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December 31, 2007

Storm Water Management Unit
Storm Water Section
Municipal Division
Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

Re: St. Louis Park Nondegradation Report Submittal

On behalf of the City of St. Louis Park, I am enclosing copies of the St. Louis Park Nondegradation Report Submittal to meet the requirements of Appendix D of the NPDES Permit (#MNR040000) for the City of St. Louis Park to Discharge Storm Water Associated with Municipal Separate Storm Sewer Systems (MS4).

With respect to the Nondegradation Report Submittal, the City of St. Louis Park believes that there are two primary issues with which the local water authorities should be concerned, and they are:

- **Do the Best Management Practices (BMP's) that are being implemented by the City meet the requirements of the local water authorities?**
- **Will the implementation of the BMP's be reasonable and practical for addressing water quality degradation as development and redevelopment occurs in the future?**

The Permit requires the preparation of a loading assessment for total suspended solids (TSS), phosphorus (TP) and runoff volume for the land use that existed in 1988 and a similar loading assessment for current conditions, and for land uses expected in 2020. The results of the loading assessment are shown in Table 2-5, St. Louis Park Nondegradation Loading Assessment Summary. The results of the loading assessment provide conservatively low estimates for water quantity and quality improvement associated with BMP implementation because it does not factor in past implementation of BMPs and assumes the minimal NURP pond BMP design requirements will be applied to future BMP implementation. The city intends to continue to utilize the Minnehaha Creek Watershed District and the Bassett Creek Watershed Management Commission to permit activities within the city that fall under their jurisdiction. **As a result, the BMP's that will be implemented by the city of St. Louis Park with future redevelopment will meet or exceed the requirements of the local water authorities.**

As discussed in Section 2.4, the loading assessment indicates that without accounting for BMP implementation, the total imperviousness, average annual flow volume, and the TP and TSS loadings from the city have not increased since 1988 and would continue to decrease by 2020. Current and future implementation of BMPs have provided additional treatment for flow volume and TP and TSS loadings in runoff to the city's receiving waters, compared to the 1988 condition. **Combining implementation of the BMP's minimally assumed for the loading assessment with the BMP's from the City's SWPPP will be reasonable and practical for addressing water quality**

degradation as development and redevelopment occurs in the future and water quality tributary to the receiving waters will be better than it was in 1988 following implementation of the planned BMP's.

As discussed in Section 3.4, the nondegradation report discusses the implications of the impaired waters listings within the city. The MPCA's Draft 2008 impaired waters listings indicate that Cobblecrest, Windsor, Twin Lake, Bass Lake, Sweeney Lake, Lake Hiawatha and Lake of the Isles receive storm water runoff from St. Louis Park and do not meet the MPCA's water quality standards for excess nutrients. Total Maximum Daily Load (TMDL) studies have not currently been approved for any of these impaired water bodies. The Minnehaha Creek Watershed District Comprehensive Water Resources Management Plan calls for an annual phosphorus load reduction of 172 lbs. from the City of St. Louis Park to ensure that the water quality standards will be met in Lake Hiawatha. The results of the loading assessment show that there is a TP load reduction of 446 lbs. expected from the City of St. Louis Park with continued implementation of BMPs that are consistent with or equivalent to the NURP design criteria, for future redevelopment projects. It is conceivable that the pollutant load allocations developed as part of future TMDL studies will dictate that the city will need to provide further loading reductions, beyond those currently projected in the nondegradation load assessment. As a result, the city will update its SWPPP to consider all reasonable and practical BMPs given the potential implications of future TMDL allocations. Based on the Nondegradation Report, no changes are proposed for the SWPPP at this time.

Please respond via email at gwilson@barr.com or contact me at 952-832-2672 with questions or comments.

Sincerely,

Gregory J. Wilson, P.E.
Senior Civil Engineer

Enclosure

Cc: Scott Anderson, City of St. Louis Park
Laura Adler, City of St. Louis Park

Nondegradation Report Submittal to the Minnesota Pollution Control Agency for Selected MS4 Permit Requirements

Prepared for

City of St. Louis Park

Submitted by

Barr Engineering Company

December 2007

Executive Summary

The Minnesota Pollution Control Agency (MPCA) revised the General National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Permit MNR040000 (Permit) for the city of St. Louis Park to Discharge Storm Water Associated with Municipal Separate Storm Sewer Systems (MS4), effective June 1, 2006. St. Louis Park had previously completed a Storm Water Pollution Prevention Program (SWPPP) to address the six minimum control measures required by the previous permit. This report has been developed to address modifications to the SWPPP for measures that may be necessary to meet the new, applicable requirements of Appendices C and D in the re-issued permit. Appendix C covers discharges to wetlands that are applicable to the city of St. Louis Park. Appendix D covers the nondegradation requirements for Selected MS4s (30 permittees including the city of St. Louis Park), including the development of a loading assessment and nondegradation report.

