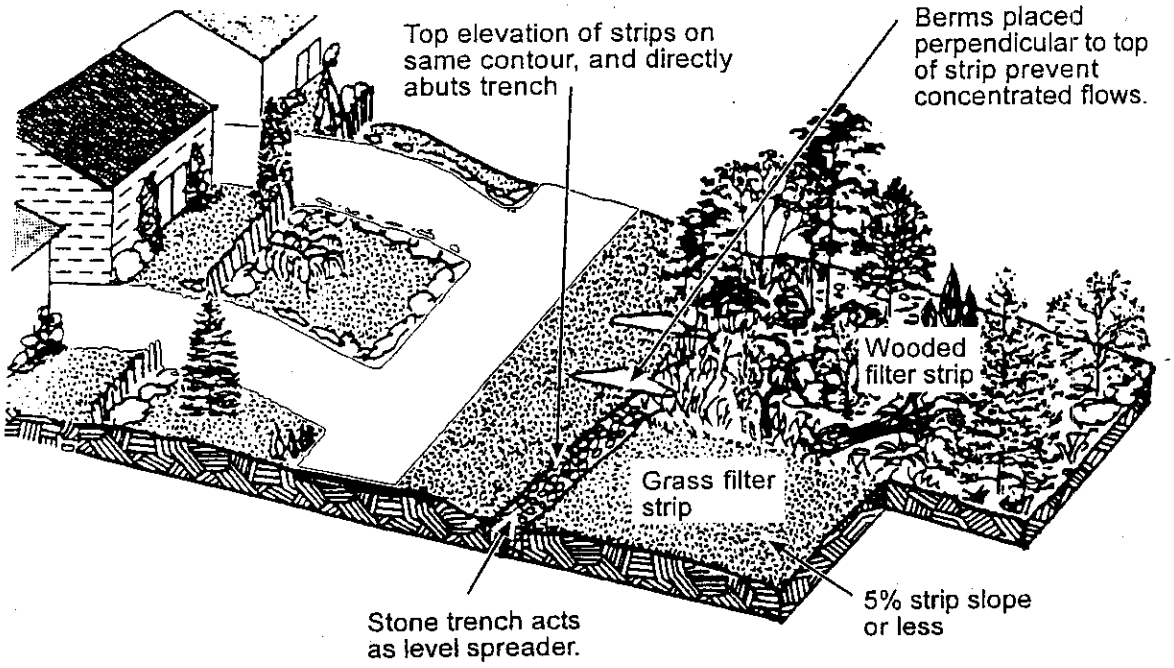


Figure 4.61-1 Schematic of a grassed-and-wooded filter strip (source: Schueler, 1987)

Existing perennial vegetation next to receiving waters may provide wildlife benefits but not significant pollutant-reduction benefits, depending on ground cover and runoff type. However, buffer areas provide valuable habitat and they should be maintained. Consideration should be given to buffer zone preservation as part of the design of the filter system.

Waterways should have filter strips on both sides to be effective as part of a filter system. An intermittent waterway itself may also provide filtering benefits if adequately vegetated (see part 4.62, Vegetated Swales).

DESIGN RECOMMENDATIONS

Measures to help prevent concentrated flows (Claytor, December 1996):

- The width of the filter should generally be measured perpendicular to the overland flow, and equal to the width of the treated drainage area
- The flow length through the filter system should be a minimum of 25 ft and at maximum no more than 300 ft. The slope of the filter should be limited to about 2 to 6%.
- The flow length of the drainage area to be treated is usually limited to 75 ft for impervious areas or 150 ft for pervious areas.

Filter strips should generally be on the contour and designed to pass the 1.25-inch, 24-hour water quality storm event at a flow depth of about 0.5 inch, and a velocity of 0.5 feet per second (fps).

Runoff water entering and moving through a filter strip must be kept shallow and uniform for effective filtering.

Shaping and grading of the area immediately upslope from the filter strip and the filter strip site itself may be necessary to insure shallow overland flow.

Velocity and depth for larger storm events should not exceed Table 4.60-1 in section 4.60, Filtration Devices.

In cases where a filter strip is planned, detention and storage will be needed to reduce peak flows to a practical level to allow for sheet flow conditions. Water carried by waterways and ditches must be converted into sheet flow conditions.

In those cases where concentrated flow is applied to a filter strip, a level lip weir or other "level spreader" measure should be included in the design to distribute flow uniformly across the top of the filter strip and maintain sheet flow across the entire strip.

Information on selecting and maintaining plant species suitable to site conditions can be found through the Natural Resources Conservation Service, the University of Minnesota Extension Service or from other professionals in this field.

Grass Filters

Tall, rigid, erect, perennial, sod-forming grasses are best suited for a filter medium. Desirable species include smooth bromegrass and creeping foxtail used alone or in combinations with fringed brome, cordgrass, intermediate wheatgrass, tall wheatgrass, tall fescue, or mixtures of big bluestem, switchgrass, little bluestem, Indiangrass, or side-oats grama.

Some species, such as reed canarygrass, function well but are highly invasive and are not recommended.

Species that have tendencies to mat down, such as Kentucky bluegrass, should generally not be used.

The effectiveness of filter strips should be maintained by cutting, usually twice each growing season. Cutting of the grass filter strips in the first few years of establishment is important to promote dense sod formation. It also helps maintain the vigor of most plant species. Cut high enough to promote rapid and adequate regrowth, usually 4 to 8 inches, depending on the species. Harvest and removal of vegetative growth may be important to projects where nutrient removal is critical. Time cutting to avoid potential adverse effects on wildlife nesting.

Seeding, sodding and other items related to establishing vegetation shall be in accordance with accepted erosion-control and planting practices. Apply needed lime and fertilizer based on a soil test and University of Minnesota or other professional recommendations.

Prepare and plant in a firm seedbed.

Forested Filter Strips

In urban areas, you can have trees and forests serve as filters and should not be destroyed to create filters or other water-quality-enhancing features. Some urban forests can be managed to more effectively act as a filter, or part of a filter system. Urban forest areas can be maintained as a buffer or as a filter without destroying the multiple benefits of habitat and water quality that forests provide.

Filter strips that include a forest component are intended to protect water quality by preserving the filtering capacity of the soil and surface vegetation. Forest leaf litter encourages infiltration, while the canopy protects the soil from impacts of direct rainfall. The forest also provides shade, which can prevent thermal effects of human activity, especially near streams and running water.

Forested filter strips are similar to, but not the same as, buffer zones. Forested filters are managed to perpetuate vegetation along aquatic areas, which helps to promote habitat and water-quality protection, especially for temperature. They are not natural areas, but they are managed for perpetuation of shade and habitat benefits. Management is allowed in these areas to promote continuous growth of shade-tolerant vegetation.

Mixed Filters

Filter strips can be planted to grasses or woody vegetation. Species selected for filter strips must be adapted to the soil and site conditions. Because of the multiple benefits to habitat, water, quality, and aesthetics, filter strips with a variety of vegetation types are often preferred.

Soils and ground cover in natural forest areas can provide effective treatment, but in disturbed areas, the ground vegetation, such as grasses, is critical to the treatment process. The vegetative ground cover can often be enhanced in forested areas to improve treatment rather than destroying the forest vegetation.

Native grasses are often best suited when biodiversity, upland habitat and pollutant filtering are objectives. Native grasses develop an extensive root system, but may take several years to become adequately established.

Cutting and harvesting forest and other native vegetation may not be beneficial or needed in most cases. However, cutting and harvest of vegetation for disease control or other management may be desirable.

INSTALLATION, OPERATION AND MAINTENANCE

Installation

Appropriate soil-stabilization methods, such as mulch, mats or blankets, should be used before establishment of vegetation.

Seeding, sodding and other items related to establishing vegetation should be in accordance with accepted erosion-control and planting practices.

Operation and Maintenance

- Avoid creation of furrows and channels immediately upslope from the filter strip to prevent flow concentration from occurring.
- Inspect annually for damage to vegetative cover, rilling or gullying in the filter strip, or sediment accumulations that block or impede sheet flow. Repair and reseed disturbed areas.
- Limit applications of fertilizer to maintain plant vigor based on soil test results and University of Minnesota recommendations.
- Avoid direct spray application and spray drift when applying pesticides on adjacent land.
- Avoid vehicle travel lanes or turn areas, in or immediately adjacent to the filter strip.
- Do not use vegetated filter strips for disposal of waste.
- Cut only when the soil is dry to prevent tracking damage to vegetation, soil compaction and development of flow concentrations.

Development of rills and small channels within filter areas must be minimized. Needed repairs must be made as soon as possible to re-establish sheet flow. For example, a shallow furrow on the contour across the filter can often be used to re-establish sheet flow.

All filter strips should be fenced as necessary to control destructive access by vehicles, pedestrians and animals.

Solids accumulations at the upstream edge of the filter may need periodic removal to maintain sheet flow and vigorous vegetation.

4.62 Filtration Practices: VEGETATED SWALES

DESCRIPTION AND PURPOSE

Definition

"Grassed swales" (see Figure 4.62-1) or "vegetated swales" (Figure 4.62-2) are earthen conveyance systems in which pollutants are removed from urban storm water by filtration through the grass and infiltration through the soil. The primary purpose of these structures is often conveyance, but they differ from conveyance channels because water-quality and quantity benefits are part of the design considerations.

Enhanced vegetated swales, or biofilters, utilize check dams and wide depressions and off- channel retention areas to increase runoff storage and promote greater settling of pollutants.

Purposes

Vegetated swales may be applied as part of a resource-management system to:

- convey water in properly protected channels.
- divert water around potential pollutant sources.
- provide infiltration to reduce total surface water runoff volumes.
- pretreat runoff prior to discharge to another treatment system (for example, an infiltration basin or trench).
- reduce sediment and other pollutants in runoff.
- enhance biological diversity by creating habitat between upland and surface waters.

PLANNING CONSIDERATIONS

Vegetated swales are most applicable in residential or institutional areas where the percentage of impervious cover is relatively small. Swales are usually located in a drainage easement at the back or side of a residential lot. They can also be used along roads in place of curb and gutter. In planning the drainage system for a development, the planner should consider the following characteristics of vegetated swales:

1. Vegetated swales are generally less expensive to install than curb and gutter.
2. Roadside swales keep flow away from the street surface during storms, thus reducing driving hazards.
3. Roadside swales become less feasible as the number of driveway entrances requiring culverts increases.
4. In areas with steep slopes, vegetated swales are best suited to locations where they can be parallel to the contours.

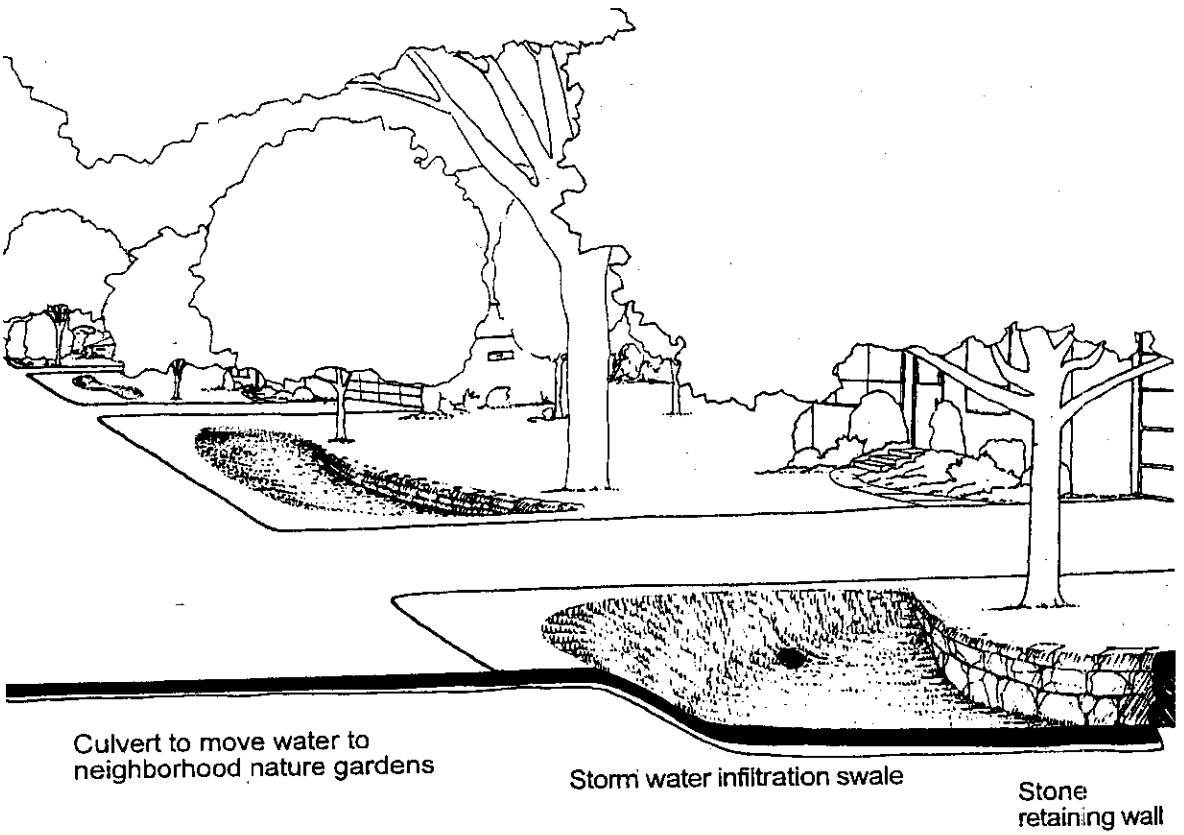


Figure 4.62-1 A turf swale can infiltrate storm water, but turf lacks the beauty and biodiversity of native plant gardens (Nassauer *et al.*, 1997).

Existing perennial vegetation adjacent to receiving waters of interest may provide wildlife benefits but not significant pollutant-reduction benefits, depending on ground cover and runoff type. However, preservation of natural areas should be considered in the swale design.

DESIGN CRITERIA

Vegetated swales are most effective when the flow depth is shallow and the velocities are low. These characteristics limit the application of grass swales as a BMP to locations where flows from the 1.25-inch, 24-hour water quality storm event can be discharged at less than 0.5 fps and 0.5 ft deep. The one-year and above event should be discharged in accordance with Table 4.60-1.

To be considered a treatment system, enhancements will generally be required. Flows from the 1.25-inch, 24-hour water-quality storm event must be stored in the facility. The storage volume can be increased by using check dams, or we recommend off channel bioretention areas to obtain the additional treatment volume and surface area (Claytor, December 1996). An overflow rate equivalent to pond design criteria (5.66 cfs/acre of surface area) may be obtainable in some cases.

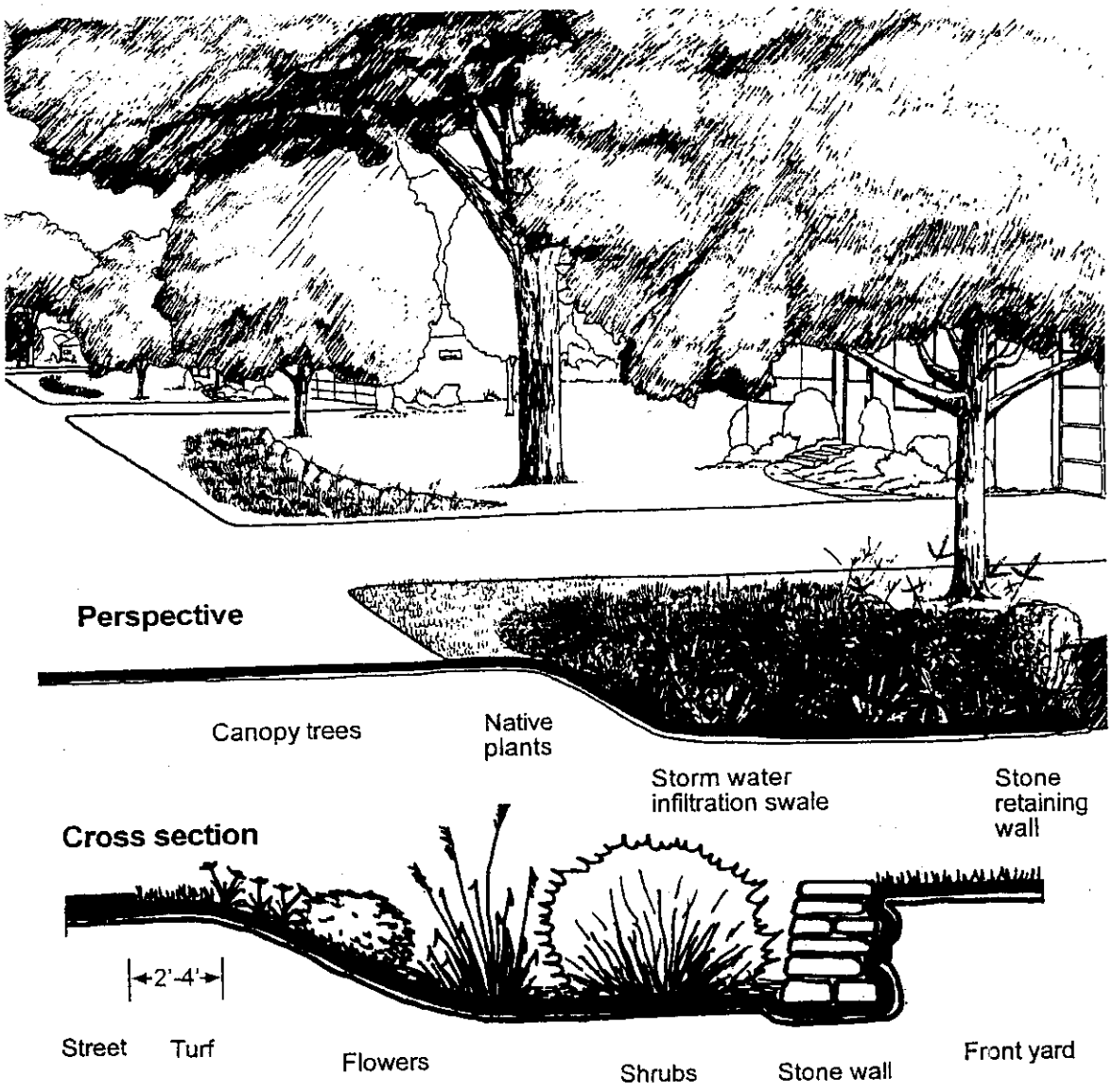


Figure 4.62-2 Asymmetrical high-volume swale with front yard defined by masonry wall (Nassauer *et al.*, 1997)

Without enhancement, higher flows will not be treated to any significant extent. The use of enhancements, channel lining and conveyance channel design features should be included to convey and treat higher flows.

Provisions should be made for removing settled solids from the channel as necessary to maintain proper functioning. A sediment forebay is desirable to facilitate ease of maintenance.

Shaping and grading is required to assure controlled flow conditions. This is usually less than a 2% grade. The grade of the finished surface should be continuous and uniform. Maximum grades should be nonerosive for the soil and runoff factors anticipated. The outlet for the swale must be suitable with adequate capacity, such as a grassed waterway, a stable watercourse, an underground outlet, a vegetated or paved area, a grade-stabilization structure, or other suitable outlet.

Grass species and shape of channel should be such that grass stems will generally remain upright during design flow.

The soils should be suitable to establish a vigorous stand of vegetation. If dense vegetation cannot be maintained in the swale, its effectiveness will be severely reduced.

Both sides of the swales should generally have filter strips or vegetated buffer zones to protect the drainageways as part of a filter system.

INFILTRATION ENHANCEMENT

Check dams can be constructed in the waterway to temporarily store water, promote infiltration and increase the effectiveness of the grass swale. The check dam should be constructed of durable material so it will not erode. The area just downstream of the check dam should be protected from scouring with properly designed rock riprap or channel lining (see Figure 4.62-3).

On permeable soils, vegetated swales can be designed for infiltration as well as sedimentation. To enhance the infiltration characteristics, check dams can be used to store water in the swale or in off-line detention areas. These check dams should be designed so that the water ponded will infiltrate in 24 hours or less in order to protect the vegetation.

The seasonally high water table should be 1 to 3 ft below the bottom of the swale. Except in unusual situations, this will allow treatment of most pollutants before they reach the ground water. The designer should be aware of the warnings concerning the use of infiltration devices contained in the introduction to this section.

OPERATION & MAINTENANCE

Vegetative Cover

Information on selecting and maintaining plant species suitable to site conditions can be found through the Natural Resources Conservation Service, the University of Minnesota Extension Service, the MnDOT, and from other professionals in this field.

Tall, rigid, erect, perennial, sod-forming grasses are best suited for a filter medium. Desirable species include smooth bromegrass and creeping foxtail used alone or in combination with intermediate wheatgrass, western wheatgrass, tall wheatgrass, tall fescue, or mixtures of big bluestem, switchgrass, little bluestem, Indigograss, or side-oats grama. Some species, such as reed canarygrass, function well but are highly invasive and are not recommended.

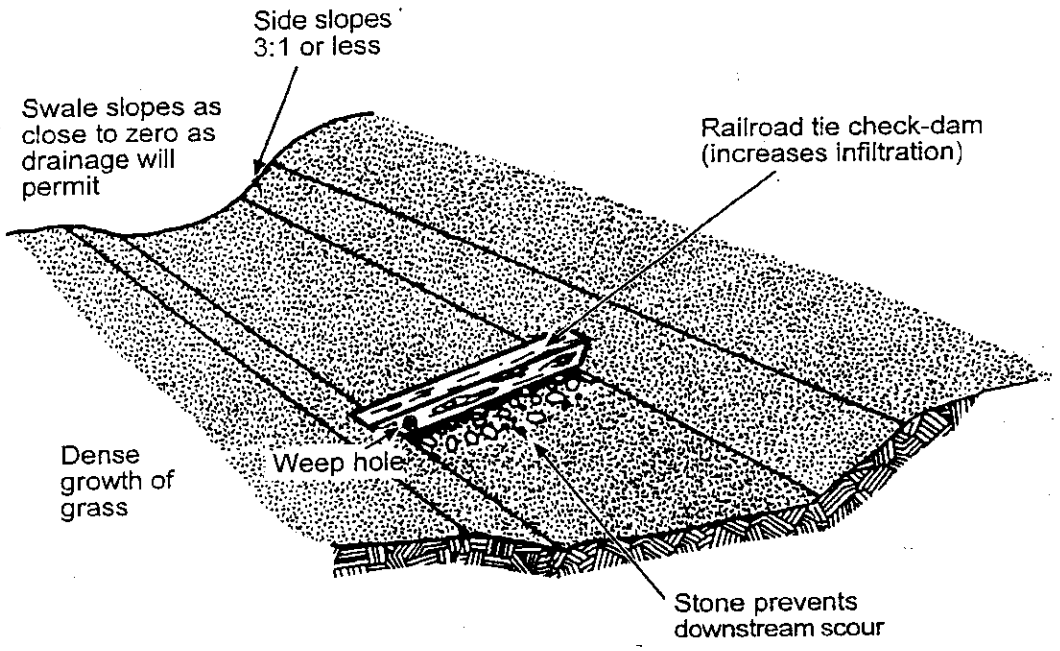


Figure 4.62-3 Schematic of an enhanced grassed swale (source: Schueler, 1987)

Native grasses, such as bluestem and brome, are best suited when biodiversity, upland habitat and pollutant filtering are objectives. Native grasses develop an extensive root system, but may take several years to become adequately established.

Appropriate soil-stabilization methods, such as mulch, mats or blankets, should be used before establishment of vegetation.

Seeding, sodding and other items related to establishing vegetation should be in accordance with accepted erosion-control and planting practices. Desirable vegetative characteristics include species that form a dense sod with vigorous, upright growth. Species that have tendencies to mat down should not be used when sediment filtering is a desired outcome.

Species selected for filter strips should be adapted to the soil and site conditions. Information on plant species suitability to site conditions is available from the Natural Resources Conservation Service and the University of Minnesota Extension Service.

Annual cutting of the swales in the first few years of establishment is important. This promotes dense sod formation and helps maintain vigor of most plant species. Stubble of 4 to 8 inches is usually high enough to promote rapid and adequate regrowth.

Depending on the vegetation, harvest and remove vegetative growth twice each growing season to maintain the effectiveness of the swale. Vegetation should be mowed to leave 6 to 8 inches of stubble, and the cuttings should be removed from the swale. Harvest only when the soil is dry to prevent tracking damage to vegetation, soil compaction and development of flow concentrations.

Apply needed lime and fertilizer based on a soil test and University of Minnesota or other professional recommendations. Consult standardized practices for optimum seeding times. Prepare and plant in a firm seedbed.

4.63 Filtration Practices: INFILTRATION BASINS

DESCRIPTION AND PURPOSE

An infiltration basin is a stormwater impoundment that does not contain a permanent pool of water because it has permeable soils. The inflow volume must be controlled so that the treatment volume can be discharged through the soil. The purpose of the basin is to temporarily store surface runoff for a specific design frequency storm and allow it to infiltrate through the bottom and sides of the basin. This infiltration removes many pollutants, provides ground water recharge, reduces the volume of runoff, and reduces peak discharges.

Target Pollutants

Infiltration basins are very effective for removing fine sediment, trace metals, nutrients, bacteria, and oxygen-demanding substances. Coarse sediment is effectively controlled, but should be removed from runoff before it enters an infiltration basin. Coarse sediment can clog the basin and take up storage volume. Dissolved pollutants are effectively controlled for storm events less than the design frequency, but these materials may not be removed from the runoff as it infiltrates, creating a potential ground-water problem.

Effectiveness

Infiltration basins have been designed to infiltrate a design runoff volume. For storms larger than the design storm, effectiveness will be reduced, but will be similar to those reported for detention ponds of similar size. Although infiltration basins are very effective for controlling pollutants in surface water, using infiltration as primary treatment can reduce the infiltration rate by clogging, and some soluble substances can be expected to move to the ground water. Chloride from road salt is an example of a soluble material that will not be removed during the infiltration process.

PLANNING CONSIDERATIONS

Note the caveats and warnings about infiltration devices in section 4.60.

Infiltration basins are best suited for sites with drainage areas of two to 15 acres. A typical basin will have a depth of 3 to 12 ft. The maximum depth of a basin is limited by the infiltration rate of the soil and maximum detention time. Figure 4.63-1 depicts a typical infiltration basin.

The soils on a prospective site are an important consideration when determining the suitability for infiltration. The soils should generally have an infiltration rate of between 1.0 inch and 6.0 inches per hour to be considered for an infiltration basin. Although any site can be designed to provide some infiltration by limiting the loading rate beyond these infiltration rates, special consideration may be required. Soil surveys are useful for preliminary screening of a site for soil infiltration rate. However, a geologic investigation of the specific site is required for design of an infiltration basin. The borings or trenches used for the geologic investigation should extend at least 5 ft below the bottom of the proposed basin.

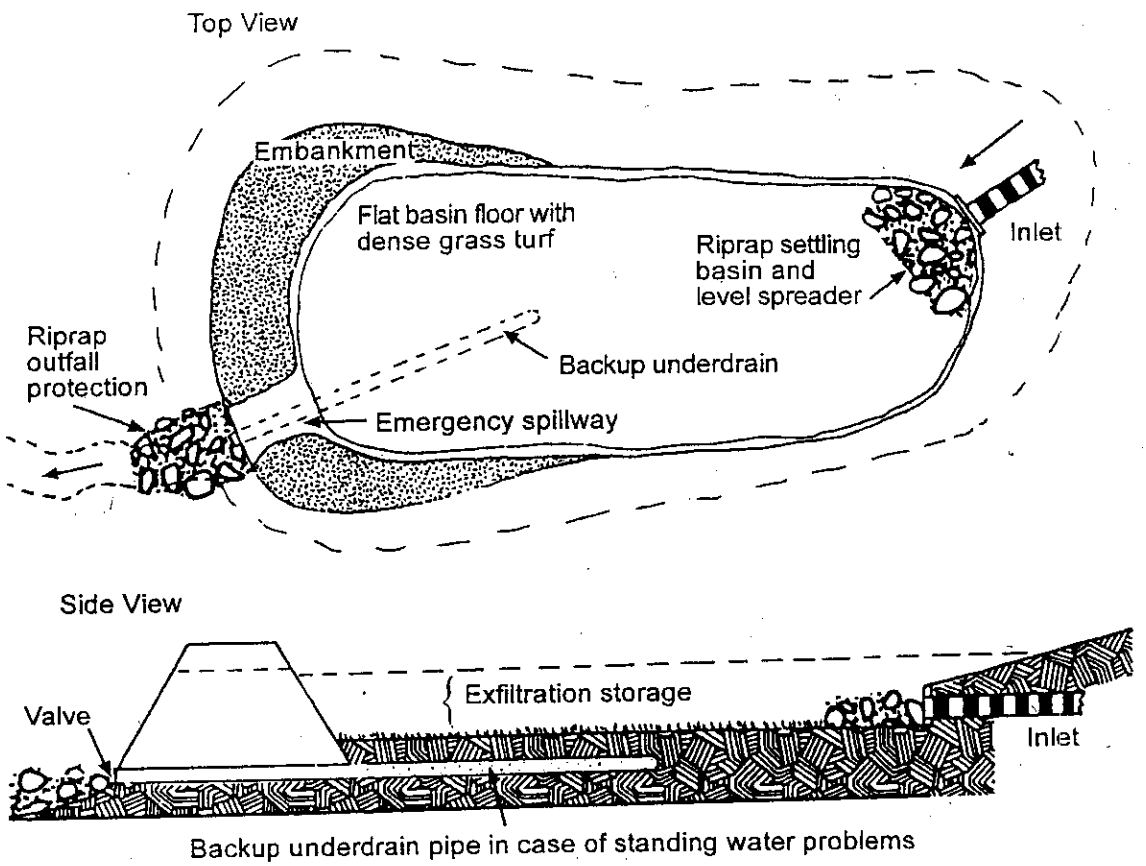


Figure 4.63-1 Schematic of an infiltration basin (source: Schueler, 1987)

DESIGN RECOMMENDATIONS

The design recommendation provided here were derived from *Standards and Specifications for Infiltration Practices,* which was prepared by the Maryland Department of Natural Resources (MdDNR, 1984). See also Table 4.60-1 in section 4.60.

Ponding Time

The maximum ponding time recommended is 24 hours. This maximum ponding time combined with the infiltration rate of the soil will determine the maximum design depth of the basin. The maximum design depth can be related by:

$d\ max = (f)(Tp)$

Where: $d\ max$ = maximum design depth (inches),
f = soil infiltration rate (in/hr), and
Tp = design ponding time (hours).

Water Table and Bedrock Separation

A minimum 3-ft distance should be provided below the bottom of the system and bedrock or the water table (For fractured bedrock, separations up to 10 ft may be required, or denial of the infiltration option may be the only reasonable alternative). This minimum separation distance is required to trap or treat pollutants before they reach ground water or bedrock and to maintain vegetation in the basin. In addition to removing pollutants, the separation to water table is required for basin hydrologic operation.

Site Sensitivity Analysis

Before an infiltration system can be designed, a site sensitivity analysis must be performed. This evaluation may eliminate an infiltration practice from consideration because of potential effects on ground water. Because of varying geologic settings, a site evaluation needs to be tailored to the specific site conditions. A team approach to this evaluation is recommended where various disciplines such as engineering, hydrogeology and soil science are represented.

When performing a site evaluation, the following items should be considered.

- **Runoff water quality.** If runoff water will contain significant concentration of soluble pollutants that can contaminate ground water, an infiltration basin should not be used.
- **Degree of detail.** Determine how much detail will be required for the study. For instance, a small structure receiving runoff from a residential roof top will not require as much detail as a structure serving a larger area and having a higher potential pollutant load.
- **Geologic (ground water) sensitivity.** A site with a highly sensitive geology, such as one with a carbonate or surficial sand aquifer, may eliminate this practice from consideration.
- **Depth to water table.** The water table must be far enough below the bottom of the infiltration basin to allow the structure to function hydraulically and to allow trapping and treatment of pollutants by the soil.
- **Soil permeability.** Permability of the soil must be great enough to drain the structure in a reasonable amount to time, generally 24 hours or less.
- **Soil characteristics.** Evaluate the soil's ability to trap or treat pollutants expected at the given site and also provide the required infiltration rate.

These are a few of the major consideration involved in a site sensitivity analysis. For a more detailed discussion, the reader is directed to "Evaluation Techniques for Large Drainfield/Mound Systems Under Varying Geologic Settings," by J. A. Magner, in *Proceedings of the Fourth National Symposium on Individual and Small Community Sewage Systems* (Magner, 1985).

OPERATION AND MAINTENANCE

Runoff Filtering

Settleable solids, floating materials and grease should be removed from runoff to the maximum extent possible before it enters the infiltration basin. If these materials enter the basin, they can clog the bottom of the basin, take up storage volume and cause the system to fail. Devices, such as detention ponds, vegetative filters, sand filters, peat sand/compost filter, grassed swale, biofilters,

bioretention, urban filter strip or oil/grit separator, can be used to remove these materials before they enter the infiltration basin. It may be feasible to allow these materials to enter the basin if their effects are considered during the design. One method of planning for this is to rely upon infiltration out of the sides of the basin rather than through the bottom.

Embankment Design

Embankments should be constructed in conformance with the USDA *Soil Conservation Service, Minnesota Field Office Technical Guide, Standard 378, Ponds.* Any structure using an embankment to impound water should have an emergency spillway to safely bypass flows from large rainfalls.

Principal Spillway for Combination Structure

If a combination detention pond/infiltration basin is being used, the elevation of the principal spillway crest should not be higher that the three-day infiltration capacity of the basin. All other aspects of the basin design, such as flood routing, should meet the requirements of an extended-detention pond.

Hydrologic Design

The hydrologic design of infiltration basins should be in accordance with the recommended procedures included in the hydrology section of this manual or other appropriate procedures. For combination basins, where flood routing is required, the short-cut routing procedures in the hydrology section of this manual can be used (see chapter 8). This procedure will result in conservative designs. A more refined flood-routing procedure may reduce the temporary storage requirement and thus the construction cost of the basin.

Infiltration Capacity Protection

Initial excavation of the basin should be carried out to within 1 ft of the final grade of the basin floor. Final excavation of the basin floor should be delayed until all disturbed areas in the drainage area are stabilized. The final phase of excavation should be performed by equipment with tracks exerting relatively light pressures. This will prevent compacting of the basin floor, which would reduce the infiltration capacity. After final grading, the basin floor should be tilled to a depth of at least 6 inches to provide a well-aerated, porous surface texture.

The bottom of infiltration basins may be lined with a layer of filter material, such as filter fabric or 6- to 12-inch coarse sand, to help prevent the buildup of impervious deposits. The filter layer can be replaced or cleaned if it becomes clogged. The slopes of infiltration basins usually need little maintenance to maintain their infiltration capacity.

Establishing dense vegetation on basin floors and slopes is recommended. Vegetation will not only prevent erosion, but will also provide a natural means of maintaining infiltration rates. Vegetation should be selected and established in accordance with the permanent vegetation practices of this manual. For Minnesota, wet-weather and drought-tolerant species are recommended.

Maintenance

Proper maintenance of infiltration basins and their pretreatment devices is critical. Basins and pretreatment devices should be maintained with a regular inspection schedule and a regular maintenance schedule. Sediment accumulation is greatest with the most efficient of infiltration devices. Therefore, it is most important to regularly inspect and maintain these systems to maximize their efficiency and longevity. Sediment removal within the basin should be performed when the sediment is dry enough so that it is cracked and readily separates from the basin floor.

Vegetation should be maintained as needed to control weed growth and maintain the health of the grass. Maintenance includes mowing and fertilization. The use of low-maintenance and drought-resistant varieties will minimize maintenance needs. When fertilizer is needed to maintain the vegetation, proper application methods should be used to minimize the potential for leaching. Split applications and use of slow-release fertilizers will help to minimize the chance of leaching.

RELATED ISSUES

Peat-sand filters are a variation of infiltration basins that show promise for treating urban runoff. A peat-sand filter consists of a bed of a peat-sand mixture, which is constructed over a drainage system. The drainage system collects treated runoff and discharges it back to surface waters. This type of filter is very effective for removal of suspended solids and associated pollutants. Preliminary studies have also found that peat-sand filters remove about 70% of phosphorus from runoff (Farnham and Noonan, 1988). These systems are still in the experimental stage at this time. For new approaches to sand and peat-sand filtration designs, refer to Schueler (1994a).

4.64 Filtration Practices: INFILTRATION TRENCHES

DESCRIPTION AND PURPOSE

An infiltration trench is a shallow excavated trench, usually 2 to 10 ft backfilled with a coarse stone aggregate, which allows temporary storage of runoff in the void between stones. Stored runoff then infiltrates into the surrounding soil. Figure 4.64-1 shows a typical infiltration trench.

TARGET POLLUTANTS

Infiltration trenches effectively control the pollutants in the surface runoff that enters them. They are not intended for control of coarse sediment or heavy concentrations of fine sediment because these materials can clog infiltration trenches. This practice should not be used to control soluble pollutants that can affect ground water quality.

EFFECTIVENESS

The effectiveness of infiltration trenches depends upon their design. When runoff enters the trench, 100% of the pollutants are prevented from entering surface water. Water that bypasses the trench will not be treated. When runoff enters infiltration trenches, many pollutants will be trapped or treated as they pass through the soil. However, some soluble substances, such as chloride from road salt, will not be treated during infiltration and will end up in ground water. This practice can be very effective for reducing the volume of runoff from a site of limited size.

PLANNING CONSIDERATIONS

Infiltration trenches are most applicable on sites with a relatively small drainage area. They can be used to control runoff from parking lots, rooftops and residential lots. An infiltration trench can also be used under a vegetated swale to increase its effectiveness for infiltration.

Soil permeability is a major consideration in determining whether an infiltration trench is feasible. Soils with an infiltration rate of 0.27 inches per hour or greater are suitable. This rate generally corresponds to sandy or silty soils in an A or B hydrologic soil group. The seasonally high water table should be at least 2 ft below the bottom of the trench. The 2-ft depth allows treatment of runoff before it reaches ground water and ensures that water will drain from the trench. As with any infiltration practice, care must be taken to prevent ground water contamination. The discussion in part 4.63, Infiltration Basins, and the general observations in section 4.60 about impacts on ground water apply to this practice, also.

Infiltration trenches should not be used in locations that will be receiving sediment loads that could clog the trench. In most cases, a vegetative filter or some other means of removing coarse sediment should be used to treat runoff before it reaches an infiltration trench.

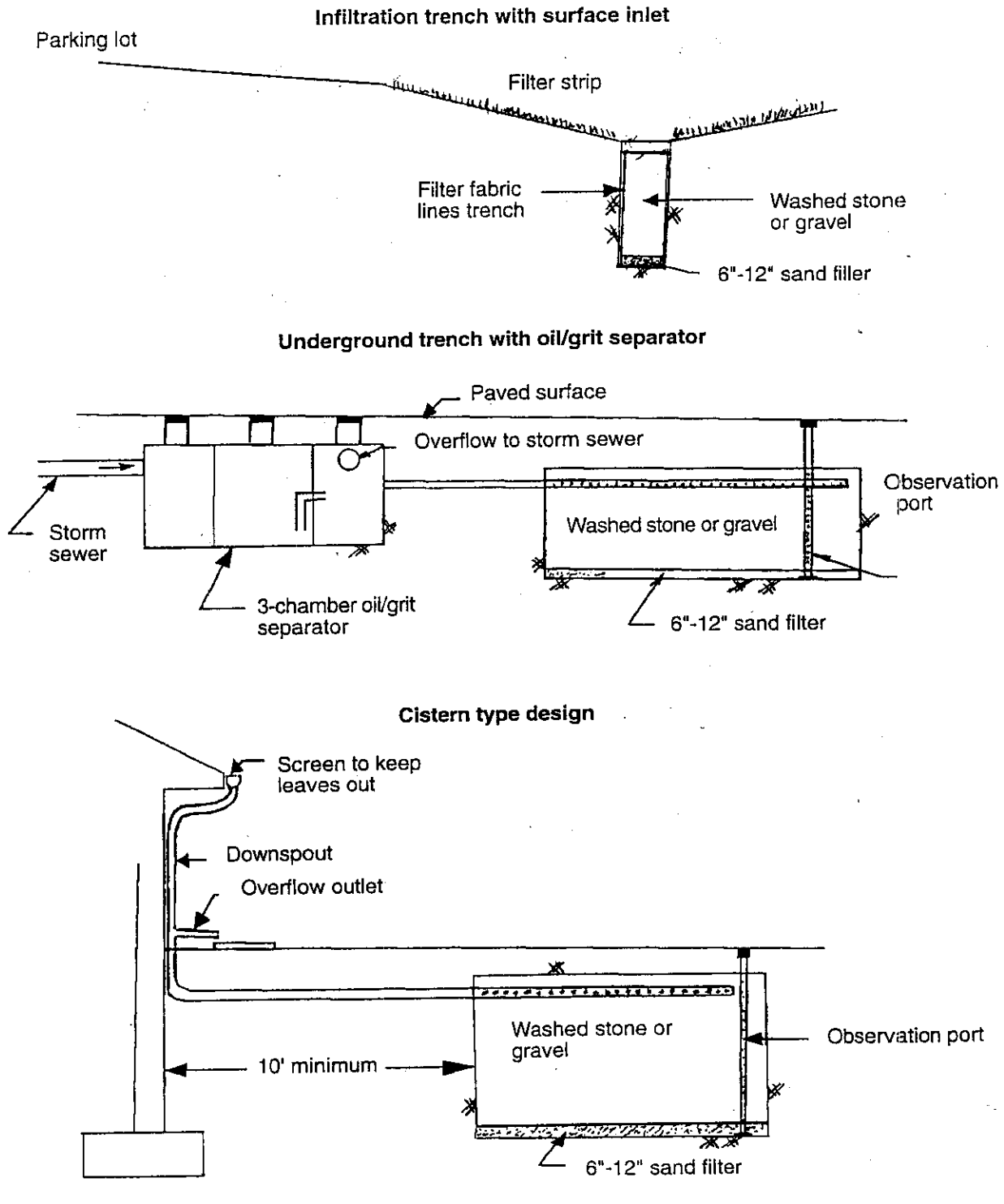


Figure 4.64-1 Schematic designs for infiltration trenches

DESIGN RECOMMENDATIONS

Storage volume

A storage volume equal to the runoff from a 1-inch rainfall is recommended. If greater control of runoff volume or peak discharge is desired, additional storage capacity can be used to meet these needs. The design storage volume of the infiltration trench is provided in the void space between the aggregate used for backfill. The aggregate backfill should be a clean, washed rock with a minimum diameter of 1.5 inches and a maximum diameter of 3 inches. For this size of rock, a void ratio of 30 to 40% can be assumed. The void ratio is the ratio of the volume of void space between the stones to the total volume. Therefore, the storage volume available is a product of the trench volume and void ratio.