For the loading assessment, the Simple Method was used to determine the pollutant loadings and runoff volumes from each of the land uses within each watershed and the P8 Model was used to account for the effects of Best Management Practice (BMP) implementation for the time periods of interest in the Permit conditions. The loading assessment modeling results were summarized for the city to show the Simple Method loading and volume estimates for each time period, as well as the total phosphorus (TP) and total suspended solids (TSS) loading and volume estimates after applying the P8 model design criteria for future BMP implementation. The loading assessment was completed assuming that future BMP implementation would follow the city's current policies and standards. The results of the loading assessment provide conservatively low estimates for water quantity and quality improvement associated with BMP implementation because it assumes the minimal NURP pond BMP design requirements.

The results show that, without accounting for BMP implementation, the total imperviousness, average annual flow volume, and the TP and TSS loadings from the city have not increased since 1988 and would continue to decrease by 2020. Current and future implementation of BMPs have provided significant treatment for flow volume and TP and TSS loadings in runoff to the city's receiving waters, compared to the 1988 condition. In the future, the city intends to implement infiltration practices to mitigate any volume and loading increases, wherever it is practical and reasonable to do so.

The MPCA's Draft 2008 impaired waters listings indicate that Cobblecrest, Windsor, Sweeney, Twin Lake, Bass Lake, Lake Hiawatha and Lake of the Isles receive storm water runoff from St. Louis Park and do not meet the MPCA's water quality standards for excess nutrients. The Minnehaha Creek Watershed District Comprehensive Water Resources Management Plan (2007) calls for an annual phosphorus load reduction of 172 lbs. from the City of St. Louis Park to ensure that the water quality standards will be met in Lake Hiawatha. The results of the loading assessment show that there is a TP load reduction of 446 lbs. expected from the City of St. Louis Park with continued implementation of BMPs that are consistent with or equivalent to the NURP design criteria, for future redevelopment projects. It is conceivable that the pollutant load allocations developed as part of future TMDL studies will dictate that the city will need to provide further loading reductions, beyond those currently projected in the nondegradation load assessment. As a result, the city will update its SWPPP as the TMDL studies are implemented to consider all reasonable and practical BMPs given the potential implications of future TMDL allocations associated with the impaired waters that are receiving storm water discharge. This approach will ensure the following:

- Receiving water quality should be improved for lakes, wetlands and streams in St. Louis Park
- Channel erosion and stream morphology changes will be controlled
- Further protection will be provided for the physical and biological integrity of the stream and wetland corridors
- Controlled bounce and duration of inundation in the city's wetlands and preservation of the functions and values for each type of wetland classification

City of St. Louis Park Nondegradation Report Submittal to the Minnesota Pollution Control Agency for Selected MS4 Permit Requirements

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1.0 Introduction

1.1 MS4 Permit Requirements

The Minnesota Pollution Control Agency (MPCA) revised the General NPDES/SDS Permit MNR040000 (Permit) for the city of St. Louis Park to Discharge Storm Water Associated with Municipal Separate Storm Sewer Systems (MS4), effective June 1, 2006. St. Louis Park had previously completed a Storm Water Pollution Prevention Program (SWPPP) to address the six minimum control measures required by the previous permit. This report has been developed to address modifications to the SWPPP for measures that may be necessary to meet the new, applicable requirements of Appendices C and D in the re-issued permit. Appendix C covers discharges to wetlands that are applicable to the city of St. Louis Park. Appendix D covers the nondegradation requirements for Selected MS4s (30 permittees including the city of St. Louis Park), including the development of a loading assessment and nondegradation report. The following sections describe the sections of the permit that are relevant for the city of St. Louis Park.

1.1.1 Loading Assessment

Each Selected MS4 must assess the change in storm water discharge loading for its permitted area using a pollutant loading water quality model that, at minimum, addresses changes in average annual flow volume, total suspended solids (TSS), and phosphorus (TP). This modeling should be based on two time periods: from 1988 to the present, and from the present to 2020. The Selected MS4s must use a simple model, or another more complex model that they find to be more appropriate, that addresses the parameters of concern. This may include a model that the Selected MS4 has already used. Other assessment methods may be used if they can be shown to be as effective at quantifying the increase in loading as the modeling methods. The models and/or other methods will be used as part of the assessment to develop the Nondegradation Report, to help in selecting appropriate best management practices (BMPs) that address nondegradation, to determine whether additional control measures can reasonably be taken to reduce pollutant loading.

1.1.2 Nondegradation Report

Selected MS4s that have significant new or expanded discharges are required to complete a Nondegradation Report and, upon approval, to incorporate its findings on BMPs that address nondegradation into their SWPPP. The BMPs should address changes in pollutant loadings as far as is reasonable and practical through future development. Additionally, the BMPs shall address, as far as is reasonable and practical, the negative impacts of increased storm water discharge volumes that

cause increased depth and duration of inundation of wetlands having the potential for a significant adverse impact to a designated use of the wetland, or changes in stream morphology that have the potential for a significant adverse impact to a designated use of the streams.