Storage time

The maximum storage time that should be used is 24 hours. This storage time, along with the void ratio of the rock backfill and infiltration rate of the soil, can be related to determine the maximum trench depth that can be used. Trenches deeper than the maximum depth would take longer than 72 hours to evacuate.

Depth to water table and bedrock

A separation distance is required between infiltration trenches and ground water and bedrock. This distance is required to provide treatment of runoff before it reaches ground water and to protect against flooding of the structure from a high water table, which would render the trench ineffective. The Minnesota state rules for septic systems (Minn. R. 7080) requires a separation distance of 2 to 4 ft between on-site wastewater systems and the seasonally high water table or bedrock. Since urban runoff can contain many of the same pollutants as on-site wastewater-treatment systems, a 2 to 3-ft separation is recommended for filtration practices. A site sensitivity analysis as outlined in Practice 4.53, Infiltration Basins, should also be a part of infiltration trench planning.

Adjacent structures

The effects of seepage from the trench should be evaluated with respect to near-by or adjacent structures, such as foundations, basements, roads or sloping areas. The use of infiltration trenches on sites with steep slopes is not recommended. In some cases, slopes down gradient of an infiltration trench could become saturated and subject to failure. In residential areas, special care should be taken to prevent seepage from the trenches, which can cause wet basements. Infiltration trenches more than 3 ft deep should be located at least 10 ft down gradient from foundation walls. Infiltration trenches should also be located at least 100 ft away from any water supply well.

Runoff filtering

Oil, grease, floating organic matter and settleable solids should be removed from runoff water before it enters an infiltration trench. Runoff filtering devices, such as vegetated filter strips or oil/grit separators, can be used to remove these materials. All trenches with surface inlets should be designed to capture sediment before the flow enters an infiltration trench. Vegetative filter strips or oil/grit separators should be designed in accordance with the recommended criteria for those practices.

Trench construction

Construction of infiltration trenches should be delayed until the entire site is stabilized. This will prevent clogging of the trench from high sediment loads during construction.

After the trench has been excavated, its sides and bottom should be lined with filter fabric to prevent intrusion of soil into the stone. Clean, washed 1- to 3-inch stones should be placed in the trench in lifts and lightly compacted with plate compactors.

It is recommended that an observation port be installed in each trench. In addition to monitoring the performance of the trench, a port helps mark the trench location. Trench performance can be monitored by inserting a dipstick in the port immediately after a storm and then each 24 hours until the trench is empty.

After the trench is constructed, surface inlets to the trench should be protected from sediment until the site is stabilized and vegetative filtering practices are fully established.

MAINTENANCE

Proper maintenance of infiltration trenches and their pretreatment devices is critical to the success and longevity of the infiltration device. A regular inspection schedule and a regular maintenance schedule should be implemented. Routine maintenance for infiltration trenches involves activities intended to prevent clogging of the trench. Grass clippings and leaves must be removed from surface trenches to prevent clogging also. The trench should be inspected after the first few runoff events and then at least annually thereafter. It should also be inspected after major storms to check for ponding, which may indicate a clogged trench. Water levels in the observation port can be recorded over a several-day period to check for clogging.

If an infiltration trench becomes clogged, rehabilitation can be very expensive. Clogging in trenches open to the surface occurs most often at the top of the trench. This problem can be corrected by replacing the filter material and filter fabric at the top of the trench.

4.65 Filtration Practices: FILTERS

INTRODUCTION

Stormwater-filtering systems refer to a diverse group of techniques for treating the quality of storm water runoff. The commonality is that each utilizes some kind of filtering media, such as sand, soil, gravel, peat or compost, to filter pollutants from stormwater runoff. In addition, most filtering systems are typically applied to small drainage areas (five acres or less). Third, filtering systems are designed solely for pollutant removal. Flows greater than the water quality treatment volumes are bypassed around the filter to a downstream stormwater management facility. Lastly, filtering systems incorporate four basic design components in every application: inflow, pretreatment, filter and outflow.

The information in this section is based on the Center for Watershed Protection's "Design of Stormwater Filtering Systems" (Claytor *et al.*, 1996).

DESCRIPTION

Filter designs are grouped into three broad categories: (1) surface and underground sand filters, (2) organic/sand filters, and (3) artificial media filters. These differ in size, method of construction, location and type of filter media used, but the operation and principles of filtration are similar (see Figure 4.65-1).

DESIGN

The various kinds of storm water filters have several common design components. The four basic design components of a filtering system are: (a) inflow regulation that diverts a defined flow volume into the system, (b) a pretreatment technique to capture coarse sediments, (c) the filter bed surface and unique filter media, and (d) an outflow mechanism to return treated flows to the conveyance system and/or safely handle storm events that exceed the capacity of the filter. Each of the design components is described in greater detail below.

Inflow Volume Control

The inflow regulator is used to divert runoff from a pipe, open channel or impervious surface into the filtering system or to divert excess flow away from the system. The inflow regulator is designed to divert the desired water quality volume into the filter and to allow large-flow volumes to continue through the conveyance channel. With a few exceptions, most filtering systems are constructed off line (*i.e.*, runoff is diverted from the main conveyance system; see left-hand side of Figure 4.65-2). A few filtering systems, such as the swale system depicted in the right-hand side of Figure 4.65-2, are constructed on-line. On-line filters are located within the conveyance system, and are exposed to the full range of flow events, from the smallest storm up to and including the 100-year event.

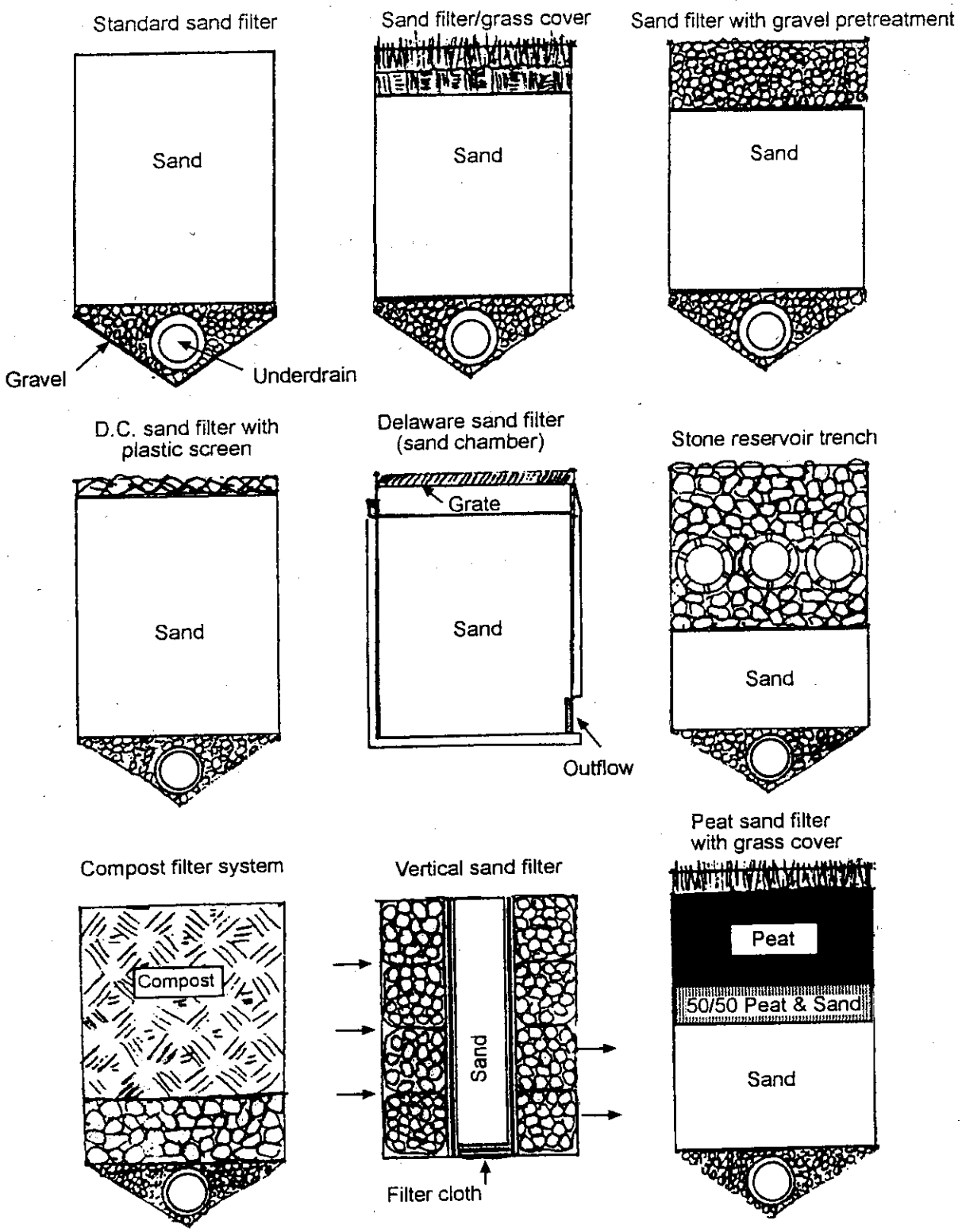


Figure 4.65-1 Cross section of sand filter design variations (source: Schueler, 1994a)

Pretreatment

The second key component of any filtering system is pretreatment. Pretreatment is needed in every design to trap coarse sediments before they reach the filter bed.

Without pretreatment, the filter will quickly clog, and lose its pollutant-removal capability. Each filter design differs with respect to the type and volume of pretreatment afforded. The most common technique of pretreatment is a wet or dry settling chamber. Geotextile screens, pea gravel diaphragms and grass filter strips may also be used as a secondary form of protection. Sediments deposited in the pretreatment chamber must be periodically removed to maintain the system.

Filter Bed and Filter Media

Each filtering system utilizes some kind of media, such as sand, gravel, peat, grass, soil or compost, to filter pollutants from urban storm water, and some designs utilize more than one. The selection of the right media is important, as each has different hydraulic, pollutant-removal and clogging characteristics.

The filter media is incorporated into the filter bed. The three key properties of the bed are its surface area, depth and profile. The required surface area for a filter is usually based as a percentage of impervious area treated and the media itself, and may vary due to regional rainfall patterns and local criteria for water quality treatment volumes. The depth of most filtering systems ranges from 18 inches to 4 ft. A relatively shallow filter bed is used for hydraulic and cost reasons, and because most pollutants are trapped in the top few inches of the bed. Each design also utilizes a slightly different profile through the bed. An example of the variation in sand filter profiles is shown in Figure 4.65-1. As can be seen, each design has slightly different surface protection and layering through the bed.

Outflow Mechanism

The final component of any stormwater filter design is the method(s) used to collect or exfiltrate the filtered runoff that leaves the filter bed and bypass the larger storm flows. The two primary methods for handling filtered runoff are to collect it in the perforated pipes and return it to the conveyance system, or to allow it to exfiltrate into the underlying soil where it may ultimately reach ground water. Each method has its pros and cons.

In the collection method, the bottom of the filter bed may be sealed with an impermeable liner, which allows the filtered runoff to be captured in pipes and returned to the conveyance system. Filtered collection is desirable if the contributing land use is considered a pollutant hotspot or if ground water contamination is a concern.

In the exfiltration method, the bottom of the filter bed is fully or partly permeable, and the filtered runoff continues downward, through the soil, and into the ground water. The uncollected runoff volume and pollutant mass drain into underlying soils and the water table. The advantage of exfiltration is that it provides ground water recharge and takes advantage of the natural filtering capacity of soil to remove additional pollutants.

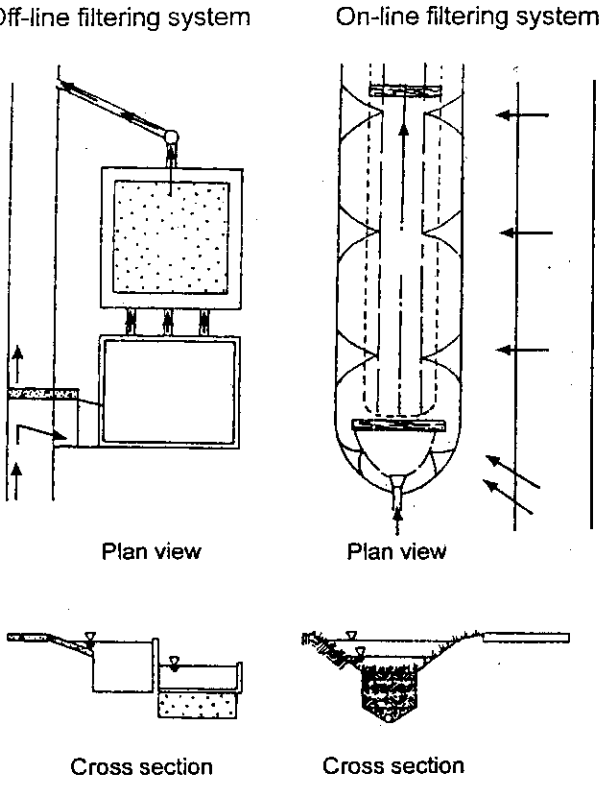


Figure 4.65-2 Schematic: on-line vs. off-line design

APPENDIX E
NURP Design Guidelines

NURP Design Guidelines

The NURP design recommendations for the design of storm water treatment basins are as follows:

a. A permanent pool ("dead storage") volume below the principal spillway (normal outlet) which shall be greater than or equal to the runoff from a 2.5 inch storm over the entire contributing drainage area assuming full development.

b. A permanent pool average depth (basin volume/basin area) which shall be > 4 feet, with a maximum depth of < 10 feet.

c. An emergency overflow (emergency outlet) adequate to control the one percent frequency/critical duration rainfall event.

d. Basin side slopes above the normal water level should be no steeper than 3:1, and preferably flatter. A basin shelf with a minimum width of 10 feet and one foot deep below the normal water level is recommended to enhance wildlife habitat, reduce potential safety hazards, and improve access for long-term maintenance.

e. To prevent short-circuiting, the distance between major inlets and the normal outlet shall be maximized.

f. A flood pool ("live storage") volume above the principal spillway shall be adequate so that the peak discharge rates from 99%, 10%, and 1% chance critical duration storms are no greater than pre-development basin watershed conditions. Additional discharge restrictions may be required as outlined in the Stormwater Management Plan.

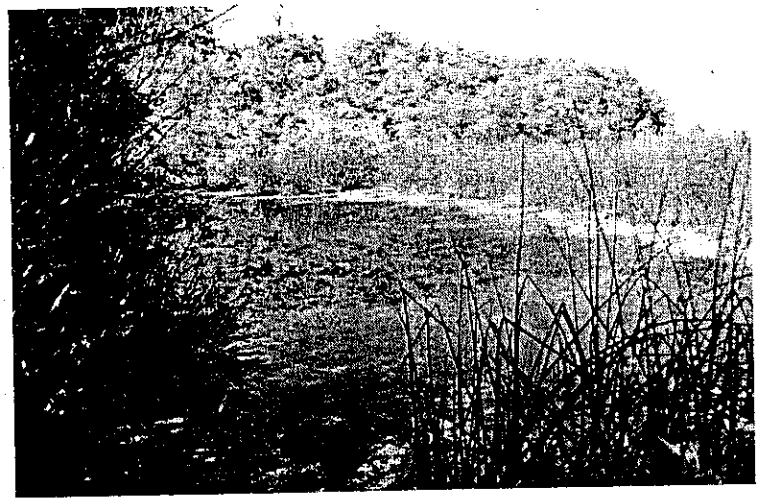
g. Retardance of peak discharges for the more frequent storms can be achieved through a principal spillway design which may include a perforated vertical riser, small orifice retention outlet, or compound weir. Additional discharge restrictions may be required as outlined in the Stormwater Management Plan.

h. A protective buffer strip of vegetation surrounding the permanent pool at a minimum width of 15 feet.

APPENDIX F
Wetland Management Plan

ROSEMOUNT

PUBLIC WORKS / ENGINEERING



Comprehensive Wetland Management Plan

ADOPTED 1998
AMENDED FEBRUARY 1999
AMENDED DECEMBER 2005

TABLE OF CONTENTS

LIST OF TABLES

LIST OF APPENDICES

I. Executive Summary

The Rosemount Comprehensive Wetland Management Plan (WMP) is an inventory/assessment of wetlands in Rosemount combined with a Plan and Ordinance designed to maximize the benefit that surface waters can provide to the community. The wetland map of the City is contained in **Appendix A.** The wetland inventory and assessment completed for each wetland is in **Appendix B**. The inventory consists of detailed technical data on each wetland. Wetlands were assessed for quality and functionality based on the information gathered in the field. Functional scores are included with the wetland inventory. Each wetland has been mapped and included in the City's Geographic Information System (GIS). The functional assessment information contained within this document consists of the previously performed field evaluations and assessments conducted by City staff in the development of the 1998 plan.

Wetlands have been prioritized for management based on the assessed functional score. This information gives City staff the ability to make an informed decision on what water resources are important and should be protected from future urbanized growth and development. Wetlands with the highest value were assigned the most aggressive management and protection strategies.

Past and present land development has influenced the administration of the WMP since the adoption of the plan in 1998. Since then, a number of issues have been brought to the attention of City staff that affect wetland mitigation and management. These issues have been handled administratively by City staff, motions by Rosemount City Council or through Technical Evaluation Panel (TEP) discussions. The City has become concerned with the ability to enforce such administration without a policy and procedure adopted as ordinance by City Council. In response, staff has elected to amend the 1998 WMP to address the outstanding and recurring issues associated with wetland impacts and management. New policies and provisions were discussed with the wetland committee and City staff.

II. Introduction and Purpose

The City of Rosemount's Comprehensive Wetland Management Plan (WMP) was developed in 1998 to be conformance with Minnesota Rules 8420.0650. The purpose of establishing the WMP was to develop policies related to the use and protection of wetlands within the City. Prior to 1998, wetland management and protection was primarily accomplished through site specific permitting actions of various regulatory agencies. The purpose of the WMP was to provide the City with the authority to rule on wetland impacts and implement regulations based on the needs of the community.