The Nondegradation Report must include consideration of the Loading Assessment, which must include analysis of flow and may include removal of pollutants by BMPs already initiated. For purposes of the permit, 1988 levels consistently attained means runoff that would have been produced under approximately average conditions of rainfall. Local storm water management plans and other pertinent factors may also be considered. BMPs implemented by other parties may be considered when those BMPs affect the storm water from the area of the Selected MS4. If the pollutant loadings cannot be reduced to levels consistently attained in 1988, the Nondegradation Report must describe reasonable and practical BMPs that the Selected MS4 plans to incorporate into a modified SWPPP. The Selected MS4 must consider alternatives, explain which alternatives have been studied but rejected and why, and propose alternatives that are reasonable and practical. The Nondegradation Report must give high priority to BMPs that address impacts of future growth, such as ordinances for new development. Where increases in pollutant loading have already occurred due to past development, the Nondegradation Report must consider retrofit and mitigation options (BMPs) that the Selected MS4 determines to be reasonable, practical and appropriate for the community. The Selected MS4 is responsible for developing any site specific cost/benefit, social, and environmental information that the Selected MS4 wishes to bring to the Agency's attention. The Selected MS4 must incorporate the BMPs into a modified SWPPP and include an implementation schedule that addresses new development and retrofit BMPs it proposes to implement.

1.1.3 Proposed SWPPP Modifications and Submittals to MPCA

Prior to submittal to the MPCA, the proposed SWPPP modifications to address nondegradation will be public noticed at the local level. Each Selected MS4 shall also submit its SWPPP modifications to address nondegradation to the appropriate local water authority (e.g. watershed organizations or county water planning authority) in time to allow for their review and comment. The Nondegradation Report explaining the proposed BMPs and the entire SWPPP must be made available to the public and local water authority upon request.

Selected MS4s must submit their proposed changes to the SWPPP, reports addressing nondegradation for all waters, together with other supporting documents, to the MPCA in accordance with the schedule in Appendix E of the permit. This submittal must include:

1. The Loading Assessment;

2. The Nondegradation Report;

3. The proposed SWPPP modifications to address nondegradation;

4. The public and local water authority comments on the proposed SWPPP modifications to address nondegradation, with a Record of Decision on the comments; and

5. An application to modify the permit.

1.1.4 Discharges to Wetlands

The permit does not authorize physical alterations to wetlands, or other discharge adversely affecting wetlands, if the alteration will have a significant adverse impact to the designated uses of a wetland. Any physical alterations to wetlands that will cause a potential for a significant adverse impact to a designated use must be implemented in accordance with the avoidance, minimization and mitigation requirements of Minn. R. 7050.0186 and other applicable rules.

1.1.5 Discharges Affecting Source Water Protection Areas

BMPs shall be incorporated into the SWPPP to protect any of the following drinking water sources that the MS4 discharge may affect, and a map of these sources shall be included with the SWPPP, if they have been mapped:

1. Wells and source waters for drinking water supply management areas identified as vulnerable under Minn. R. 4720.5205, 4720.5210, and 4720.5330, and

2. Source water protection areas for surface intakes identified in the source water assessments conducted by or for the Minnesota Department of Health under the federal Safe Drinking Water Act.

1.2 Discussion of MPCA Guidance

1.2.1 Responses to Comments

Following the close of the comment period on the draft permit, the MPCA issued responses to comments received through April 15, 2005 on the Permit. To provide further guidance on

compliance with the Permit requirements, this section describes responses to comments that pertain to the following subjects:

- Loading Assessment modeling approach and complexity
- Addressing volume as a parameter of concern for the Loading Assessment and Nondegradation Report
- Nondegradation requirements for Wetlands
- Nondegradation requirements for Special Waters

1.2.1.1 Modeling Approach and Complexity

In response to several comments regarding the modeling approach and complexity required for the Loading Assessment described in the Permit, the MPCA stated that the Loading Assessment should include changes to pollutant loadings associated with changes due to past land use changes and changes due to anticipated land use changes. The Loading Assessment is intended to be used as a planning tool to compare 1988 levels to present and 2020 levels of discharge. It is to be presented as comparative results (increase), not absolute (accurate) flow, total suspended solids (TSS), and phosphorus discharge levels from the MS4. It is acceptable for MS4s to do more extensive modeling for design of BMPs, but it should be explained.

The Permit does not, however, specifically require that BMPs be factored into the Loading Assessment, but the MPCA clearly states that BMP analysis could be provided if any Selected MS4 so desires. The assessment can include changes due to BMPs that have already been implemented, if increase in the loading since 1988 is explicitly stated, as well as changes due to BMPs that are planned to be implemented and written into the MS4's ordinances or other regulatory mechanisms.