The WMP was also designed to provide information to land developers and the public regarding the amount, characteristics, and value of local wetlands and surface water. This WMP exists for the purpose of optimizing the City's surface water resources as provided under the Minnesota Wetland Conservation Act. The goals of this plan are to:

- Determine the quantity and quality of the wetland resources in Rosemount
- Map wetlands at a scale appropriate for local planning purposes
- Maintain data for use by residents and developers
- Focus limited resources in the most effective direction
- Solve chronic wetland management problems
- Identify key educational areas
- Achieve no net loss in the quantity, quality, functionality, and biological diversity of Rosemount's existing wetlands
- Increase the quantity, quality, functionality, and biological diversity of Rosemount's wetlands by enhancing diminished or drained wetlands
- Avoid direct or indirect impacts from activities that destroy or diminish the quantity, quality, and biological diversity of wetlands
- Replace wetland values where avoidance of activity is not feasible and prudent
- Optimize management of City surface water and wetland by integrating all surface water related management plans and ordinances
- To identify existing and potential problems or opportunities for protection, management, and development of water resources and related land resources in the county

- To develop and implement a plan of action to promote sound management of water resources in the City

According to the Metropolitan Council, the City of Rosemount is expected to be one of the top ten growth cities in the metropolitan area between 1995 – 2020. Land development has put great pressure on the quality and benefits associated with the City's surface water resources. The total wetland area in Rosemount covers about 1,832 acres, or about 8% of the City. About 1,174 of these acres are associated with the Mississippi River corridor. Most of the remaining 658 acres include about 400 other surface water bodies in Rosemount which are small to medium sized pothole wetlands lying within the City's northwest corner. Here a swath of the Wisconsin Age, St. Croix Moraine has left behind a hilly terrain with many potholes and small enclosed watersheds. Large tracts of this area are yet to be developed, but are seen as prime locations for residential housing. Just north across Rosemount's border within the City of Eagan is the Lebanon Hills Regional Park which takes advantage of this interesting terrain for education and recreation.

Wetlands within the City were assessed in 1997 and 1998 as a part of the WMP plan development (see **Appendix A**). This field assessment focused on the undeveloped Municipal Urban Service Area (MUSA) identified in the 2020 Land Use Plan. These properties have a greater density of wetlands and surface waters than other areas of the City and are expected to experience significant development and have the highest potential for wetland impacts. The 1998 WMP and ordinance were in effect before much of the development projects in Rosemount, allowing the City to protect and preserve the natural water resources to the fullest extent feasible on the property being developed.

The City has applied the WMP policies on all land development in the City of Rosemount since the adoption of the plan in 1998. The plan provides a clear outline of the City's expectations concerning wetland management and protection. Buffer monuments have contributed to the public education portion of the WMP. Buffer areas themselves have increased in overall area and vegetation density. Wetland monitoring provides the City with technical data on mitigation sites. The data are reviewed to ensure that the appropriate wetland type and functionality is attained. The City's 1998 Erosion Control policy has helped to prevent soil erosion and deposition impacts to wetlands adjacent to construction.

Based on the implementation of this Plan since 1998, it has been determined by the City that a number of policy clarifications were needed. The purpose of this plan amendment is to address the following issues:

- Wetland buffer zones and related policies
- Location of storm water ponds within buffers
- Public education
- Wetland management classification appeals
- Wetland mitigation regulations and procedure

The WMP provides greater flexibility and control over wetland management and protection to meet the specific needs and goals of the community. The plan was developed in recognition of

the City of Rosemount's 2020 Land Use Plan and the Comprehensive Stormwater Management Plan. This document is written in recognition of the Wetland Conservation Act (WCA) and shall serve as a supplement to this legislation.

III. Definitions and References

Applicant: Person or party proposing wetland impact or related activity.

Best management practices: State-approved and practices published in the "Protecting Water Quality in Urban Areas" associated with draining, filling, or replacing wetlands that are capable of preventing and minimizing degradation of surface water and groundwater. The "Protecting Water Quality in Urban Areas" manual is written and produced by the Minnesota Pollution Control Agency.

Buffer zones: Non-wetland areas which extend a specified distance from the wetland edge. Buffer zones are terrestrial areas of native vegetation that experience little to no human impact. Buffer zones help to protect adverse impacts to the wetland. Restrictions apply to the activities within a wetland buffer zone once a buffer is established. The buffer starts at the delineated wetland edge.

Buffer Averaging: Practice of allowing a variable width buffer around a wetland where the average buffer width is equal to the buffer width required for the wetland management category.

City: The incorporated City of Rosemount.

Creation: Construction of wetlands in an area that was not wetlands in the past.

Excavation: The displacement or removal of the sediment or other materials by any method.

Fill: Any solid material added to or re-deposited in a wetland that would alter its cross-section or hydrological characteristics, obstruct flow patterns, change the wetland boundary, or convert the wetland to a non-wetland. It does not include posts and pilings for linear projects such as bridges, elevated walkways, or power line structures, or structures traditionally built on pilings such as docks and boathouses. It does include posts and pilings that result in bringing the wetland into a non-aquatic use or significantly altering the wetland's functions and values, such as the construction of office and industrial developments, parking structures, restaurants, stores, hotels, multifamily housing projects, and similar structures. It does not include slash or woody vegetation, if the slash or woody vegetation originated from vegetation growing in the wetland and does not impair the flow or circulation of water or the reach of the wetland.

Growing Season: The portion of the year when soil temperature at 19.7 inches below the soil surface is higher than biological zero (5° C). For ease of determination this period can be approximated by the number of frost free days.

Hydric soils: Soils that are saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions in the upper part.

Hydrophytic vegetation: Macrophytic plant life growing in water, soil, or on a substrate that is at least periodically deficient in oxygen as a result of excessive water content.

Impact: A loss in the quantity, quality, or biological diversity of a wetland caused by draining or filling or excavating.

Landowner: A person or entity having the rights necessary to drain or fill a wetland, or to establish and maintain a replacement or banked wetland. Typically, the landowner is a fee title owner or a holder of an easement, license, lease, or rental agreement providing the necessary rights. The right must not be limited by a lien or other encumbrance that could override the obligations assumed with the replacement or banking of a wetland.

Local government unit: The City of Rosemount.

Project: A specific plan, contiguous activity, proposal, or design necessary to accomplish a goal as defined by the local government unit. As used in this chapter, a project may not be split into components or phases for the sole purpose of gaining additional exemptions.

Public value of wetlands: The public benefit and use of wetlands as determined based upon a functional assessment method.

Soil and water conservation district: A legal subdivision of state government under Minnesota Statutes, chapter 103C.

Wetlands:

A. Lands transitional between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water. For purposes of this Plan wetlands must:
   (1) Have a predominance of hydric soils;
   (2) Be inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of hydrophytic vegetation typically adapted for life in saturated soil conditions; and
   (3) Under normal circumstances, support a prevalence of hydrophytic vegetation.

B. The wetland size is the area within its boundary. The boundary must be determined according to the United States Army Corps of Engineers Wetland Delineation Manual (January 1987). The wetland type must be determined according to United States Fish and Wildlife Service Circular No. 39 (1971 edition).

References

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- United States Fish and Wildlife Service, Wetlands of the United States, United States Fish and Wildlife Service Circular No. 39, (1971).
- United States Army Corps of Engineers, Wetland Delineation Manual, (1987).
- Cowardin, et al., Classification of Wetlands and Deepwater Habitats of the United States, (1979)
- Board of Water and Soil Resources, Minnesota Routine Assessment Methodology for Evaluating Wetland Functions, Version 1.0 - May (1996).
- National Wetland Inventory Maps United States Fish and Wildlife Service.

IV. Acknowledgements

The Rosemount WMP was developed with input from a wetland committee. The members of this committee are outlined below:

2004-2005 Committee
Kimberly Shoe-Corrigan, City Council
Jeffery Weisensel, Former Planning Commission
John Powell, Planning Commission
Joan Schneider, Utility Commission
Andrea Moffatt, WSB & Associates Inc.
Chad Donnelly, Water Resource Engineer

1997-1998 Committee
Kimberly Shoe-Corrigan, Planning Commission
Jeffery Weisensel, Planning Commission
Donald Berg, Utility Commission
Kelly Sampo, Parks Committee
Tim P. Brown, Water Resources Coordinator
Brian Huser, Intern
Bud Osmundson, Public Works Director
Wayne Barstad, Minnesota Department of Natural Resources
Matt Moore, Minnesota Board of Water and Soil Resources
Doug Norris, Minnesota Department of Natural Resources
Brian Watson, Dakota County Soil and Water Conservation District

V. Wetland regulations

Wetland regulation involves federal, state, and local agencies including the Board of Soil and Water Resources, Department of Natural Resources, Watershed Districts, Army Corps of Engineers, and Local Government Units. Notification is provided to each agency in the event of wetland related impacts. The following items describe the role and responsibility of each agency:

A. US Army Corps of Engineers

The US Army Corp of Engineers (COE) regulates the discharge of dredged or fill materials to wetlands and other water bodies through Section 404 of the Clean Water Act provided that there is a surface water connection to navigable waters. Any impact to a navigable water or wetland or impact that is connected to navigable waters, including filling, draining or excavating may require a permit from the COE. Wetland delineations are also subject to COE approval. Depending on the size and extent of the wetland impact, the Minnesota Pollution Control Agency (MPCA) may be involved in certifying the COE permit. For more information about the COE regulations, the area COE project manger can be contacted at (651) 290-5015 or information can be obtained from the COE website at www.mvp.usace.army.mil.

B. Department of Natural Resources

The Department of Natural Resources (DNR) has jurisdiction over Public Waters and Wetlands as depicted on the DNR Public Waters Inventory maps. The DNR has jurisdiction over Public Water and wetlands to the Ordinary High Water Elevation (OHW) or to the top-of-bank for streams. The OHW is determined by the DNR. Any impact to a Public Water or Wetland may require a permit from the DNR. The DNR Area Hydrologist can be contacted for more information at (651) 772-7910 or information can be obtained from the DNR website at www.dnr.state.mn.us/waters/.

C. Minnesota Pollution Control Agency

Minnesota Pollution Control Agency (MPCA) water quality standards applicable to wetland protection are contained in Minnesota Rules 7050. Water quality standards are applicable to all wetlands of the state. Sequencing mitigation requirements of Minn. Rule 7050.0186 apply to all wetland alterations that are permitted or certified by the MPCA as described below.

The NPDES/SDS permit program is a delegated federal permit issued under the responsibilities and authorities contained in Minnesota Statutes Chapter 115. Minnesota Rule 7050.0186 requires a sequencing evaluation to avoid, minimize, and mitigate wetland impacts in the issuance of NPDES/SDS permits, including issuance of the general Construction Storm Water NPDES permits. If a project includes a physical wetland alteration caused by draining, filling, excavation, or inundation of the wetland and that impact is not addressed in either the US Army Corps of Engineers 404 permit, the Department of Natural Resources permit, or the Wetland Conservation Act permit, then mitigation compliance with MN Rule 7050.0186 must be demonstrated. For the purposes of the MPCA NPDES permit, *de minimis* determinations by another permitting agency that

address the project impacts are recognized by the MPCA. However, a non-jurisdictional determination by another permitting agency does not address project impacts and therefore does require the project proposer to demonstrate that it meets the NPDES permit conditions and Minnesota Rule 7050.0186.

In the past, 7050.0186 requirements were often applied during the issuance of Section 401 Water Quality Certification which is part of the issuance process of the US Corps of Engineers 404 permit. The 401 Water Quality Certification program is an element of the Federal Clean Water Act and has been delegated to the MPCA. Under this program, the MPCA reviewed all federal permits including Clean Water Act Section 404 permit applications for compliance with state water quality standards primarily contained in Minnesota Rule 7050. The MPCA can approve, deny, or waive 401 certification. If denied, the federal permit, usually the US Corps of Engineers 404 permit, cannot be issued. The MPCA is currently not implementing the Section 401 program on a regular basis and nearly all certifications are being waived. This action does not eliminate, waive, or vary the applicant's responsibility of complying with all water quality standards and requirements contained in Minnesota Rules 7050. In addition, this waiver action does not waive MPCA's authority to take necessary actions, including enforcement actions, to ensure that the applicant and the project's construction, installation, and operation comply with water quality standards and all other applicable MPCA statutes and rules regarding water quality.

D. Local Government Unit (LGU)

The Wetland Conservation Act (WCA) is a state law that was passed in 1991 and has been subsequently amended (Minn. Laws CH 354, Minn. Statute 103G.222-2373 and other scattered sections). The Board of Water and Soil Resources (BWSR) publishes MN Rule 8420 in accordance with the Wetland Conservation Act laws. BWSR's role is to assist the Local Government Units (LGUs) in the implementation of the WCA and to be a member of the Technical Evaluation Panel (TEP).

The WCA is administered by the LGUs. The City of Rosemount is the LGU for the WCA within the City's political boundary. The City can issue or deny permits depending on whether or not the project is in conformance the WCA and the requirements of this plan.

The intent of the WCA is to achieve a "No Net Loss" of wetlands in Minnesota. Therefore, the WCA prohibits filling, draining, and excavating of wetlands in some areas unless the activity is exempt or wetlands are replaced by restoration or creation of wetland of at least equal public value.

1. **Wetland Impact and Replacement Application**
   When filling or draining any wetland, or excavating in the permanently or semi-permanently flooded areas of a type 3, 4, or 5 wetland, or excavation greater than 6 feet in any wetland is anticipated as a part of a project, an application must be completed by the project proposer and submitted to the City. These applications are contained on BWSR's web site at http://www.bwsr.state.mn.us/wetlands/index.html. If wetland impacts are

unavoidable, a wetland mitigation plan must accompany the application as outlined within this plan. An application fee may apply.

2. **Wetland Delineation**
   For any site development activities within the City of Rosemount, the City requires the developer to submit a wetland delineation report that identifies the location and the extent of any wetlands present on the site. Wetland delineations must be performed in accordance with the *1987 Corps of Engineers Manual for Delineating Wetlands*. Delineations are to be performed by a wetland professional who has been trained in wetland delineations. Wetland delineations must be performed during the growing season, and will be considered incomplete if received at a time of year not conducive for proper review. Delineations are valid for five years.

   Delineations will be subject to field verification by City staff, the Technical Evaluation Panel (TEP) and/or the US Army Corps of Engineers. It is recommended that City staff review wetland delineations prior to plan development and/or application submittal.

3. **Wetland Sequencing**
   Sequencing must be provided as a part of an application for wetlands categorized as Preserve, Manage I, and Manage II. Manage III wetlands are applicable for sequencing flexibility when impacts are proposed. An applicant who proposes to impact a wetland identified in the WMP must adhere to the wetland Sequencing Standards outlined in Minn. Rules 8420.0520 in the WCA. The applicant may submit a sequencing evaluation with the wetland impact application or apply for a preliminary sequencing determination from the City. The determination of a complete sequencing evaluation will be made by the City and/or TEP assigned to the project. For a comprehensive description of the Sequencing standards, see Minn. Rules 8420.0520 in the WCA.

4. **Wetland Replacement**
   Once sequencing has been completed in conformance with this plan and it has been determined that wetland impacts are unavoidable, the lost functions and values of the wetland must be replaced. Replacement of lost functions and values must be in conformance with the *Wetland Replacement* section of this plan. Applications can be found at BWSR's web-site : http://www.bwsr.state.mn.us/wetlands/index.html.

   Wetland replacement should be located within the project site. If this is not feasible, replacement locations should be within the same subwatershed within the City. It is strongly encouraged that wetlands categorized as Manage II or Manage III within this plan are used for wetland mitigation when feasible. The preservation of existing wetlands on the subject property is not an eligible credit for the mitigation requirements except as otherwise provided in Minnesota Rules 8420.0541

Wetland replacement may be completed in the form of New Wetland Credit (NWC) or through a combination of NWC and Public Value Credit (PVC) as provided in the *Wetland Replacement* section of this plan. For a comprehensive description of NWC and PVC, see Minn. Rules 8420.0541 in the Wetland Conservation Act.

5. **Replacement for Road Projects**
   Through the WCA, wetland impacts that occur due to road improvement projects that address safety issues and are not undertaken solely to accommodate additional traffic capacity by the City or County as the local road authority are eligible to be replaced by BWSR as outlined in Minn. Rules 8420.0540 Subp. 4 (5) (6) and Subp. 5. Impacts need to be avoided and minimized to the greatest extent feasible. Notification to BWSR of the intent to use BWSR mitigation is required through application process and/or annual reporting by the City. Applications can be found at BWSR's web-site : http://www.bwsr.state.mn.us/wetlands/index.html. BWSR mitigation is not eligible for new streets associated with land development.

6. **WCA Exemptions**
   The WCA exemption standards are covered in MN Rule 8420.0122 and are included by reference to this plan. Wetlands that are exempt per the WCA shall not be regulated by the policies within this Plan.

E. Wetland Application Process and Timeline

When filling or draining any wetlands or excavating in the permanently or semi-permanently flooded areas of a Type 3, 4, or 5 wetland or excavating greater than 6 feet for any wetland is anticipated as part of a project, an application must be completed by the project proposer and submitted to the City. These applications are available at BWSR's web-site: http://www.bwsr.state.mn.us/wetlands/index.html.

If wetland impact is less than 10,000 square feet, the City will send a summary and Notice of Application of the project within 10 days of receipt of a complete application to the TEP, the DNR, the Watershed Management Organization, the COE and anyone who has requested this information. If wetland impact is greater than 10,000 square feet, the City will send a Notice of Application and copy of the application within 10 days of receipt of the application to the TEP, Watershed Management Organization, the DNR, COE, the Watershed Management Organization, and anyone who has requested such information. The TEP, Watershed District, DNR, COE and other agencies shall have between 15-30 calendar days to comment on the project.

Once the comment period has ended, the City will make a decision on the application within 60 days of receiving a complete application in accordance with Minn. Rules 8420.0230 Subp. 2. If the 60 day process cannot be accommodated due to the timing of the preliminary plat process, the applicant will be informed. Generally applications will be approved or denied during the preliminary plat process. Once a decision is made, the City will mail a Notice of

Decision and Findings and Conclusions to all who received a summary or copy of the permit application. The City's decision is then effective and the project can commence provided that replacement of the wetland impacts occurs before or concurrently with the wetland impact and provided all other permits from other agencies have been obtained. There is a 30 day appeal process in MN Rule Chapter 8420. The applicant can begin work during this appeal window at its own risk. If the LGU's decision is appealed, work on the project would be suspended until the appeal process is resolved.

The project proposer can appeal the City's decision. This appeal must be made to the Board of Water and Soil Resources within 30 days after the date on which the Notice of Decision is mailed. Minn. Rule 8420.0250 can be consulted for further information on appeals.

Determinations on Wetland Replacement Plans that impact greater than 10,000 sf of wetland will be made by the City Council. Determination on Wetland Replacement Plans that impact 10,000 sf or less of wetland or Exemption Determinations can be made by City Staff, unless it is deemed necessary to bring the application to the City Council.

This wetland management plan has been developed to be in conformance with the Wetland Conservation Act. Any future changes in the WCA would supersede the requirements outlined in this plan.

VI. Technical Elements

A. Wetland/Surface Water Inventory

Wetlands were identified based on instructions in the "Minnesota Wetland Delineation Field Guide". Included in field documentation is notation on: hydrology, size, vegetation and soils, several photographs, and Dakota County topographic half-section map locations.

This field reconnaissance was carried out in 1997 and 1998 by the City's Water Resources Engineer with assistance from interns trained and supervised by the former. The database was set up using the National Wetland Inventory (NWI) compiled in 1987 using aerial photography. The database was then modified with any changes found by field inspection during the spring, summer and fall of 1997 and spring of 1998. Wetlands found by field inspection that were not listed in the NWI have been added. Wetland determinations were arrived at using the three defining factors for a wetland, **Hydrology, Vegetation, and Soils**. Each of these parameters needs to be present before an area could be determines as "wetland" according to the 1987 Corps of Engineers Manual for Delineating Wetlands.

B. Field Methods

Various resources were utilized both in the office and in the field to determine possible wetland sites. Initially, 1991 topographic maps were used in conjunction with the NWI map to locate wetlands in the City. Next, 1991 aerial photographs were viewed to locate low and possible water holding areas. The last step in the office reconnaissance was to check the local soils map for hydric (wetland) soils. After these preparatory steps were taken, the field work was undertaken. All areas were covered on foot, and low areas or areas with one of the three wetland indicators (hydrology, soils, and vegetation) were tested. Areas that tested as wetlands were documented on field data sheets as well as sketched onto topographic maps for approximate representation of size. Photographs were taken of the wetland sites as well. Precise delineations of wetlands are left to be completed by property owners, as the need arises.

C. Database Information

Using the information collected during field work, wetlands were categorized using the Fish and Wildlife Service (FWS) and NWI classification systems. This information was then entered into the wetland database. The database shows Rosemount's wetland number, size, FWS type, DNR number, and other relevant information (see **Appendix A**). This information is directly linked to the Geographic Information Systems (GIS) map which shows all of the wetlands in Rosemount that were identified in the inventory process. The inventory does not include all surface water features with the City of Rosemount. Wetland features of the GIS system are visual representations of the identified wetlands and do not represent the actual wetland delineation

D. Geographic Information Systems Map

Polygon coverage using the program Arcview was linked to the tabular data in the Microsoft Access Database with a common identifier. Polygons representing the shape of the wetlands were drawn using contour and parcel coverages as a backdrop. The overall process was used to create a digital map that can be accessed with ease to locate wetlands throughout the City of Rosemount. Maps can be generated and database information about the wetlands can be viewed. The GIS maps are updated seasonally to account for wetland impact activity and monitoring accomplished for that season. New and replacement wetlands will be incorporated in the GIS database and City map as they are established. The functionality and classification will be updated based on the monitoring information provided to the City.