MPCA further states that the Loading Assessment was developed after considerable discussion, including discussion with consultants, cities, and the League of Minnesota Cities. It was determined that to limit costs the nature of the assessment must be limited. The MPCA chose not to include treatment options in this requirement since the level of modeling must be significantly increased to model treatment. Many communities will not be conducting other modeling, therefore this requirement will be a cost that needs careful distinction between what is desirable and what is required. The MPCA chose a level that will prevent undue burden while still developing useful information.

The Loading Assessment is comparable to an influent analysis, while the Nondegradation Report addresses the actual discharges of storm water to receiving water. The permittees are allowed to show reduction in discharge or to make other arguments they believe are appropriate in the development of the Nondegradation Report. A detailed Loading Assessment can support the Nondegradation Report.

Under the provisions of Minn. R. 7050.0185, subp. 4, the MPCA must "determine whether additional control measures beyond those required by subpart 3 can reasonably be taken to minimize the impact of the discharge on the receiving water." The MPCA does not have absolute numeric or other criteria that it will use in making this determination for each of the Selected MS4s. The criterion of "reasonableness" requires flexibility and site specific determinations. Reasonableness determinations will therefore be made on a case-by-case basis. Site specific variations in situation, funding, population, and receiving water will be as critical to the determination of reasonableness as a specific increase in loading. Additionally, the MPCA must note that the required analysis and documentation for the Nondegradation Plans are relative, not absolute, in nature. For example, the Loading Assessments required by the permit are net changes; we do not request the actual pollutant loading, just estimates of the relative quantity of the change.

1.2.1.2 Average Annual Flow Volume

In response to several comments regarding the requirement for addressing volume as a parameter of concern for the Loading Assessment and Nondegradation Report described in the Permit, the MPCA stated that permit and guidance were revised to include more specifics on how flow volume will be addressed in BMPs and the Nondegradation Report. The responses were qualified by first stating that when an MS4 develops a Nondegradation Report, site specific objections, costs and other considerations can be raised, which the MPCA must consider in its determinations. Reasonable measures, not any and all measures, must be installed. For this permit, the reasonableness of volume control policy is not general and applicable for all MS4s, but is determined on an individual, site specific basis. In some situations the problems created by increased flow volume can be reduced and minimized by effective implementation of appropriate BMPs based on site specific conditions.

The MPCA asserts that based on the following statutory definition (**Minn. Stat. § 115.01 Definitions** *Subd. 13.* ***Pollution of water, water pollution, pollute the water.***) and actual environmental impacts, volume may qualify as water pollution under many specific conditions:

> *"Pollution of water," "water pollution," or "pollute the water" means: (a) the discharge of any pollutant into any waters of the state or the contamination of any waters of the state so as to create a nuisance or render such waters unclean, or noxious, or impure so as to be actually or potentially*

harmful or detrimental or injurious to public health, safety or welfare, to domestic, agricultural, commercial, industrial, recreational or other legitimate uses, or to livestock, animals, birds, fish or other aquatic life; or (b) the alteration made or induced by human activity of the chemical, physical, biological, or radiological integrity of waters of the state.

MPCA staff looked at the rules that are applicable to nondegradation (Minn. R. 7050.0185) and studied the concept of increased loading of one or more pollutants as used in the rule. They determined that the rule directs the MPCA to consider the adverse effects of increased flow volume, and where effects are adverse, to consider flow volume as a pollutant. It is not volume per se that was asked to be addressed but the change in volume related to MS4 development. Additionally, it is well known that increases in flow can have a variety of negative environmental impacts. A discussion of the reasoning for the inclusion of volume of storm water as a pollutant was provided in excerpts from Chapter 11 of the Minnesota 2001-2005 Nonpoint Source Management Program Plan. These excerpts are summarized below:

- Hydromodification, which involves changes in flow patterns in natural waterways such as rivers or streams and wetlands, is the second leading cause of impairment of fresh waters. Removal of perennial vegetation led to a decrease in infiltration and an increase in the volume of runoff. Exposing soils to wind and water increased sediment loads carried by runoff. Impervious surfaces and artificial drainage systems increased the volume of runoff and accelerated the rate at which water was removed from the landscape. Impervious surfaces in urban areas also transported runoff more rapidly and in greater volumes than before development.

- Minn. Stat. § 155.01, subd. 13 (b) defines pollution of waters as "the alteration made or induced by human activity of the chemical, physical, biological, or radiological integrity of waters of the state". The basis for this statute is that human activity, such as hydromodification, affects these waters in many adverse ways. Under natural conditions and at bank-full capacity, studies have shown that streams can handle a flow approximately equal to the 1.5- to 2-year frequency peak discharge within their banks (Rosgen, 1994; Leopold *et al.*, 1964). After urbanization, increased runoff can cause bank-full flow to be exceeded several times each year. In addition to increased flooding, this condition causes previously stable channels to erode and widen. Much of the eroded material becomes bed load and can smother bottomdwelling organisms.