VII. Functional Assessment

The functional value of each wetland was evaluated in 1997-1998 with respect to the following functional parameters:

- Floral diversity and integrity
- Water quality protection
- Fish and wildlife habitat
- Flood/storm water attenuation
- Shoreline protection
- Groundwater recharge and discharge
- Aesthetic/recreation/education and science
- Commercial uses

Wetland functionality was assessed according to a modified version of the Minnesota Routine Assessment Method (MnRAM) referred to as the Rosemount Wetland Functional Assessment (RoseWFA) worksheet (**Appendix B**). It was developed over in 1997 and in consultation with the Minnesota Board of Water and Soil Resources, the Minnesota Department of Natural Resources, the Dakota County Soil and Water Conservation District, the Rosemount Wetland Committee, and City staff.

Upon development of a site, the City will require that the applicant complete a re-assessment of the wetlands using the RoseWFA. This is in addition to the wetland delineation report that is required to be submitted if the site is proposed to be developed. Field work must be completed during the growing season, which is generally May 1 – October 15.

VIII. Wetland Classification

Wetlands are classified for management and protection based on the total score of each functional parameter evaluated in the RoseWFA. The management classifications and corresponding functional scores are as follows:

Preserve: Wetlands placed into the preserve category received the highest functional score ranging between 425-660.

Manage I: Wetlands placed into Manage I category received functional scores between 280-420 and were selected for the MI category due to their special value.

Manage II: Wetlands placed into Manage II category received functional scores between 280-420.

Manage III: Wetlands placed into Manage III category received functional scores between 0-275.

In the event of a dispute concerning wetland classification, the applicant or project proposer will be required to submit a *Request for Appeal* to the City's Engineer. The *Request for Appeal* must include the wetland number, current classification, and reason(s) for the appeal. A functional assessment will be conducted by City staff or a City approved wetland specialist. A decision will be made based on a review of the information within 30 days during the growing season or 30 days after the growing season begins. A Notice of Decision will be sent to the appealing party and the regulatory agencies. The Notice of Decision will indicate the wetland classification and the management and protection strategies assigned to the wetland by support of this document. Staff will make a decision within 60 days of receiving a complete request and notify the applicant of the decision. Appeals to this decision can be made to the City Council.

IX. Wetland Management Policies

A. General Water Quality Practices

For wetlands citywide, several tools can be applied with minimal expense. The City shall maintain its regularly scheduled program of street sweeping and storm drain sump cleaning. City streets are swept twice yearly and catch basin sumps are cleaned seasonally based on the schedule of the Stormwater Pollution Prevention Program (SWPPP). These programs can have a significant impact on wetland water quality by removing sediments and chemicals from the storm water runoff that enters surface water bodies.

The Engineering Department and Building Inspections currently maintain a general erosion control inspection and enforcement program. The goal of this program is to minimize transport of sediments eroded from construction sites to surface water bodies. This program is supported by language in the City's Surface Water Management Ordinance as well as the Uniform Building Code for the State of Minnesota. This program is continually being reviewed and improved to minimize the impact to water quality of storm water runoff.

In compliance with state requirements, the City has developed and implemented a Stormwater Pollution Prevention Program (SWPPP) which focuses on the preventative aspects of storm water pollution. The SWPPP is a combination of Best Management Practices (BMP's), ordinance, and public education tools used to prevent storm water pollution. The Minnesota Pollution Control Agency (MPCA) has required the City of Rosemount to submit a SWPPP for review and approval. The City is required to submit an annual report with results and summaries of the actions taken for the previous year.

In order to organize and implement Rosemount's Wetland and Surface Water Management Plan, an ordinance has been developed under Minnesota Statute Chapter 462. This ordinance is included in **Appendix C**.

Efforts to educate residents regarding wetland ecosystems and best management practices are ongoing and will continue. Along with dissemination of surface water specific information, programs that will encourage direct action on the part of residents, such as the Citizens Assisted Monitoring Program (CAMP) will be discussed by City staff. The City will continue to promote and sponsor an "Adopt-A-Wetland" program. This will enlist volunteers to collect litter and trash that accumulates around and within City wetlands as well as addressing other needs as they develop. Other educational opportunities will be actively sought.

B. Category Specific Management Strategies

The inventory and functional assessment information was used to determine management categories for individual wetlands based on functional level. Wetlands that score highest are targeted for maximum protection and resource dedication. The wetland category management strategies were designed to optimize resource allocation. The goal of this plan is to devote resources in a manner that optimizes the overall functional value of wetlands to the community and the natural ecosystem. This plan does not "roll back" any protection for

wetlands existing under state or federal law but rather specifies proactive management strategies scaled to the current functional levels of Rosemount wetlands.

The management strategies call for increasing levels of protection for wetlands that score high in the functional assessment. In terms of actual management practices these different levels are implemented through **buffer zones, storm water treatment, mitigation requirements, and public education**.

1. Wetland Buffer Zones

Wetland Buffer Zones are upland areas that contain natural areas of vegetation designated by a LGU to protect the ecological values and functions of the aquatic system. Buffer zone functions include:

- Stabilizing soils and preventing erosion
- Filtering suspended solids and nutrients
- Supporting and protecting fish and wildlife habitat
- Encouraging the production of unique vegetation
- Stabilizing water temperature
- Deterring human encroachment

Dense native vegetation is the optimal condition for an effective wetland buffer zone. Once established, activities in buffer zones that disturb the roots or influence the growth of the vegetation, such as grading, mowing, landscaping and planting, fertilizing, spraying (herbicides), and seeding or sodding are prohibited. Herbicides and controlled burns or other management practices used to control noxious weeds will be allowed only with permission from the City Engineer.

The width of buffer considered appropriate to protect a wetland from degradation is related to the wetland functions being protected and the buffer functions being provided. Buffer widths for each management category are outlined below and described in **Table IX-1**. Additional buffer zone may be required above and beyond the prescribed width if determined necessary and feasible by the City Engineer.

Preserve: 75 feet
Manage I: 50 feet
Manage II: 30 feet
Manage III: 15 feet (non-agricultural areas)

In addition to the buffers, the City requires a 30' structure setback from the buffer to allow for usable yard space.

Buffers will be contained within a conservation easement that includes both the wetland and the buffer. A sample of the City's conservation easement is in **Appendix D.** The conservation easements will be recorded with the final plat and must be indicated on subsequent land development plans. The extent of the conservation easement will be determined based on the prescribed buffer width for the wetland in question and/or the

outer limits of an approved averaged wetland buffer. These easements provide the City with a legal right to the property and the ability to enforce the wetland buffer requirements as outlined in this document.

The construction of bike paths or trails through designated wetland buffers will be determined administratively by City staff. The applicant must demonstrate that the placement of the trail does not result in a loss of total wetland buffer area for the wetland. The buffer area consumed by the placement of the bike path or trail must be compensated for by establishing additional buffer areas in equal or greater amount consumed by the bike path or trail. The buffer area on both sides of the bike path or trail must remain natural and must not be manicured or landscaped.

2. Buffer Averaging

Buffer averaging is the practice of allowing a variable buffer width around a wetland where the average buffer area is equal to the buffer area required for that particular wetland management classification. Buffer averaging will be reviewed on a project-by-project basis. When proposing buffer averaging, the project proposer or applicant must adhere to the following:

- The buffer width averaging will be reviewed on a case-by-case basis.
- A minimum 30' buffer is allowed on P and M1 wetlands.
- A minimum 15' buffer is allowed on M2 and M3 wetlands.
- Averaged buffer acreage must be equal to or greater than the required buffer acreage

An exception to the minimum buffer average will be considered for linear public road projects on existing roads.

Conservation easements are required over the buffer perimeter and will be recorded at the time of final plat. The City Engineer will review the proposal and either approve, approve with conditions, or deny the request to utilize buffer averaging around the wetland.

3. Buffer Establishment

For areas where seeding or buffer establishment is needed either because the buffer has been disturbed or it is determined that the buffer will not become established on its own, a buffer establishment plan must be developed. This can include the current BWSR or Mn/DOT guidelines regarding planting of native species on wetland replacement sites. Revegetation with native plants is required around wetland buffers.

4. Buffers around Mitigation Wetlands

Buffers will be required to be established around wetland mitigation sites. If the wetland mitigation is proposed to be an expansion of an existing wetland, the buffer width required for the existing wetland will be the required buffer width of the mitigation area. It the wetland mitigation is a stand-alone site, the buffer width will be based on the required buffer width of the wetland being impacted.

5. Storm Water Pre-Treatment

Storm water can have a detrimental impact on wetlands. To alleviate the sediment and nutrient loading such input places on wetlands, this plan includes various levels of storm water pretreatment as follows:

Preserve: Sediment and nutrient pretreatment required, consider diversion if possible
Manage 1: Sediment and nutrient pretreatment required
Manage 2: Sediment pretreatment required
Manage 3: Pretreatment to NPDES standards (per Minnesota Pollution Control Agency rules) is required if these standards apply to the project

The above requirements are left somewhat open as to the particular method selected for each case. This will allow some flexibility, especially to incorporate new technologies and techniques. Storm water ponds will be required to be placed in easements. Final approval of treatment methods shall in all cases be left to the City Engineer.

6. Storm Water Treatment Ponds within Wetland Buffer Zones

Storm water treatment ponds within designated wetland buffer zones are becoming a common land development practice. Although the pond compromises wetland buffer area, the construction of a pond provides storm water treatment where suspended solids and other pollutants settle out prior to overflowing into a wetland. A well designed and placed treatment pond can be beneficial to the quality and integrity of the adjacent wetland. The basin also provides additional flood control for large rain events.

The design and placement of storm water treatment ponds within wetland buffer zones must comply with the provisions of the Comprehensive Storm Water Management Plan (CSWMP) and this document concerning storm water treatment. The design guidelines are available from the City.

If the area of a wetland buffer zone includes a storm water treatment pond, the buffer zone must adhere to the following:

- Wetland buffer must be provided between the pond and the wetland and around the perimeter of the entire system. Wetland buffer must be a minimum 15 feet between the NWL of the pond and wetland edge.
- Only one treatment pond in the wetland buffer zone is allowed.
- Buffer area must be equal to the total buffer area required for the wetland based on the classification prescribed in **Table IX-1**. The storm water pond itself will not count towards the buffer area.

New Wetland Credit will not be issued for the construction of storm water treatment ponds in wetland buffer zones. The treatment ponds will be considered a function of

storm water management, applicable for issuance of Public Value Credit as outlined in **Table IX-1**.

7. Wetland Buffer Monuments

For all new and redeveloped land subsequent to passage of this plan, the developer shall be responsible for installation of monuments which mark the outer edge of the wetland buffer zones. Buffer monuments must be indicated on the grading plan and shall generally be placed at the intersections of lot lines and the buffer boundary. All markers and their placement shall be per city specification or approved by the City Engineer. A monument template is available at the City.

8. Buffers in Previously Developed Areas

In areas developed prior to the establishment of the WMP, no buffers were required. Previously developed areas are defined as areas where final plats have been approved before the adoption of this plan and the accompanying ordinance. In these areas, the implementation of buffers will be encouraged rather than required. Education efforts of these residents and businesses will be used to encourage buffers in these areas for both wetlands and storm water ponds. It is believed that most Rosemount residents will respond when the benefits are understood and toward that end this plan recommends an intensive educational effort.

Table IX-1
Wetland Management and Protection Requirements

Management Class	Score	Management Strategy	Wetland Buffer Requirements	Storm Water Management	Mitigation Standard
Preserve	660 - 425	Maintain wetland and existing functions, values and wildlife habitat. Apply strict avoidance standards.	75 feet 30' minimum if buffer averaging is allowed Monuments required	Sediment and nutrient pretreatment required; consider diversion if possible	3:1 replacement ratio with a minimum 1.5 acres of New Wetland Credit and maximum 1.5 acres of Public Value Credit for every acre impacted.
Manage I	420 - 280	Maintain wetland without degrading existing functions, values and wildlife habitat. Sequencing is applicable	50 feet 30' minimum if buffer averaging is allowed Monuments required	Sediment and nutrient pretreatment required	2:1 replacement ratio with a minimum of 1 acre of New Wetland Credit and a maximum of 1 acre of Public Value Credit
Manage II	420 - 280	Maintain wetland functionality Apply some sequencing flexibility	30 feet 15' minimum if buffer averaging is allowed Monuments required	Sediment pretreatment required	2:1 replacement ratio with a minimum of 1 acre of New Wetland Credit and maximum of 1 acre of Public Value Credit
Manage III	275 - 0	Allow maximum sequencing flexibility	15 feet for non-agricultural areas only 15' is the minimum buffer standard Monuments not required	Pretreatment to NPDES standards (per Minnesota Pollution Control Agency rules) is required if these standards apply to the project	2:1 replacement ratio with a minimum of 1 acre of New Wetland Credit and maximum of 1 acre of Public Value Credit

X. Wetland Replacement

Subject to an approved sequencing evaluation, the applicant will need to provide a wetland replacement plan to account for the proposed wetland impacts. Impacts due to development or other construction activity are regulated under the WCA. In terms of impact mitigation, the WCA serves as a baseline for evaluation of impacts and associated wetland replacement plans. This Plan specifies guidelines for City Staff and Commission/Council review and recommendations for individual wetlands to insure resources allocation is optimized. The guidelines are as follows:

> **Preserve**: Wetlands under this category shall receive the maximum amount of protection under this plan. Impacts will be allowed only under extreme hardship. Replacement is required at a 3:1 ratio with a minimum of 1.5 acres of New Wetland Credit (NWC) and a maximum of 1.5 acres of Public Value Credit (PVC) for every acre impacted.
>
> **Manage I:** Mitigation of wetlands in this category will be at a 2:1 ratio with 1 acre of NWC minimum and 1 acre of PVC maximum for every acre impacted.
>
> **Manage II**: Mitigation of wetlands in this category will be at a 2:1 ratio with 1 acre of NWC minimum and 1 acre of PVC maximum.
>
> **Manage III**: Mitigation of wetlands in this category will be at a 2:1 ratio with 1 acre of NWC minimum and 1 acre of PVC maximum. WCA Sequencing flexibility is applicable for these wetlands.

Actions available for mitigation credit are outlined in Minnesota Rules 8420.0541.

XI. Wetland Monitoring

Wetland monitoring is required for replacement wetlands for a period of five years. City staff coordinates the monitoring for all wetland replacement within the City of Rosemount. Monitoring includes actively managing the replacement site to ensure that vegetation is becoming established, erosion problem areas are stabilized, hydrology criteria are being met, and any other activities to ensure the wetland replacement goals are met. Monitoring requirements are outlined in **Appendix E**.

A letter of credit is required with the Subdivision or Development Agreement to ensure the proper establishment of the mitigation site(s). Twenty percent of this bond shall be returned to the developer with City approval of each yearly monitoring report.

XII. New Wetlands

"New wetlands" include wetlands deliberately created where none existed at the time this plan was adopted. This might include wetlands created as part of a wetland mitigation/creation project or as a result of blocked drainage patterns. Wet areas created by human activity as specified in Minnesota Rules 8420.0122 not intended to produce wetland shall not become part of this plan.

Because newly created wetlands take time to develop into functioning wetlands, the functional assessment, if done immediately, would not provide a reasonable indicator of the quality of the wetland as intended. Rather, a functional based categorization should be undertaken when the wetland has reached the fully developed functionality intended. Normally it could take 5-10 years for a created wetland to become established. A full functional assessment will be done 5 years after its creation and scores stored in the wetlands database. Upon review of the new wetland's progress and score, the City Engineer will place it in the category appropriate to the score. The City Engineer may place a created wetland in any category that is appropriate before the functionality has reached the level required by this plan.

XIII. Other Programs

A. Wetland Health Evaluation Program

The Dakota County Wetland Health Evaluation Program (WHEP) is a joint research and educational project sponsored by the Dakota County Environmental Education Program, Dakota County Soil and Water Conservation District, the Minnesota Pollution Agency, and the Cities of Dakota County. The goals of the project are to provide meaningful data on wetland health to local governments, foster public awareness of wetland value and health, and create positive partnerships between citizens and their local government in addressing natural resource issues.

Rosemount has participated in the program since 1998 and has had much success in doing so. The project provides City Staff with technical data on monitored City wetlands and it offers a great opportunity for public involvement. WHEP has attracted national and local attention for its innovative and unique approach to addressing wetland health.

B. Department of Natural Resources – Greenway Project

The Northern Dakota County Greenway Project has identified quality natural areas, prioritized restoration efforts, and will empower landowners to create a viable suburban greenway corridor in northern Dakota County. Detailed natural resource inventories show multiple potential green corridors that can provide a natural, ecological connection between Lilydale Regional Park, Eagan's Lebanon Hills, Dodge Nature Center in Sunfish Lake and West Saint Paul, Marcott Lakes in Inver Grove Heights, and the Pine Bend Bluffs on the Mississippi River. These green corridors can provide tremendous wildlife habitat and create a green pathway across the county. A map of the greenway corridor is attached in **Appendix F.**

C. CAMP – Citizen Assisted Monitoring Program

The Citizen-Assisted Monitoring Program (CAMP) is a Metropolitan Council of Environmental Services (MCES) managed program where citizen volunteers monitor the water quality of local surface waters. On a biweekly basis (April-October), City volunteer groups collect a surface water sample for laboratory analysis of total phosphorus, total Kjeldahl nitrogen, and chlorophyll-a; obtains a Secchi transparency measurement; and provides some user perception information about the lake's physical and recreational condition. The main purpose of CAMP is to provide water resource personnel with water quality information that will not only help them properly manage these resources, but will also help document water quality impacts and trends. An added benefit of the program is the volunteers' increased awareness of their lakes' condition, which has fostered local efforts to protect lakes and promote support for lake management.

At this time, the City of Rosemount does not participate in this program. In the future, the City Staff will review the costs and benefits of the program and determine if the City's involvement in this program will be beneficial.

Minnesota Board of Water and Soil Resources
520 Lafayette Road North
St. Paul, Minnesota 55155

In the Matter of the review of the Wetland Management Plan Amendment for the **City of Rosemount** pursuant to Minnesota Statues Section 103G.2242, Subdivision 1 (c)

ORDER APPROVING WETLAND MANAGEMENT PLAN AMENDMENT

Whereas, the City of Rosemount submitted a Comprehensive Wetland Protection and Management Plan Amendment (Plan) to the Minnesota Board of Water and Soil Resources (Board) pursuant to M.S. Section 103G.2242, Subd. 1 (c), and;

Whereas, the Board has completed its review of the Plan;

Now Therefore, the Board hereby makes the following Findings of Fact, Conclusions and Order:

FINDINGS OF FACT

1. **Requirement to Plan.** Minnesota Statutes Section 103G.2242, Subd. 1 (c) and Minnesota Rules Chapter 8420.650 allow the Board to approve a Comprehensive Wetland Protection and Management Plan developed by a city, provided it is implemented by an ordinance adopted under Minnesota Statues Chapter 462. The City of Rosemount intends to implement the plan through a Surface Water Management section of the City ordinance.

   The Plan was approved by the Board in 1998. The intent of the plan was to provide the means for the City of Rosemount to protect and manage its wetlands by utilizing the flexibility within the Wetland Conservation Act (WCA). The Plan provides guidelines for wetland protection and management, assistance with WCA, and acts as a reference guide to developers to use when working near wetlands. The development of protection and management strategies for wetlands within the City stems from the function and values assessment completed as part of the Plan. These management strategies allow the City to protect and manage wetland resources by implementing flexibility in WCA. The intent of the Plan amendment is to address needed policy clarifications that have arisen since adoption of the plan in 1998.

2. **Nature of the Plan Area.** The City of Rosemount is located in southern Dakota County, and is expected to be one of the top ten growth cities in the metropolitan area between 1995 and 2020. Land development has put great pressure on the quality and benefits associated with the City's surface water resources. The total wetland area in Rosemount

covers about 1,832 acres, or about eight percent of the City. About 1,174 of these acres are associated with the Mississippi River corridor.

3. **Local Review.** The Plan amendment was developed, reviewed, and revised in consultation with the state agencies, technical evaluation panel, landowners, and local governments. The amended Plan also has an amended Surface Water Management Ordinance that will be adopted by the City.

4. **Dakota Soil and Water Conservation District Review.** The Dakota SWCD did not provide comments on the Plan Amendment.

5. **Department of Agriculture Review.** The MDA did not provide comments on the Plan Amendment.

6. **Minnesota Environmental Quality Board Review.** The EQB did not provide comments on the Plan Amendment.

7. **Department of Health Review.** The MDH did not provide comments on the Plan Amendment.

8. **Department of Natural Resources Review.** The DNR did not provide comments on the Plan Amendment.

9. **Pollution Control Agency Review.** The MPCA did not provide comments on the Plan Amendment.

10. **Metropolitan Council.** Met Council believes the amended Plan provides an excellent framework for managing wetlands within the city and recommends that the Board approve the plan.

11. **Board Review.** Board staff recommended numerous minor changes in wording, additions, and clarifications. No substantive changes were recommended. Board comments were satisfactorily addressed.

12. **Highlights of the Amended Plan.** The critical elements of the Plan are similar to the original Plan. They include:

    - A functional assessment of all wetlands in the plan area.
    - Development of management categories based on the functional assessment and comments from agencies and the public.
    - A 3:1 replacement ratio is required for the highest ranked wetlands, a 1:1 ratio is allowed for passive recreation projects, and a 2:1 ratio is required for all other wetland impacts.
    - Flexibility in sequencing is allowed for the lowest ranked wetlands.
    - Upland buffers are required around all wetlands, varying by management category.
    - Varying levels of bounce are allowed, varying by management category.

12. **Metro Water Planning Committee Meeting.** The Board's Metro Water Planning Committee met on October 5, 2005 with representatives of the City to review and discuss the amended Plan. Board staff recommended approval of the Plan amendment. After discussion, the Committee unanimously decided to recommend approval of the City of Rosemount's Amended Comprehensive Wetland Protection and Management Plan and Ordinance to the full Board.

CONCLUSIONS

1. All relevant substantive and procedural requirements of law and rule have been fulfilled.

2. The Board has proper jurisdiction in the matter of approving an Comprehensive Wetland Protection and Management Plan ,for the City of Rosemount pursuant to Minnesota Statutes Sections 103G.2242, Subd. 1 (c).

3. The City of Rosemount Comprehensive Wetland Protection and Management Plan attached to this Order provides a function and value assessment framework for all wetlands within the City of Rosemount, management strategies based on this assessment, and an implementation program.

4. The attached Plan Amendment is in conformance with the requirements of Minnesota Statutes Sections 103G.221 to 103G.2373 and Minnesota Rules Chapter 8420.

ORDER

The Board hereby approves the attached Comprehensive Wetland Protection and Management Plan, dated September 2005, for the City of Rosemount, Dakota County, Minnesota.

Dated at Saint Paul, Minnesota this 26th day of October 2005.

MINNESOTA BOARD OF WATER AND SOIL RESOURCES

BY: Jerome Deal, Chair

APPENDIX G
Shoreland and Floodplain Ordinance

material. The interior depth and total area of the island must allow the root zone of all planted materials to develop to their natural growth potential.

G. Landscaping Performance Security: The City may, at its option, withhold occupancy certification or require cash, a letter of credit or a bond satisfactory to the City, securing the full performance of landscaping requirements. The amount of the security shall be determined by the contract value of the required improvements and may be held by the City for one full year from the date improvements were completed. (Ord. B, 9-19-89)

9: SPECIAL OVERLAY REGULATIONS: In addition to the requirements of the applicable zoning district, the following special overlay restrictions shall apply. (Ord. B, 9-19-89)

9.1: SHORELAND OVERLAY REGULATIONS:

A. Purpose and Intent: It is the intent of these shoreland overlay regulations to impose restrictions in addition to those required by the underlying zoning for the protection of shoreland areas, the preservation and enhancement of the quality of surface waters and the wise utilization of water and related land resources.

B. Shoreland Classification:

1. Recreational Development Waters: Keegan Lake (19-11)

2. General Development Waters: Mississippi River, U.S. Lock and Dam, Pool #2 (19-5)

3. Natural Environment Waters:

a. Unnamed T115, R19, Section 16 (19-8). 8W

b. Unnamed T115, R19, Section 16 & 21 (19-9). 320W

c. Unnamed T115, R19, Section 17 (19-10). 220W ?

d. Unnamed T115, R19, Section 21 (19-12). 12W

C. Shoreland Development Standards:

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	Natural Development Waters		Recreational Development Waters		General Development Waters	
	S	U	S	U	S	U
1. Lot Area		2.5 AC		2.5 AC		2.5AC
a) Water Front Lots	20,000		20,000		20,000	
b) Other Lots	10,000		10,000		10,000	
2. Water Frontage/Lot Width	110	150	110	150	110	150
3. Building Setback from OHWE	150	200	75	100	50	75
4. Minimum Building Setback from Streets and Highways 5. Minimum Building Setback from Top of Bluff	50 feet for Federal, State or County 20 feet for Municipal or Private According to City Ordinance No. XVII.39 (Mississippi River Corridor Ordinance					
6. Elevation of Lowest Floor Above Highest Known Water Level	3	3	3	3	3	3
7. Maximum Building Height 8. Maximum Lot Coverage with Impervious Surface	{ According to Sections 7.1 and 7.2 of this Ordinance.					
9. Sewage System Setback from OHWE	N/A	150	N/A	150	N/A	150
10. Sewage System Elevation Above Highest Groundwater Level, Bedrock or Impervious Soils	N/A	4	N/A	4	N/A	4

OHWE = Ordinary High Water Elevation/Mark
S = Sewered Area
U = Unsewered Area
*Whenever the Underlying Zoning is more restrictive, the requirements of the Zoning District shall apply.

D. Shoreland Alterations:

1. Natural Vegetation: The removal of natural vegetation shall be restricted to prevent erosion into public waters, to consume nutrients in the soil and to preserve shoreland aesthetics. Removal of natural vegetation in the shoreland overlay district shall be in accordance with the following criteria:

a. Selective removal of natural vegetation shall be allowed, provided that sufficient vegetative cover remains to screen cars and structures when viewed from the water.

b. Clearcutting of natural vegetation shall be prohibited except as necessary for placing public roads, utilities, structures and parking areas.

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c. Natural vegetation shall be restored insofar as is feasible after any construction project is completed.

2. Grading and Filling: Grading and filling in shoreland areas or any alterations of the natural topography where the slope of the land is toward a public water or watercourse leading to a public water must be authorized by the City in accordance with the following criteria:

a. The smallest amount of bare ground is exposed for as short a time as feasible.

b. Temporary ground cover, such as mulch, is used and permanent ground cover, such as sod, is planted.

c. Methods to prevent erosion and trap sediment are employed.

d. Fill is stabilized to accept engineering standards.

3. Alteration of Beds of Public Waters:

a. Excavation on shorelands where the intended purpose is connection to a public water shall require approval from the City before construction is begun. Such approval may be obtained only after the Commissioner has issued a permit for work in the bed of a public water.

E. Planned Unit Development: To encourage more creative design and greater environmental sensitivity in the development of land, Planned Unit Development (PUD) may be utilized in the Shoreland Overlay District. PUD within the Shoreland Overlay District is subject to both the requirements of these regulations and additional standards established by the State of Minnesota, Department of Natural Resources (DNR). Where requirements differ DNR standards shall take precedence.

F. Administration and Enforcement:

1. Permits Required: Before any construction, subdivision of land, installation of sewer and water facilities, grading and filling or removal of vegetation within any shoreland area is commenced, a permit shall be issued by the City.

2. Applications: Application shall be made by the owner on forms provided by the City. Said application shall be accompanied by plans drawn to scale showing the nature, location, dimensions and

elevations of the lot and all proposed structures and such other information as shall be required by the Director of Community Development.

3. Variances: All requests for variances shall be referred to the Board of Appeals and Adjustments.

4. Lots of Record: Lots of record which do not meet the requirements of this Section shall not be required to comply herewith.

5. Referral to DNR:

a. Notices: Copies of all notices of any public hearings to consider variances, amendments or conditional uses relating to shoreland management shall be received by the Commissioner at least ten (10) days prior to such hearings. Notices of hearings to consider proposed plats must include copies of the plats.

b. Final Decisions: A copy of approved amendments and plats, and final decisions granting variances or conditional uses with regard to the shoreland shall be received by the Commissioner within ten (10) days of final action. (Ord. B, 9-19-89)

9.2: WETLAND OVERLAY REGULATIONS:

A. Purpose and Intent: It is the intent of this Section to protect designated public waters from the potential adverse effects of filling; excavation; structural encroachments; water level manipulation; and the construction of bridges, culverts and utilities.

B. Permit Required: Any alteration of any Type 3,4 or 5 Wetland as depicted on the Official City Zoning Map shall require the issuance of a "Protected Waters Permit" by the DNR prior to the issuance of a building permit by the City of Rosemount. (Ord. B, 9-19-89)

9.3: MISSISSIPPI RIVER CORRIDOR CRITICAL AREA OVERLAY DISTRICT:

A. Intent and Purpose:

1. Findings: The City finds that the Mississippi River Corridor within the Metropolitan Area and the City is a unique and valuable resource. The river is essential to local, regional, State, and national

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CLEAR-CUTTING:	The removal of an entire stand of trees and shrubs.
CRITICAL AREA:	The Mississippi River Corridor Critical Area as designated by the Governor in Executive Order No. 130 (as amended) dated November 23, 1976.
HARBOR:	The portion of a body of water along or landward of the natural shoreline deep enough for recreational watercraft navigation, and so situated with respect to shoreline features as to provide protection from winds, waves, ice, and currents. Natural harbors consist of bays and estuaries, while artificial harbors are constructed by dredging.
LIFT STATION:	A facility, usually including pumping facilities, for the lifting of sewage or stormwater runoff to a higher sewage or stormwater runoff facility.
MARINA:	An area of concentrated small craft mooring, where ancillary facilities may be provided for such services as fuelling, sewage pumpout, boat launching, repair and storage. Marina does not mean temporary docks associated with riparian residential development if the mooring area is of a size not to exceed the resource limitations of the site and the needs of the residents of the development.
MISSISSIPPI RIVER CORRIDOR:	That area within the described boundaries of the Mississippi River Corridor Critical Area and as shown on the Official Zoning Map.
NATURAL RATE OF ABSORPTION:	The amount of stormwater absorbed into the soil during a storm of once in twenty (20) year occurrence.
NORMAL HIGH WATER MARK:	The mark delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. The normal high water mark is commonly that point where the natural vegetation changes from predominately aquatic

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to predominately terrestrial. In areas where the normal high water mark is not evident, setbacks shall be measured from the stream bank of the following water bodies that have permanent flow or open water: the main channel, adjoining side channels, backwaters, and sloughs.

PIPELINE: A line of pipe either above ground or under ground including associated pumps, valves, control devices and other structures utilized for conveying liquids, gases, sewage, or other finely divided solids from one point to another.

PLEASURE CRAFT: A boat or yacht used primarily for recreational activity.

RETAINING WALL: A structure utilized to hold a slope in a position which it would not naturally remain in.

RIVERFRONT: Every lot or parcel of land which is immediately adjacent to the Mississippi River.

SELECTIVE CUTTING: The removal of single scattered trees or shrubs. Selective cutting shall not be construed to mean the removal of all trees or shrubs in a given area resulting in the clearing of the land.

SEPTIC TANK: Any device for the treatment and disposal of human waste which utilizes the percolation of the liquid portion of the waste into the soil, including all portions of said system which are not contained inside a building.

SLOPE: The inclination of the natural surface of the land from the horizontal.

STRUCTURE: Anything manufactured, constructed or erected which is normally attached to or positioned on land, including portable structures.

SUBSTANDARD LOT: Any lot which does not meet the minimum lot area, length, depth, width or other dimensional standards of the ordinance.

3. Site Plan Application: A written application for site plan approval shall be filed with the City Clerk or City Planner as required by Section 14.4.B and Section 9.3.B as follows.

4. Site Plan Contents:

a. Site plans shall be prepared to a scale appropriate to the size of the project and suitable for the review to be performed.

b. Site plans shall include information as required for Planning Commission review of site plans in Section 14.4.B and additional information as follows:

(1) A topography map clearly delineating blufflines and streams including intermittent streams and swales, rivers, waterbodies, and wetlands located on the site including information on depth of water and bottom slope, a description of body materials and all vegetation found in the waterbody, a statement of water turbidity, a statement of water quality, and the classification given to the waterbody by the Minnesota Department of Natural Resources (DNR) and the Minnesota Pollution Control Agency (PCA), if any. The topography map shall also indicate the floodway and/or flood fringe lines and shall indicate the normal high water mark of the river if the property fronts on the river.

(2) A description of soils with a map indicating soil types.

(3) A description of existing drainage delineating the direction, volume, and rate at which stormwater is conveyed from the site, and setting forth those areas of the site where stormwater collects and is gradually percolated into the ground or slowly released to stream or lake.

(4) A proposed drainage plan of the developed site delineating the direction, volume, and rate at which stormwater will be conveyed from the site, and setting forth the areas of the site where stormwater will be allowed to collect and gradually percolate into the ground or be slowly released to stream or lake.

(5) A description of any features, buildings or areas which are of historic significance.

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TRANSMISSIONS SERVICES:	Electric power, telephone, and telegraph lines, cables, or conduits used to transport large blocks of power between two points. In the case of electrical power, this will generally mean sixty nine (69) kilovolts or more. For mains or pipelines for gas, liquids or solids in suspension, this means those that are used to transport large amounts of gas, liquids or solids in suspension between two (2) points.
UTILITY FACILITY:	The physical facilities associated with electric, telephone, telegraph, cable television, water, sewer, solid waste, gas, and similar service operations.
WATER BODY:	Any lake, stream, pond, wetland or river.
WATER RELATED USE:	Uses which, in order to exist or function, require a location on or use of the riverfront. Such uses include, but are not limited to: barge loading and fleeting areas; marinas; industries which receive or ship goods or materials by water as an essential part of their operation; boat and barge construction, dismantling, and repair; riverfront recreation; intakes and outfalls; and water monitoring and measuring facilities.
WETLAND:	Land which is seasonably wet or flooded, including all marshes, bogs, and swamps.

B. Site Planning Requirements:

1. Site Plan Required: No building permit, zoning approval or subdivision approval permit or certificate shall be issued for any action located in an area covered by this Ordinance until a site plan has been prepared and approved in accordance with the provisions of this Ordinance.

2. Exceptions:

a. The City of Rosemount Planning Commission may waive certain requirements of Section 9.3.B.4 of this Ordinance if portions are not applicable to the proposed action.

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(2) Adequate controls and protection exist uphill from the proposed development such that there is no danger of structures or roads being struck by falling rocks, mud, uprooted trees or other materials.

(3) The proposed development presents no danger of falling rock, mud, uprooted trees or other materials to structures downhill.

(4) The view of the developed slope from the river and opposite riverbank shall be consistent with the natural appearance of the undeveloped slope, consistent with any historic areas nearby, and compatible with surrounding architectural features. To the maximum extent possible, the use of natural devices, including vegetation management, shall be preferred over the construction of artificial devices, including culverts, holding ponds, walls, and terracing.

(5) All structures other than buildings, warehouses, pipelines, conveyors, transmission services, utility facilities, storage tanks, and roadway surfaces, but including retaining walls, shall meet the following design requirements:

(A) Retaining walls or terrace contours shall not exceed five feet (5') in height.

(B) The minimum space in between terraces and retaining walls shall be twenty feet (20').

(C) Construction shall be of native stone or wood. In those situations where the use of metal pilings, metal tiebacks, metal retaining walls and pre-cast or cast-in-place concrete retaining walls is necessary, they shall not be exposed.

(6) No septic tank shall be placed on a slope of greater than twelve percent (12%). The natural slope may not be altered in any way where the septic tank system or part thereof is to be located. The drain lines shall be located parallel to contour lines.

(7) In no case shall natural slopes in excess of eighteen percent (18%) be developed, except for conveyors, pipelines, and transmission services.

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c. Wetlands and other water bodies shall not be used as primary sediment traps during or after construction.

d. The proposed development will minimize both increases in the natural rate of runoff and decreases in the natural rate of absorption of stormwater.

e. The development is consistent with the reasonable preservation of the view of the river corridor from other properties and by the public, and the walling off of views of the river corridor from other properties and public rights of way has been minimized.

f. Erosion protection measures shall make maximum use of natural in-place vegetation rather than placing new vegetation on the site to control erosion. The use of natural erosion control devices shall be preferred to the maximum extent over the construction of artificial drainage devices including culverts, holding ponds, and ditches.

g. The development shall be located so as to minimize the removal of vegetation and alteration of the natural topography.

h. The grades of streets shall not exceed seven percent (7%), except those referenced in Section 9.3.B.5.b. above.

i. The applicant shall demonstrate that there are no feasible or prudent alternatives to cutting trees on the site, and if trees are cut, the density of trees shall be restored to that which existed before development. The applicant shall demonstrate that all grading which takes place will be conducted in a manner that preserves the root zone aeration and stability of existing trees and provides an adequate watering area equal to at least one-half ($^1/_2$) of each tree's crown cover.

j. The applicant shall demonstrate that the types and densities of land use proposed shall be suited to the site and soil conditions and shall not present a threat to the maintenance of the groundwater quality; a potential increase in maintenance cost of utilities, parking areas or roads; and shall not be subject to problems due to soil limitations, including but not limited to soil bearing strength, shrink/swell potential and excessive frost movement.

k. The quality of water runoff and water infiltrated to the water table or aquifer shall be undisturbed after development to the maximum extent practicable.

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l. The proposed development shall be adequate and consistent with local transportation and thoroughfare planning.

m. The proposed development shall not lessen existing public access to and along the river bank, nor shall it lessen public opportunity to view the river from within the corridor.

n. Adequate parking facilities shall be provided to service the proposed development. The construction of said parking facilities shall be consistent with the character of the river corridor, screened from river view by natural vegetation, and not in excess of that reasonably foreseen to be required by the development proposal.

o. The conduct of all grading, landscaping, structure placement, and street routing shall be consistent with and, to the maximum extent, in furtherance of the goals and policies for the development of the river corridor in the Mississippi River Critical Area Plan.

C. Overlay District Designations:

1. Because the river shall be managed as a multiple-purpose resource, and because it possesses a variation in both natural characteristics and type of urban and rural development, that portion of the Mississippi River Corridor located in the City has been segmented into the following overlay districts:

a. Rural open space.

b. Urban diversified.

2. The rural open space and urban diversified districts have been established because they represent a distinct difference in development patterns which the City desires to continue, as is reflected in the Corridor area plan.

3. The boundaries of the Mississippi River Corridor and the urban diversified and rural open space districts within the Corridor include all of the land riverward of the boundary line and as shown on the map designated as the Official Zoning Map for the City.

4. Boundaries of the Mississippi River Corridor and the urban diversified and rural open space districts on the map designated as the official zoning map for the City is made a part of this Ordinance and is on file with the City Clerk and City Planner.

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D. Overlay District Dimensional Requirements:

1. Objectives: The objectives of dimensional requirements are: to maintain the aesthetic integrity and natural environment of certain districts, to reduce the effects of poorly planned shoreline and bluffline development, to provide sufficient setback for sanitary facilities, to prevent pollution of surface and ground water, to minimize flood damage, to prevent soil erosion and to implement Metropolitan Plans, Guides, and Standards.

2. Substandard Lot: A proposed new structure or changes to an existing structure on a substandard lot may be approved when the following findings are made:

a. The lot was recorded in the office of the County Recorder prior to the effective date of the State of Minnesota Governor's Executive Order, November 23, 1976, designating the Mississippi River Corridor Critical Area.

b. The lot was in separate ownership from all abutting land on November 23, 1976.

c. The proposed use is consistent with the provisions of these regulations and other City ordinances.

d. It can be demonstrated that a proper and adequate sewage disposal system can be installed according to regulations of the Health Department and Pollution Control Agency (PCA).

e. The lot size is within sixty percent (60%) of the size required in the underlying zoning district as specified in the dimensional standards of Section 7.1.

3. Lot Size: In the urban diversified and rural open space districts the minimum lot size shall be consistent with the requirements of the underlying zoning district as specified in the dimensional standards of Section 7.1.

4. Structure Setback:

a. All required setbacks shall be applicable to both the bluffline and one hundred feet (100') from the normal high water mark.

b. All new structures and roads shall meet the following minimum setbacks:

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(1) In the rural open space district, no structure or road shall be placed less than two hundred feet (200') from the normal high water mark and no less than one hundred feet (100') from the bluffline.

(2) In the urban diversified district, the structure or road shall be placed no less than forty feet (40') from the bluffline.

c. Exceptions to setback provisions shall be:

(1) Public safety facilities, public bridges and their roadway approaches, railroad sidings, barge facilities, and minor public and private roadways serving water-related uses on the riverfront.

(2) Pipelines, conveyors, and other devices used to move materials or products to or from transportation facilities on the riverfront, structures and facilities used to store such materials or products, and related equipment.