- In this process, stream habitat diversity is damaged or lost. Water that was once slowed by bends, pools, and woody debris in the water column moves faster and with greater volume cutting into the bed and eroding the banks. This faster flowing water carries with it an increased sediment load, some of which is deposited in the downstream reaches. Many fish and invertebrate species cannot use substrates that are laden with excessive silt for reproduction, feeding, or cover. Riffles and pools become scarce or absent as the stream is converted from riffle, run, pool sequences to long runs or pipes. Not only is habitat diversity affected but the stream hydrology becomes inherently less stable. As water leaves the system faster, the natural hydrologic timing is altered. The overall effect is an increase in the intensity of the high flows and decreased duration of low flow events. If the water is stored to prevent increased peak flows, then the flow duration is extended. Streams in which the surrounding vegetation has been removed or altered are usually compromised by an increase in the amount of silt-laden runoff. Also, water temperatures within the stream may rise as the overhead canopy is removed exposing the stream to full sunlight.

- Urbanization also changes the extent and duration of inundation in wetlands, which can modify the established wetland vegetation. Measures to control discharges to wetlands must control the peaks and volume of flow to wetlands, if they are to be protected. This also means that reduced surface and ground water flow caused by diversion to storm sewers is also an area of concern, especially for sensitive wetlands.

- Urbanizing areas increase runoff from small events in greater proportion than large events. This is important because, in Minnesota, more than 90% of the precipitation events are less than 1.0 inch. These rainfall events also account for approximately 65% of the cumulative runoff quantity in urban areas and proportionately large amounts of the pollutant loading associated with these rainfall events (Pitt, 1998). While the significance of large flood events should not be underestimated, the smaller flows with an approximately nine month to two-year return period frequency, are probably as important or more important to overall water quality. These flows can be very erosive and can be the major source of increased pollutant loading. Pollutant loading is more closely associated with total runoff volume than with peak runoff rates. Utilizing methods to maintain volumes and peaks closer to those that originally shaped the channel can reduce the channel reshaping process in a watershed. Examples of appropriate management techniques are the volume reduction that results from the use of swales instead of curb and gutter, reduced impervious surfaces or infiltration structures. Wetland and upland vegetation can affect or be significantly affected by hydrologic changes.

> For example, drainage can obviously change the vegetation at a site, but increased water that drains from a project area into an off-site drainage basin can impact trees and other vegetation, including wetland vegetation. In such cases, water itself is the damaging agent even if it is clean. The increase in water level, both surface and subsurface, can result in the death of roots. Roots require oxygen from the air, and saturated soils create an anaerobic condition that will eventually kill the roots. A case in point is a tamarack swamp that receives water from several developments. As water levels increase through the swamp, the increased flow depth results in the death of many of the tamarack trees, even though they are tolerant of wet conditions. In Minnesota, we have several tree species that tolerate short periods of flooding, but we should be encouraging diversity and be mindful of sensitive areas downstream. Likewise vegetation in upland areas can change the infiltration capacity or evapotranspiration capacity of a watershed. By using native plantings that have denser canopies and/or deeper root networks the storage capacity of the upland areas are significantly increased reducing run-off volumes, especially in the smaller storms.

Addressing average annual flow volume in the nondegradation plan may show that the modeling effort indicates a significant increase in flow from 1988. This is an indication to the MPCA that your loading of one or more pollutants has increased, and the plan will need to address what is reasonable and practical to get the flow back to 1988 levels. Alternatively, you may wish to demonstrate that your flow increase has not resulted in water quality degradation and therefore does not need to be addressed. The MPCA has found flow volume to be related to significant degradation, therefore claims to the contrary will be carefully scrutinized. To address flow volume some of the options include consideration of BMPs for flows existing before 1988, BMPs for flows developed since 1988, and limitations on future flows. The MPCA notes that the 1.0 inch event is about the 90_{th} percentile event for 24 hour storm on an average annual basis, and that this represents 67% of the cumulative volume of precipitation. This means that runoff reduction often can be related to BMPs that reduce flow from events smaller than 1.0 inches in depth. If properly designed the BMPs could also treat some percentage of flow related to larger events without loss of effectiveness for reasons such as re-suspension. Depending on development patterns, zoning, soils, water table, and other factors, many communities may be able to meet the non degradation goal of returning the flow to pre-1988 levels. Treatment BMPs that reduce flow include infiltration basins, trenches, bio-retention, enhanced swales, evapo-transpiration, disconnection of impervious surfaces, reduced imperviousness, filterstrips, and variations and combinations of these and other BMPs.

In some instances, a community may not be able to reduce the flows to 1988 levels. If so, the basis for this conclusion should be explained. For example the current problems may be related to past development patterns, past or present zoning, soils, water table, and other factors that may be pertinent. In establishing the case, any cost information that is available, especially site specific information, should be provided. The MPCA must consider the potential impact of the discharge on the receiving water and cumulative impacts of multiple discharges. While MS4s are not required to develop information on this aspect of the analysis, they may find it beneficial to supply information that supports their position.