(3) Public recreation facilities, scenic overlooks, public observation platforms, the regional trail system, docks, and boat launching facilities.

(4) Approved river crossings of essential service and essential services distribution systems which are primarily underground, except for terminal and metering devices not exceeding six feet (6') in height and supporting structures for transmission crossing spans.

(5) The construction of above ground pumping stations for sewer lines which shall be screened from view of the river.

(6) The reconstruction or restoration of historical structures or sites on the inventory of the State Historical Society or the National Register of Historic Places.

5. Heights of Structures:

a. In the rural open space district:

(1) New structures and additions to existing structures shall be limited to a maximum of thirty five feet (35').

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(2) The following exceptions to height limits shall be permitted:

(A) Barns, silos, and similar farm structures.

(B) Essential service distribution systems.

(C) Bridges, bridge approach roadways, and transmission services.

(D) Restoration or reconstruction of historical structures and sites on the inventory of the State Historical Society or the National Register of Historic Places.

b. In the urban diversified district height standards shall comply with the established underlying zoning district standards.

6. Placement of Structures. Unless otherwise indicated, the following standards shall apply in both districts:

a. No new structures except conveyors, pipelines, and transmission services shall be placed on slopes which are eighteen percent (18%) or greater.

b. Structures may be permitted on slopes in excess of twelve percent (12%) but not greater than eighteen percent (18%) when the site plan approval standards of Section 9.3.B.5. are met.

c. Structure placement shall be governed by Section 9.1 regulating shoreland development.

d. In the urban diversified and rural open space districts no development shall be permitted on presently undeveloped islands, except those developments specifically related to wildlife preservation, recreation open space uses, and other water related uses.

7. Line of Sight: In the rural open space district, the development of permitted uses shall be allowed if it cannot be seen from the normal high water mark on the opposite side of the Mississippi River. Water related uses are not subject to this requirement.

E. Permitted Uses in Urban Diversified and Rural Open Space Districts:

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1. Residential Development: Residential development shall be permitted in both districts, consistent with the underlying zoning as established in Ordinance B - City of Rosemount Zoning Ordinance. All structures and accessory uses or appurtenances of residential development shall be subject to the dimensional standards and criteria in Section 9.3.D. of this Ordinance.

2. Commercial and Industrial Uses:

a. In the rural open space district the development of commercial and industrial uses shall not be permitted.

b. In the urban diversified district, new and expanded industrial and commercial developments shall be allowed if they meet the dimensional standards and criteria in Section 9.3.D., if they do not require premature expansion of metropolitan public services, and if they meet the site plan requirements of Section 9.3.B. of this Ordinance.

3. Agricultural Uses: All agricultural uses except new feedlots may be permitted in both districts.

4. Mining and Extraction:

a. In both districts:

(1) New mining and extraction may be permitted and shall be subject to the dimensional standards and criteria in Section 9.3.D.

(2) New and, where practicable, existing extraction uses shall be appropriately screened from view of the river by establishing and maintaining natural screening.

(3) The unscreened boundaries of mining and extraction areas shall be limited to the loading area.

(4) Existing and future extractive uses shall be required to submit land reclamation and reforestation plans compatible with these regulations.

(5) Only one barge loading area, which shall be limited to the minimum size practicable, shall be permitted for each mining or extraction operation.

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(6) All mining and extraction shall meet the standards of Section 14.8, as amended, regulating mineral extraction.

5. Recreational Uses: In both districts, recreational uses and structures and accessory uses or appurtenances shall be permitted subject to the dimensional standards and criteria in Section 9.3.D. Water-related commercial recreation uses shall be subject to the dimensional standards and criteria in Section 9.3.D.

6. Signs:

a. In the rural open space district, general advertising signs shall be prohibited.

b. In the urban diversified district, general advertising signs are permitted.

c. All signs permitted in the established districts shall conform to all applicable standards of Section 10, as amended, regulating signage within the City.

F. Specific Permitted Facilities:

1. Transmission Services: In both districts, the construction of new and reconstruction of existing transmission services shall meet the following standards:

a. Transmission services of under two hundred (200) kilovolts which cross lands within the River Corridor shall meet the standards set forth in this Section.

b. When routing transmission services of under two hundred (200) kilovolts, the following shall be avoided where practicable:

(1) Steep slopes.

(2) Scenic intrusions into streams, valleys, and open exposures of water.

(3) Scenic intrusions into areas such as ridge crests and high points.

(4) Creating tunnel vistas by, for example, building deflections into the route.

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(5) Wetlands.

(6) Forests by running along the fringe rather than through them. If necessary to route through forests, open areas should be utilized in order to minimize cutting.

(7) Soils susceptible to erosion which would create sedimentation and pollution problems.

(8) Areas of unstable soils which would be subject to extensive slippages.

(9) Areas with high water tables, especially if construction requires excavation.

(10) Open space recreation areas.

c. Transmission services shall be subject to the dimensional standards and criteria in Section 9.3.D., except at crossing points.

d. Structural design of transmission services. When locating overhead or underground utilities:

(1) Primary considerations shall be given to underground placement in order to minimize visual impact. When considering overhead placement, the proposers shall explain the economic, technological or topographical factors which make underground placement infeasible. Economic considerations alone shall not justify overhead placement.

(2) If overhead placement is necessary, the crossing should be hidden from view as much as practicable.

(3) Structures shall be made to appear as compatible with the natural area as practicable with regard to height, width, materials used, and color.

(4) With regard to the width of the right of way, the cleared portion of the right of way should be kept to a minimum.

(5) The location shall be in or adjacent to existing transmission service corridors whenever practicable.

e. In the construction of transmission services, the following guidelines shall be applied whenever practicable:

9.3

(1) Construction in wetlands shall minimize damage to vegetation and prevent erosion and sedimentation.

(2) Construction shall be undertaken at times when local fish and wildlife are not spawning or nesting.

(3) Effective erosion and sedimentation control programs shall be conducted during all clearing, construction or reconstruction operations in order to prevent degradation of the river and adjacent lands.

f. Safety Considerations: Developers must adhere to applicable Federal and State safety regulations, both with regard to prevention (such as safety valves and circuit breakers) and with regard to emergency procedures in the event of failure (fire suppression, oil spill clean-up).

g. Right-of-Way Maintenance:

(1) If possible, natural vegetation that is of value to fish or wildlife and does not pose a hazard to or restrict reasonable use of the utility shall be allowed to grow in the right of way.

(2) Where vegetation has been removed, new vegetation consisting of native grasses, herbs, shrubs, and low growing trees shall be planted and maintained on the right of way.

(3) Chemical control of vegetation should be avoided when practicable, but where such methods are necessary, the chemicals used and the manner of their use must be in accordance with the rules, regulations, and other requirements of all State and Federal agencies with authority over their use.

2. Pipelines: Pipeline facilities shall be permitted in both districts and shall be subject to the following standards:

a. All pipelines and underground facilities shall be subject to the site planning requirements set forth in Section 9.3.B. of this Ordinance.

b. The facilities shall be located so as to minimize damage to wetlands, vegetation, and woodlands, and prevent soil erosion and sedimentation.

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c. All underground placement of facilities and pipelines shall be followed by revegetation and rehabilitation to the conditions which existed on the site prior to development.

d. All pipelines shall be located in or adjacent to existing pipeline corridors whenever practicable.

3. Sewage Treatment Plants: In both districts sewage treatment plants shall, wherever practicable, conform with the dimensional standards and criteria in Section 9.3.D.

4. Essential Services and Public Safety Facilities:

a. Essential services and public safety facilities are permitted in both districts.

b. All essential services and public service facilities shall be subject to the site planning requirements set forth in Section 9.3.B.

c. New essential services and public service facilities shall be compatible in height, scale, building materials, and landscaping with the natural environment in the Mississippi River Corridor.

5. Transportation Facilities: The construction or reconstruction of all public transportation facilities and railroads shall be permitted in both districts, subject to the following standards and criteria.

a. The following guidelines shall be applied whenever practicable in selecting routes for public transportation facilities and railroads:

(1) Careful consideration should be given to the provision of scenic overlooks for motorists and safe pedestrian crossings and pathways along the river.

(2) If possible, access to the riverfront should be in public ownership and allow reasonable public use of the land between the river and the transportation facility.

(3) New roads should be located so as to avoid cuts and fills and to blend into the natural terrain.

(4) The following shall be avoided where practicable:

(A) Steep slopes.

9.3

(B) Scenic intrusion into stream, valley, and open exposures of water.

(C) Scenic intrusion into areas such as ridge crests and high points.

(D) Wetlands.

(E) Forests by running along fringes of forests rather than through them. If it is necessary to route through forests, open areas should be utilized in order to minimize destruction of commercial forest.

(F) Soils whose high susceptibility to erosion would create sedimentation and pollution problems during and after construction.

(G) Areas of unstable soils which would be subject to extensive slippage.

(H) Areas with high water tables, especially if construction requires excavation.

(I) Open space recreation areas.

b. Public transportation facilities and railroads shall be subject to the dimensional standards and criteria in Section 9.3.D., except at crossing points.

c. The following guidelines shall be applied when practicable in constructing public transportation facilities and railroads:

(1) Reconstruction of an existing public road or railroad should be performed in a manner that would minimize any adverse effect on the natural beauty and environment of the river.

(2) Effective erosion and sedimentation control programs shall be conducted during all clearing, construction or reconstruction operations in order to prevent the degradation of the river and its adjacent lands.

(3) Construction across wetlands shall take place in a manner which minimizes damage to vegetation and prevents erosion and sedimentation.

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(4) Construction shall occur at times when local fish and wildlife are not spawning and nesting.

d. Safety Considerations: Developers must adhere to applicable Federal and State safety regulations with regard to new public road construction or reconstruction of an existing public road.

e. The following guidelines shall be applied when practicable for right-of-way maintenance:

(1) If possible, natural vegetation that is of value to fish or wildlife and which does not pose a safety hazard shall be allowed to grow in the roadside right of way.

(2) Where vegetation has been removed, new vegetation consisting of native grasses, herbs, shrubs, and trees shall be planted and maintained on the road side right of way.

(3) Chemical control of vegetation is discouraged. But where such methods are justified, the chemicals used and the manner of their use must be in accordance with the rules, regulations, and other requirements of all State and Federal agencies with authority over their use.

6. Private Roads: Private roads necessary for river access for water-related commercial or industrial uses shall be permitted in the urban diversified district.

a. Private roads necessary for river access for water-related commercial or industrial uses and pipelines, conveyors, and other devices used to move materials or products to or from transportation facilities on the riverfront shall be permitted on any slope, provided that steps are taken to minimize erosion and manage vegetation to control runoff in compliance with provisions of Section 9.3.B. of this Ordinance.

7. Barge Facilities:

a. New barge loading facilities and barge slips shall not be permitted in the rural open space district.

b. Barge loading facilities and barge slips are permitted for industrial or commercial land operations in the urban diversified district.

c. Barge fleeting facilities related to on-land industrial or commercial uses are permitted in the urban diversified district.

G. Earthwork and Vegetation:

1. Grading and Filling: In both districts, the following provisions shall apply to grading and filling:

a. Grading, filling, excavating or otherwise changing the topography landward of the normal high water mark shall not be conducted without a permit, except for the maintenance or repair of existing facilities. All grading and filling activities requiring a permit shall comply with the site planning standards in Section 9.3.B. of this Ordinance.

b. A separate grading and filling permit is not required for grading, filling or excavating the minimum area necessary for a building site, essential services, sewage disposal systems, private roads, and parking areas undertaken pursuant to a validly issued building permit.

2. Vegetation Management:

a. In the rural open space district, clearcutting is prohibited on developed islands, public recreation lands, the slope or face of bluffs, within two hundred feet (200') of the normal high water mark of the river, and within the area forty feet (40') landward from blufflines.

b. On all other lands within the rural open space district, and in the urban diversified district, clearcutting shall be guided by the following provisions:

(1) Clearcutting shall be conducted only where clearcut blocks, patches or strips are shaped and blended with the natural terrain where practicable.

(2) The size of clearcut blocks, patches or strips shall be kept at the minimum necessary.

(3) Where feasible, all clear-cuts shall be conducted between September 15 and May 15. If natural regeneration will not result in adequate vegetative cover, areas in which clearcutting is conducted shall be replanted to prevent erosion and to maintain the aesthetic quality of the area. Where

9.3

feasible, replanting shall be performed in the same spring or the following spring.

c. The selective cutting of trees greater than six inches (6") in diameter is permitted when the cutting is appropriately spaced and staged so that a continuous natural cover is maintained.

d. These vegetative management standards shall not prevent the pruning and cutting of vegetation to the minimum amount necessary for the construction of bridges and roadways and for the safe installation, maintenance, and operation of facilities, essential services, and permitted utility transmission services.

H. General Provisions:

1. Nonconforming Uses and Structures:

a. Any structure or use existing upon the effective date of this Ordinance which does not conform to the restrictions of a particular use district shall automatically continue as a nonconforming structure or use under the provisions of Section 13.2 regulating the alteration, maintenance, reconstruction, and abandonment of nonconforming uses.

b. Any extension, enlargement or alteration of an existing non-conforming structure or sanitary facility shall meet all the setback standards of this Ordinance.

2. Sanitary Standards and Criteria: The following standards shall apply to both districts:

a. All parts of on-site sewage disposal systems shall be setback at least seventy five feet (75') from the normal high water mark.

b. No on-site sewage disposal system shall be placed within designated flood plains.

c. No person, firm or corporation shall install, alter, repair or extend any individual sewage disposal system without first obtaining a permit from the Building Inspector for the specifically approved installation, alteration, repair or extension.

3. Marinas and Boat Launching Ramps:

a. Boat Launching Ramps:

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1. Procedures: In addition to applicable administrative procedures set forth in Section 16, the following procedures shall be implemented with respect to land use, subject to this Ordinance.

a. A public hearing shall be held by the City of Rosemount for all underlying zoning district amendments, rural open space and urban diversified district amendments, plats, and variances to this Ordinance.

b. The City shall notify the Environmental Quality Board (EQB) of applications for amendments filed with the City for the following:

(1) The amendment of the urban diversified and rural open space district boundaries.

(2) An amendment to this Ordinance.

c. The City Council shall give due consideration to the comments, if any, received from the EQB concerning the application in making its decision.

d. Within ten (10) days after the final action, the City Council shall notify the EQB of its final action on the application.

e. The City shall give notice of the purpose, time, and place of any such public hearing to all property owners as specified in Section 16.2.D., affected townships, and the municipal council of any municipality within two (2) miles of the affected property at least ten (10) days prior to the date of the hearing.

2. Variances:

a. Variances shall only be granted where there are particular hardships which make the strict enforcement of this Ordinance impractical and where the variance will not alter the essential character of the locality. Conditions may be imposed in the granting of a variance to insure compliance and to protect adjacent properties and the public interest, especially in regard to the view from the river.

b. The formal public hearing for a variance shall be held as set forth in Section 15 providing for actions before the Board of Appeals and Adjustments.

3. Requirements of the Applicant for a Public Hearing:

9.3

a. The applicant shall submit sufficient copies of the following information, and additional information as requested, to the City thirty (30) days prior to the public hearing on the application for a variance, platting of property, and rezonings:

(1) Property survey showing the property location, boundaries, dimensions, elevations, blufflines, utility and roadway corridors, the ordinary high water mark, floodway, and flood plain.

(2) The most recent aerial photo of the property with property lines drawn in.

(3) Location of existing and proposed structures including height and setback dimensions.

(4) Location of existing and proposed alterations of vegetation and topography.

(5) Adjoining water related uses.

(6) Suitability of soils for on-site waste disposal and information on the type, size, and location of the system.

(7) Water supply system.

b. Factors to be considered:

(1) When considering a proposal or zoning amendment within the Mississippi River Corridor, the City shall address the following items in making its decisions:

(A) Preserving the scenic and recreational resources of the Mississippi River Corridor, especially in regard to the view from and use of the river;

(B) The maintenance of safe and healthful conditions;

(C) The prevention and control of water pollution, including sedimentation; and

(D) The location of the site with respect to floodways, flood plains, wetlands, slopes, and blufflines.

K. Violations and Penalties:

1. Any person who violates or fails to comply with any provisions of this Ordinance shall be guilty of a misdemeanor as provided in Section 14.2, Violations and Penalties.

2. In the event of a violation or threatened violation of this Ordinance, the City may institute appropriate actions or proceedings to prevent, restrain, correct or abate such violations or threatened violations. It is the duty of the City Attorney to institute such action. (Ord. B-15, 10-1-91)

10: SIGNS:

10.1: PURPOSE, DEFINITIONS, GENERAL PROVISIONS:

A. Purpose: The purpose of this provision shall be to achieve the following objectives:

1. To establish standards which permit businesses a reasonable and equitable opportunity to advertise.

2. To allow for effective identification, advertising and communication through the use of orderly, discrete and necessary communicative facilities.

3. To restrict the locations of advertising signs with messages which are not exclusively related to the premises in which they are located, to areas where visual intrusions have the least impact on the resident population yet allow maximum exposure to vehicular movement.

4. To create standards regulating the type, size, number and location of signs to promote uniformity and protect the investment of the most discriminating sign makers and users.

5. To prevent the use of signs from downgrading the appearance of residential and commercial neighborhoods or depreciating property values from the overcrowding or the oversizing of signs.

6. To prevent the location, size, display or lighting of signs from affecting the safety of vehicular movement.

7. To encourage a concern for the visual environment which makes the City a more desirable place to visit, work and live in.

DWELLING, MULTIPLE-FAMILY:	A residential building, or portion thereof, containing three (3) or more dwelling units.
DWELLING, SINGLE-FAMILY ATTACHED:	A dwelling which is joined to another dwelling at one or more sides by a party wall or walls and has at least two (2) walls exposed to the outdoors. This definition shall not include units which are joined to one another by floor or ceiling.
DWELLING, SINGLE-FAMILY DETACHED:	A building designed for or occupied exclusively by one family and attached to no other building.
DWELLING, TWO-FAMILY:	A residential building containing two (2) dwelling units.
EQUAL DEGREE OF ENCROACHMENT:	A method of determining the location of floodway boundaries so that the hydraulic capacity of flood plain lands on each side of a steam are calculating proportionate increases in flood stages.
FAMILY:	An individual, or two (2) or more persons related by blood, marriage or adoption, or a group of not more than five (5) persons not so related, living together as a single housekeeping unit using common cooking and kitchen facilities.
FENCE:	A fence is defined for the purpose of this Ordinance as any partition, structure or wall, or gate erected as a dividing marker, barrier or enclosure and located along the boundary or within the required yard. All fences are subject to a building permit as required by the Minnesota State Building Code.
FLOOD:	A temporary rise in stream flow or stage that results in inundation of areas adjacent to the channel.
FLOOD FREQUENCY:	The frequency for which it is expected that a specific flood stage or discharge may be equalled or exceeded.

3.2

FLOOD PLAIN: The areas adjoining a watercourse, which have been or hereafter may be covered by the regional flood.

FLOOD PLAIN CONDITIONAL USE: A specific type of structure or land use that may be allowed in the Flood Plain, but only after an in-depth review procedure and with appropriate conditions or restrictions as provided in the official zoning controls or building codes and upon a finding that: 1) certain conditions as detailed in the zoning ordinance exist and 2) the structure and/or land use conform to the comprehensive land use plan if one exists and are compatible with the existing neighborhood.

FLOOD PROOFING: A combination of structural provisions, changes or adjustments to properties and structures subject to flooding primarily for the reduction or elimination of flood damages.

FLOODWAY: The bed of a wetland or lake and the channel of the watercourse and those portions of the adjoining flood plains which are reasonably required to carry and or store the regional flood discharge.

FLOOR AREA: The sum of the gross horizontal areas of the floors of a building or dwelling unit, measured from the exterior walls, or from the center line of party walls separating buildings, excluding basements.

FUNERAL HOME: A building used for the preparation of the deceased for burial and the display of deceased and ceremonies connected therewith before burial or cremation.

GARAGE, PRIVATE: An accessory building or an accessory portion of a principal building designed or used solely for the storage of noncommercial motor vehicles, boats and similar vehicles which are owned and used by the occupants of the building to which it is accessory.

watercourse, or regulatory flood hazard area which may impede, retard, or change the direction of the flow of water, either in itself or by catching or collecting debris carried by such water, or that is placed where the flow of water might carry the same downstream to the damage of life or property.

OFFICES, BUSINESS: A building(s) in which business of a nonretail nature and clerical services and duties are carried out, including corporate offices, banks, credit unions, insurance and real estate offices and including multiple-tenant office buildings.

OFFICES, PROFESSIONAL: A building in which professional and management duties and services are carried out, including medical and dental clinics and offices; psychiatrists and psychologists offices; architectural, engineering, planning and legal offices; and similar uses.