1.2.1.3 Wetlands

In response to several comments and questions regarding the designated uses and nondegradation requirements for wetlands in the Permit, the MPCA clarified that the terms “designated uses” of the permit relate to MPCA rules and requirements and are set by MPCA through notice and comment rulemaking under state law and any changes to designated uses would have to be made through notice and comment rulemaking. The MPCA has included, in guidance, the pertinent parts of those rules to help describe the context of these terms. The permit and rules are under MPCA authority and the permit implements the rules.

Under this NPDES permit, the permittee is required to comply with conditions that are established to protect the water quality standards of wetlands as listed in Minn. R. 7050. One of the purposes of the NPDES permit is to establish requirements or conditions that the permittee must operate under in order to assure compliance with the water quality standards. While the WCA for LGUs does regulate the activities that cause draining, filling and some excavation to certain wetlands, the WCA does allow for ten categories of exemptions to these requirements, does not have jurisdiction over all wetlands that are considered waters of the state, and does allow the LGU to vary wetland sequencing requirements if a local wetland plan is developed. The permittee must recognize the nondegradation standards for wetlands and the required mitigation sequence of Minn. R. 7050.0186 to mitigate for degradation of wetlands, apply to all wetlands that are considered waters of the state. The MPCA water quality standards provide more comprehensive water quality protection for all wetlands in Minnesota than is required of the LGU to implement under WCA. Application of the WCA by the LGU will provide comparable wetland protection to wetland impacts in many to most cases and the WCA determination would also satisfy the Minn. R. 7050.0186 determination. However, in the few projects where the requirements of the WCA are not as comprehensive as MPCA water quality standards, then the requirements of the NPDES permit will require an LGU to make a determination that will also satisfy Minn. R. 7050.0186. Considering those

exceptions, allowing the permittee to only reference the WCA requirements for wetland protection would not be adequate to assure compliance with the NPDES permit for all cases.

The MPCA does not anticipate that it will review and make a separate determination (a duplicate effort) regarding the evaluation of the sequence mitigation requirements when that determination has been conducted by the permittee. MPCA enforcement of the NPDES permit requirements of Minn. R. 7050.0186 regarding wetland impacts associated with a component of the storm water system should only be necessary if the LGU does not apply the permit requirements to their determinations. A separate determination by the permittee under the NPDES requirements that a wetland alteration activity satisfy Minn. R. 7050.0186 sequencing is only initiated when the WCA requirements exempt or consider the wetland or the activity nonjurisdictional or if the local wetland plan designation of the wetland does not require full sequence evaluation for impacts of a wetland alteration. It should be noted the WCA also recognizes that there may be other agencies or programs that have regulatory jurisdiction regarding wetland impacting activities. The WCA rules contained in Minn. R. 8420.0105, item B state that WCA rule is in addition to other regulations including those of the United States Army Corps of Engineers, United States Department of Agriculture, Minnesota state agencies, watershed districts, and local governments. Also, specifically the WCA requires that the person conducting an activity in a wetland under an exemption ensure the activity is conducted in compliance with all other applicable federal, state, and local requirements (see Minn. R. 8420.0115).

1.2.1.4 Special Waters Considerations

The evaluation for special waters is contained in Appendix C and the evaluation of other waters is contained in Appendix D**.** The test for ORVWs is that feasible and prudent alternatives must be used. The test for other waters is reasonable and practical BMPs to be implemented. These analyses have a different criteria and standard of judgment with a long history of precedent that must be considered. The exact format of the evaluation is not described, but this distinction should be kept in mind as evaluations are planned; the MPCA will also address this in guidance.

1.2.2 Guidance Manual for MS4s

The purpose of this draft report (MPCA, 2006) is to provide guidance for MS4s to comply with the Permit requirements, including the nondegradation policy. Nondegradation is achieved if 1988 levels of flow and pollutants can be maintained. If it is not feasible for a Selected MS4 to demonstrate that it has achieved 1988 levels of flow and pollutants, the MPCA must find if additional measures (BMPs) are “reasonable and practical” (Minn. R. 7050.0185). These measures are in addition to the minimum measures of the permit. The MPCA will review required submittals such as the loading

assessments, and other information such as water plans, population growth data and development plans to determine appropriate measures. During the review, the MPCA will consider what additional control measures would be reasonable to reduce the impact on the receiving water in light of the relative importance of the economic and social impacts. The objective is to allow the MPCA to make an informed, public decision that reasonably balances additional BMP costs against the adverse impact on the environment posed by the new or expanded discharge.

Under Minn. R. 7050.0185, the MPCA is free to consider whatever information is available while the MS4 has the opportunity, albeit the burden, to demonstrate to the MPCA why expanded discharges are necessary to accommodate important economic or social development and what treatment is reasonable and practical. This burden is appropriately placed upon the MS4 since the discharger is in the position to know the relative costs and benefits of the proposed actions. The MPCA must consider the economic and social development of the community; this means the houses, jobs, taxes, recreational opportunities, and other impacts on the public at large that will result from development. Therefore, the MS4 should point out to the MPCA how and why the public has benefited from the development that created the new or expanded significant discharge, and why the public costs associated with the proposed BMPs are reasonable.

1.2.2.1 Loading Assessment

Loading Assessment modeling must be conducted for the entire MS4, not for individual watersheds or areas unless the MS4 will model these for their own interests. Some communities may wish to use models that address peak flows, or site specific increased loading. While this makes some sense in terms of overall plan development, it is not required by the permit; it is an option that the MPCA encourages but does not require. Modeling examples of methods that may be acceptable include but are not limited to the following:

- The Simple Method
- PONDNET
- SLAMM
- P8 Urban Catchment Model
- XP-SWMM

Modeling or assessment methods will be used to estimate increases in loading based on two time periods, 1988 to current development and current to projected (2020 or ultimate, whichever is first) development. Modeling may also be used to help in the decision making process of determining appropriate BMPs to implement to bring those discharges back to 1988 levels, or maintaining those levels into the future if they are not already exceeded. Use of the models in this manner is not required but is encouraged.

The MPCA expects that the model will produce relative values. For this effort, the MPCA is more concerned with the average annual increases than about specific event increases. It is not as important for this particular requirement of the permit to get the actual loads correct as it is to model consistently, showing the relative change in loads rather than the actual loads. Also note, the permit does not require the development of annual rainfall tables or calculation of hydrographs and/or store and release calculation.

All models need to be adapted for use in the specific circumstances of each MS4. Gather available information on land use/imperviousness and other pertinent facts from conditions that existed or will exist from 1988 to 2020. Selection of the appropriate method is often dependant on the readily available or collectable data as well as on the outputs or results required. Since the MPCA's goal is to show relative increases or decreases in loading, a simple method can be used rather than a more complex model. MS4s may still want to use models that are more complex for your own purposes. The permit requirement is to consistently model between time periods so that the result can be objectively compared. An MS4 may want to select a model that can model BMPs to show removal from various practices that you may have installed or that you may want to install. This is not necessary for compliance with the permit, but makes sense when it comes to justifying your nondegradation plan. The model does not need to calculate design features such as hydrographs, but can show removal rates based on design criteria which can be just as useful for planning purposes. Design calculations may need to be run before implementation but often these can be run on a much smaller scale. Runoff and loading factors should be developed based on available information. BMP modeling, while optional, can be used in plan development and could consider BMP measures taken since 1988 to present and proposed BMP measures for present to 2020 or ultimate development conditions. The MPCA has examples of how the "simple method" can be applied to every community in the metro area.

The modeler must provide an explanation of assumptions and calculation methods. The inputs will need to be listed and the values shown. All values will need to be explicitly stated. The modeler must also provide an explanation of assumptions and calculation used in the model, whether they are inherent to the model or assigned by the user. The exact algorithms must be shown. The results of the model must be

examined to demonstrate reasonable results from the model runs. Outlier values that do not seem in line with reasonable results must be explained or discussed in enough detail to help the MPCA decide the significance of the results.

1.2.2.2 Nondegradation Report

Based on the modeling, local storm water management plans, and other pertinent factors, permittees must develop a Nondegradation Report to get new or expanded discharges back to 1988 levels. Where increases in runoff or pollutant loading has occurred due to new or expanded discharges from storm water runoff, the Nondegradation Report must include retrofit and mitigation options (BMPs) that the permittee has determined to be reasonable and practical to be included in the permittee's SWPPP.

Each Selected MS4 will submit its SWPPP, including BMPs proposed to be included, to the appropriate water authority, watershed organizations or county water planning authority, for their review and comment. The Nondegradation Report, as the basis for the SWPPP, will also be available to the water authority. The intention is that these groups will work together to create a Nondegradation Report that is acceptable to the public and other affected parties. As required in the permit, the proposed SWPPP, as based on the Nondegradation Report, will be public noticed at the local level for public participation.

The Nondegradation Report explains the decisions made by the permittee regarding the incorporation of BMPs into their SWPPP to meet the nondegradation requirements. The purpose of the Nondegradation Report is "to allow the MPCA to make an informed, public decision that reasonably balances additional BMP costs against the adverse impact on the environment posed by the new or expanded discharge" (Minn. R. 7050.0185). The report is an explanation of the nondegradation implementation plan proposed to be adopted by the MS4 community, explaining why some measures have been rejected and why the measures taken are reasonable and practicable given the circumstances for the community they serve.

To help the MPCA determine if discharge loads should be allowed to increase, Selected MS4s must submit pertinent information that demonstrates how potentially adverse water quality impacts from a new or expanded discharge have been addressed. The goal of the Nondegradation Report is to demonstrate what additional control measures would be reasonable to reduce the impact on the receiving water in light of the relative importance of the environmental, economic and social impacts. The Report should explain all aspects of the proposed Report that the permittee intends to implement. It is understood that the SWPPP itself may have already addressed some specific aspects of nondegradation, and it may be beneficial to note these in the Report. The Report should also address the alternatives that have been studied but rejected. It is not necessary to include all rejected alternatives, but it will be very important to

establish the general thinking regarding why some option have been rejected and the basis for such rejection.