OPEN SPACE: Any unoccupied space open to the sky on the same lot with a building.

ORDINARY HIGH WATER LINE (OHWL): A line delineating the highest water level which has been maintained for a sufficient period of time to leave evidence on the landscape. The ordinary high water mark is commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial.

PASSENGER VEHICLE: A motor vehicle which meets the criteria for "passenger" class registration and license plate as established by the Minnesota Department of Public Safety.

PERFORMANCE STANDARD: A criterion established to control noise, odor, toxic or noxious matter, vibration, fire and explosive hazards, or glare or heat generated by or inherent in uses of land or buildings.

PLANNED UNIT DEVELOPMENT: A process to acquire rezoning and/or variances from ordinance requirements which includes the

3.2

preparation of and a commitment to the implementation of an approved plan.

PRINCIPAL USE or STRUCTURE: The main use to which the premises are devoted and the principal purpose for which the premises exist.

PRIVATE PROPERTY: Any real property within the City which is privately owned and which is not public property as defined in this Section.

PROTECTED WATERS: Any waters of the State which serve a beneficial public purpose, as defined in Minnesota Statutes 1976, section 105.37, subdivision 6. However, no lake, pond or flowage of less than ten (10) acres in size and no river or stream having a total drainage area less than two (2) square miles shall be regulated as protected waters for the purposes of shoreland management.

PUBLIC HEARING: An official public meeting for which notice has been published in the official newspaper.

PUBLIC PROPERTY: Any street or highway and includes the entire width between the boundary lines of every way publicly maintained for the purposes of vehicular travel, and shall also mean any other publicly owned property or facility.

PUBLICATION: A notice placed in the official newspaper.

REACH: A hydraulic engineering term to describe a longitudinal segment of a stream or river influenced by a natural or man-made obstruction. In an urban area the segment of a stream or river between two consecutive bridge crossings would most typically constitute a reach.

RECREATION VEHICLE: A vehicle which meets the criteria for "recreation" class registration and license plate as established by the Minnesota Department of Public Safety.

3.2

RECYCLING OPERATION:	An area where used, waste, discarded, or salvaged materials are bought, sold, exchanged, stored, baled, cleaned, packed, disassembled or handled, including but not limited to scrap iron, and other metals, paper, rags, bottles and lumber.
REGIONAL FLOOD:	A flood which is representative of large floods known to have occurred generally in Minnesota and reasonably characteristic of what can be expected to occur on an average frequency in the magnitude of the 100-year recurrence interval. Regional Flood is synonymous with the term "base flood" as used in the Flood Insurance Study.
REGULATORY FLOOD PROTECTION ELEVATION:	An elevation not less than one foot (1') above the water surface profile associated with the regional flood plus any increases in flood heights attributable to encroachments on the flood plain. It is the elevation to which uses regulated by this Ordinance are required to be elevated or floodproofed.
RESIDENTIAL FACILITIES:	A residential use defined by chapter 462, Minnesota Statutes, which provides twenty four (24) hour housing for the mentally retarded and physically handicapped and foster care patients.
RIGHT OF WAY:	A street, alley or easement permanently established for the passage of persons and vehicles including the traveled surface of lands adjacent that are formally dedicated to such usage.
SETBACK:	The minimum horizontal distance between a lot line and a building line or use.
SHOPPING CENTER:	A group of unified commercial establishments located on a single land parcel and consisting of not less than four (4) distinct business entities which share or jointly use parking facilities.

3.2

SHORE IMPACT ZONE:	Lands located adjacent to and within one hundred feet (100') of the OHWL of a public water.
SHORELAND:	Lands located within one thousand feet (1,000') of the OHWL of a lake, pond or flowage and within three hundred feet (300') of a river or stream or the landward extent of a floodway designated by ordinance and the Zoning Map on such river or stream, whichever is greater. The practical limits of shorelands may be less than the statutory limits whenever the waters involved are bounded by topographic divides which extend landward from the OHWL for lesser distances.
SOLAR COLLECTOR:	A device, structure or part thereof that transfers direct solar energy into thermal, chemical or electrical energy and that contributes significantly to a structure's energy supply. To be utilized in a cost effective manner the collector should be oriented to within twenty two and one-half degrees ($22^{1}/_{2}°$) true south.
SPENT BAUXITE:	A nonhazardous industrial waste, consisting primarily of aluminum oxide, aluminum silicate and silica material.
SPENT BAUXITE DISPOSAL FACILITY:	A facility that accepts and land disposes of only spent bauxite. A facility shall include containment cells, leachate collection systems, monitoring systems and other appurtenances necessary for its operation.
STREET:	A public thoroughfare which affords the principal means of access to abutting property.
STREET LINE:	The legal line of demarcation between a street and abutting land.
STRUCTURE:	Anything constructed or erected, the use of which requires a location on the ground, or attached to something having a location on the ground.

3.2

TOWER:	A structure upon which communication equipment is mounted or attached and including support devices such as cables, braces, etc.
USE:	The purpose or activity for which the land or building thereon is designed, arranged, or intended, or for which it is occupied or maintained and shall include any manner of performance of such activity with respect to the performance standards of this Ordinance.
USE, PERMITTED BY PUD:	A use which is permitted only if the PUD procedure is used and a plan is formally approved by the City.
USE, PERMITTED BY RIGHT:	A use which is unconditionally permitted in the district under which it is listed.
USE, PUBLIC and INSTITUTIONAL:	A government, nonprofit or quasi-public use or institution such as a church, library, public or private school, hospital or municipally owned or operated building, structure or land use for public purpose, or a use owned or operated by a nonprofit, religious or eleemosynary institution and providing educational, cultural, recreational, religious or similar types of public programs.
VEHICLE:	The term "vehicle" means any vehicle which is self-propelled or designed to be pushed or pulled and shall include, but not be limited to, automobiles, buses, motorbikes, motorcycles, motor scooters, trucks, tractors, go-carts, golf carts, campers, trailers, boats, planes and gliders.
WETLAND ALTERATION:	Any activity that will change or diminish the course, current, or cross-section of a public water.
WETLANDS:	Swamps, marshes or drainage basins as defined in U.S. Fish and Wildlife Circular No. 39 (1971 Edition). For the purposes of shoreland/wetland regulations, wetland types 3, 4 and 5, of at least two and five-tenths (2.5) acres in size, will be regulated.

YARD, FRONT: A yard extending along the full width of the front lot line between side lot lines and extending from the abutting front street right-of-way line to a depth required in the yard regulations for the district in which such lot is located. On a corner lot the narrowest street dimension shall be the front yard.

YARD, INTERIOR SIDE: A side yard which is not adjacent to a street.

YARD or SETBACK: A required open space on a lot which is unoccupied and unobstructed from the ground upward, except as otherwise provided for herein. The measurement of a yard shall be construed as the minimum horizontal distance between the lot line and the building line.

YARD, REAR: A yard extending along a side lot line between the front and rear yards, having a width as specified in the yard regulations for the district in which such lot is located.

YARD, STREET SIDE: A side yard which is adjacent to a street.

ZERO LOT LINE HOUSING: Single-family detached dwellings located on individual lots which are designated to have no setback from one or more lot lines.

ZONING DISTRICT: See "District." (Ord. B, 9-19-89; amd. Ord. B-1, 12-5-89; Ord. B-4, 5-15-90; Ord. B-13, 9-17-91; Ord. B-20, 5-19-92; Ord. B-21, 6-16-92; Ord. B-25, 2-2-93; Ord. B-32, 9-21-93; Ord. B-35, 1-25-94)

4: GENERAL PROVISIONS: These provisions apply to all districts.

4.1: SCOPE AND INTERPRETATION:

A. Scope: No structure, or part, thereof, shall be erected, converted, enlarged, reconstructed, altered or moved and no structure or land

5.2: ZONING DISTRICTS MAP: The boundaries of these districts are hereby defined and established on a map entitled *ZONING MAP CITY OF ROSEMOUNT, MINNESOTA,"* dated this 19th day of 1989, which map and all explanatory matter thereon is hereby made a part of this Ordinance. (Ord. B, 9-19-89)

5.3: INTERPRETATION OF ZONING DISTRICTS MAP: Where uncertainty exists with respect to the boundaries of any districts indicated on the Zoning Map, the following rules shall apply:

A. Boundaries indicated as approximately following the center line of streets or highways shall be construed as following the center lines of said streets or highways.

B. Boundaries indicated as approximately following lot lines shall be construed as following such lot lines.

C. Boundaries indicated as approximately following City boundary lines shall be construed as following such boundaries.

D. Boundaries indicated as approximately following railroad lines shall be construed to be midway between the main tracks.

E. Boundaries indicated as approximately parallel to the center lines of streets or highways shall be construed as being parallel thereto and at such distance therefrom as indicated on the official Zoning Map. If no distance is given, such dimension shall be determined by the use of the scale shown on the official Zoning Map.

F. Boundaries following the shoreline of a stream, lake or other body of water shall be construed to follow the Ordinary High Water Elevation (OHWE) and in the event of change in the shoreline shall be construed as moving with the OHWE.

G. Boundaries indicated as approximately following the center line of streams, rivers, canals or other bodies of water shall be construed to follow such center lines.

H. Where the application of the aforesaid rules leaves a reasonable doubt as to the boundaries between two (2) districts, the regulations of the more restrictive district shall govern the entire parcel in question, unless otherwise determined by the Board of Appeals and Adjustments. (Ord. B, 9-19-89)

6.16: WM WASTE MANAGEMENT DISTRICT:

A. Purpose and Intent: This District is intended to accommodate waste industries and the inherent environmental problems associated with waste management.

B. Uses Permitted by Interim Use Permit:

1. Nonhazardous industrial waste containment facility. (Ord. B, 9-19-89)

6.17: P PUBLIC AND INSTITUTIONAL DISTRICT:

A. Purpose and Intent: This District is primarily intended to accommodate major public and institutional uses of a governmental, educational, cultural, recreational, public service and health care nature that serve the entire community. Where available, structures shall be serviced by the public sewer and water systems.

B. Uses Permitted by Right: All public and institutional uses, facilities and structures. (Ord. B, 9-19-89)

6.18: FP FLOOD PLAIN DISTRICT:

A. Purpose and Intent: The Flood Plain District is designed to provide Flood Plain Management for the City of Rosemount in accordance with the policies of Minnesota Statutes (chapters 103F and 462). The intent of the Flood Plain District is to regulate the flood hazard areas for the purposes of reducing the risk of loss of life, loss of property, health and safety hazards, disruption of commerce and governmental services, extraordinary public expenditures for flood protection and relief, and impairment of the tax base, all of which adversely affect the public health, safety, and general welfare.

B. General Provisions:

1. Establishment of Zoning District: The flood plain areas within the jurisdiction of this Ordinance are hereby designated Flood Plain District (FP). The boundaries of this District shall be shown on the Official Zoning Map. The Official Zoning Map together with all materials attached thereto is hereby adopted by reference and declared to be a part of this Ordinance. The attached materials shall

6.18

include the Flood Insurance Study for the City of Rosemount prepared by the Federal Insurance Administration dated January, 1980, and the Flood Boundary and Floodway Map, dated July 16, 1980, and Floodway Insurance Rate Map, dated July 16, 1992. The floodway and the flood fringe areas delineated on the Flood Boundary Map comprise the area designated as the Flood Plain Zoning District on the Official Zoning Map. A copy of the Official Zoning Map and all other maps referenced herein shall be on file in the office of the City Clerk.

2. Rules for Interpretation of Flood Plain District Boundary: The boundary of the Flood Plain District established by this Section shall be determined by scaling distances on the Official Zoning Map. Where interpretation is needed as to the exact location of the boundary of the district as shown on the Official Zoning Map or there is a conflict between a mapped boundary and actual field conditions, the Planning Commission shall make the necessary interpretation. All decisions will be based on elevations on the regional (100-year) flood profile and other available technical data. The person contesting the location of the district boundary shall be given a reasonable opportunity to present their case to the Planning Commission and to submit technical evidence.

3. Compliance: No new structure or land shall hereafter be used and no structure shall be located, extended, converted, or structurally altered without full compliance with the terms of Section 6.18 and other applicable regulations which apply to uses within the jurisdiction of this Ordinance. Within the Flood Plain District, all uses not listed as permitted uses or conditional uses shall be prohibited. In addition, a caution is provided here that:

a. Modifications, additions, structural alterations or repair after damage to existing nonconforming structures and nonconforming uses of structures or land are regulated by the general provisions of Section 6.18 and specifically subsection C.

b. As-built elevations for elevated or floodproofed structures must be certified by ground surveys and floodproofing techniques must be designed and certified by a registered professional engineer or architect as specified in the general provisions of this Section and specifically as stated in Section 14.11.

4. Warning and Disclaimer of Liability: This Section does not imply that areas outside the Flood Plain District or land uses permitted within such districts will be free from flooding or flood damages. This

6.18

Section shall not create liability on the part of the City or any officer or employees for any flood damages that result from reliance on this Section or any administrative decision lawfully made thereunder.

C. FP Flood Plain District:

1. Uses Permitted by Right: The following uses shall be permitted within the Floodway District. These uses shall not obstruct flood flows or increase flood elevations. In addition, these uses shall not involve structures, fill, obstructions, excavations or storage of materials or equipment.

a. Agricultural uses such as general farming, pasture grazing, outdoor plant nurseries, horticulture, viticulture, truck farming, forestry, sod farming, and wild crop harvesting.

b. Private and public recreational uses such as golf courses, tennis courts, driving ranges, archery ranges, picnic grounds, boat launching ramps, swimming areas, parks, wildlife and nature preserves, game farms, fish hatcheries, shooting ranges, hunting and fishing areas, and single or multiple purpose recreational trails.

c. Residential uses such as lawns, gardens, parking areas, and play areas.

d. Industrial-commercial loading and parking areas.

2. Uses Permitted by Conditional Use Permit: The following uses shall be permitted upon issuance of a conditional use permit subject to the procedures and standards set forth in Section 14.11 of this Ordinance. These uses shall not be permitted if they will cause any increase in the stage of the regional flood or increase the potential for flood damage in the reach or reaches affected.

a. Extraction and storage of sand, gravel, and other materials.

b. Marinas, boat rentals, docks, piers, wharves, and water control structures.

c. Railroads, streets, bridges, utility transmission lines, and pipelines.

d. Storage yards for equipment, machinery, or materials.

6.18

e. Structures accessory to the uses listed above in Section 6.18.D.1 and D.2.

f. Placement of fill.

3. Additional Standards for Flood Plain Conditional Uses:

a. Standards for Fill:

(1) Fill, dredge spoil and all other similar materials deposited or stored in the flood plain shall be protected from erosion by vegetative cover, mulching, riprap or other acceptable method.

(2) Dredge spoil sites and sand and gravel operations shall not be allowed in the floodway unless a long-term site development plan is submitted which includes an erosion/sedimentation prevention element to the plan.

(3) As an alternative, and consistent with subsection C3a2 immediately above, dredge spoil disposal and sand and gravel operations may allow temporary, on-site storage of fill or other materials which would have caused an increase to the stage of the 100-year or regional flood but only after the Planning Commission has received an appropriate plan which assures the removal of the materials from the floodway based upon the flood warning time available.

b. Standards for Structures:

(1) Structures shall not be designed for human habitation.

(2) Structures, if permitted, shall be constructed and placed on the building site so as to offer the minimum obstruction to the flow of flood waters:

(A) Whenever possible, structures shall be constructed with the longitudinal axis parallel to the direction of flood flow.

(B) So far as practicable, structures shall be placed approximately on the same flood flow lines as those of adjoining structures.

(C) Accessory structures shall be elevated on fill or structurally dry floodproofed in accordance with the FP-1 or

6.18

FP-2 floodproofing classifications in the State Building Code. As an alternative, an accessory structure may be floodproofed to the FP-3 or FP-4 floodproofing classification in the State Building Code provided the accessory structure constitutes a minimal investment, does not exceed five hundred (500) square feet in size, and for a detached garage, the detached garage must be used solely for parking of vehicles and limited storage. All floodproofed accessory structures must meet the following additional standards, as appropriate:

i. The structure must be adequately anchored to prevent flotation, collapse, or lateral movement of the structure and shall be designed to equalize hydrostatic flood forces on exterior walls.

ii. Any mechanical and utility equipment in a structure must be elevated to or above the Regulatory Flood Protection Elevation or properly floodproofed.

c. Standards for Storage of Materials and Equipment:

(1) The storage or processing of materials that are, in time of flooding, flammable, explosive, or potentially injurious to human animal, or plant life is prohibited.

(2) Storage of other materials or equipment may be allowed if readily removable from the area within the time available after a flood warning and in accordance with a plan approved by the Planning Commission.

(3) No garbage and waste disposal sites shall be issued for floodway areas and there shall be no further encroachment upon the floodway at existing sites.

d. Standards for Flood Control:

(1) Structural works for flood control that will change the course, current or cross section of protected wetlands or public waters shall be subject to the provisions of Minnesota Statute, Chapter 103G. Community-wide structural works for flood control intended to remove areas from the regulatory flood plain shall not be allowed in the floodway.

(2) A levee, dike or floodwall constructed in the floodway shall not cause an increase to the 100-year or regional flood and

6.18

the technical analysis must assume equal conveyance or storage loss on both sides of a stream.

e. Standards for Public Utilities, Railroads, Roads and Bridges:

(1) Public Utilities: All public utilities and facilities such as gas, electrical, sewer, and water supply systems to be located in the flood plain shall be floodproofed in accordance with the State Building Code or elevated to above the Regulatory Flood Protection Elevation.

(2) Public Transportation Facilities: Railroad tracks, roads, and bridges to be located within the flood plain shall comply with Sections 4.0 and 5.0 of this Ordinance. Elevation to the regulatory flood protection elevation shall be provided where failure or interruption of these transportation facilities would result in danger to the public health or safety or where such facilities are essential to the orderly functioning of the area. Minor or auxiliary roads or railroads may be constructed at a lower elevation where failure or interruption of transportation services would not endanger the public health or safety.

(3) On-site Sewage Treatment and Water Supply Systems: Where public utilities are not provided: 1) On-site water supply systems must be designed to minimize or eliminate infiltration of flood waters into the systems; and 2) new or replacement on-site sewage treatment systems must be designed to minimize or eliminate infiltration of flood waters into the systems and discharges from the systems into flood waters and they shall not be subject to impairment or contamination during times of flooding. Any sewage treatment system designed in accordance with the State's current statewide standards for on-site sewage treatment systems shall be determined to be in compliance with this Section.

D. Permit Requirements:

1. Permit Required: All permits issued by the City in conformity with the provisions of this Ordinance shall be secured prior to the erection, addition, or alteration of any building, structure, or portion thereof; prior to the use or change of use of a building, structure, or land; prior to the change or extension of a nonconforming use; and prior to the placement of fill, excavation of materials, or the storage of materials or equipment within the flood plain.

6.18

2. Application for Permit: Application for a permit shall be made in duplicate to the Planning Department and shall include the following where applicable: 1) plans in duplicate drawn to scale, showing the nature, location, dimensions, and elevations of the lot; 2) existing or proposed structures, fill, or storage of materials; and 3) the location of the foregoing in relation to the stream channel.

3. State and Federal Permits: Prior to granting a local permit or processing an application for a Conditional Use Permit or variance, the Planning Department shall determine that the applicant has obtained all necessary State and Federal permits.

4. Certificate of Zoning Compliance for a New, Altered, or Nonconforming Use: It shall be unlawful to use, occupy, or permit the use or occupancy of any building or premises or part thereof hereafter created, erected, changed, converted, altered, or enlarged in its use or structure until a certificate of zoning compliance shall have been issued by the Planning Department stating that the use of the building or land conforms to the requirements of this Ordinance.

5. Construction and Use to be Provided on Applications, Plans, Permits, Variances, and Certificates of Zoning Compliance: Permits, conditional use permits, or certificates of zoning compliances issued on the basis of approved plans and applications authorize only the use, arrangement, and construction set forth in such approved plans and applications, and no other use, arrangement, or construction. Any use, arrangement, or construction at variance with that authorized shall be deemed a violation of this Ordinance, and punishable as provided by Section 14.2 of this Ordinance.

6. Certification: The applicant shall be required to submit certification by a registered professional engineer, registered architect, or registered land surveyor that the finished fill and building elevations were accomplished in compliance with the provisions of this Ordinance. Floodproofing measures shall be certified by a registered professional engineer or registered architect.

7. Record of First Floor Elevation: The Planning Department shall maintain a record of the elevation of the lowest floor (including basement) of all new structures and alterations or additions to existing structures in the flood plain. The Planning Department shall also maintain a record of the elevation to which structures and alterations or additions to structures are floodproofed.