1.3 Storm Water Management Planning and Water Quality Improvement Projects

In addition to its SWPPP (St. Louis Park, 2006), the City of St. Louis Park has completed, participated in, and implemented several storm water management planning and water quality improvement projects since 1988. These projects are summarized below:

- Comprehensive Water Resources Management Plan (CWRMP, 2001)—Established water quality goals and BMP implementation requirements for all new development within the city.
- Capital Improvement Program projects specifically designed for water quality improvement and erosion control.
- The City has continued work on the following ongoing water quality monitoring and improvement programs and projects:
    - Lawn fertilizer application control, erosion control, shoreland zoning, and animal control ordinances
    - Street sweeping program
    - Pond maintenance
    - Storm water education presentations, outreach, meetings and training
    - Wellhead Protection Program

2.0 Loading Assessment

2.1 Land Use/Land Cover Compilation

To meet the Permit requirements, it will be necessary to estimate average annual runoff volumes, TP and TSS loadings for 1988 (the base year), 2000-2002 (existing conditions), and 2020. An important parameter for estimating historical TP and TSS loading and stormwater runoff volumes is an accurate determination of land use for the city of St. Louis Park for the years of interest. These land use data are available in Geographic Information System (GIS) data format for various years in the Twin City Metropolitan area, but due to land use changes in St. Louis Park, the land use data available does not reflect the development status of the City during all of the years specifically analyzed for this study. A generalized classification system was developed to get a consistent comparison of land use for the existing and future conditions using the data that were available. The land use classes used are shown in Table 2-1.

Table 2-1 Land Use and Land Cover (LULC) Classes

County Landuse Code based on Existing Conditions Data	Converted Land Use Classification	
	Converted Landuse Code	Landuse Description Used in Analysis
ABP	IND	Industrial
ADU	COM	Commercial
ANM	COM	Commercial
BAR	COM	Commercial
BLB	COM	Commercial
BNK	COM	Commercial
BNK	COM	Commercial
CCR	CIV	Institutional
CDO	COM,RH,RM*	Commercial, Medium Density Residential or High Density Residential
CLB	COM	Commercial
CLR	RM	Medium Density Residential
EDU	CIV	Institutional
ELD	RH	High Density Residential
ENT	COM	Commercial
FDS	COM	Commercial
FUH	COM	Commercial
GAS	COM	Commercial
GHN	RL	Low Density Residential
GHS	RL	Low Density Residential
HOS	OFC	Office
HOT	OFC	Office

LIB	CIV	Institutional
MED	OFC	Office
MFG	IND	Industrial
MFR	RM	Medium Density Residential
MIX	COM, IND, OFC, PRK, RH, RM*	Commercial, Industrial, Office, Park/Open Space/Vacant, High Density Residential, Medium Density Residential
MUS	CIV	Institutional
MVR	COM	Commercial
MVS	COM	Commercial
NUR	RH	High Density Residential
OFC	OFC	Office
OWH	IND	Industrial
PKG	IND	Industrial
PKR	OFC	Office
PND	PRK	Park/Open Space/Vacant**
POF	IND	Industrial
PRK	PRK	Park/Open Space/Vacant
PRT	COM, IND*	Commercial or Industrial
PSS	CIV	Institutional
RCY	IND	Industrial
REC	PRK	Park/Open Space/Vacant
REL	CIV	Institutional
REP	COM	Commercial
RET	COM	Commercial
ROW	COM, TRANS, ROW*	Highway Right of Way, Municipal Right of Way, or Railroad Right of Way
RRR	TRANS	Railroad Right of Way
RSC	COM	Commercial
RWL	COM	Commercial
RWO	COM	Commercial
SDO	IND	Industrial
SFR	RL	Low Density Residential
SHW	COM	Commercial
STR	IND	Industrial
SUB	IND	Industrial
SVC	COM	Commercial
TFR	RM	Medium Density Residential
TWR	IND	Industrial
VAC	PRK	Park/Open Space/Vacant
WHS	IND	Industrial

*Actual classification was chosen based on examination of existing development as observed from 2004 Aerial Photography

**Water surfaces were assigned based on Met Council Landcover data (2000) and Aerial Photography. If appropriate, non-water areas around ponds were assigned Park/Open Space/Vacant classification.

Land use data for the city of St. Louis Park for the 2000/2002 and 2020 time periods are summarized in Table 2-2. Table 2-2 shows that approximately 400 acres of the city is expected to undergo a change in land use between the current and future conditions. Sources used to derive the data for 1988 and existing conditions include the 1990 and 2000 Metropolitan Council land use GIS data, 1991 and 2004 aerial photography. The City of St. Louis Park's Existing Conditions and 2020 Comprehensive Plan land use GIS layers were obtained from the City's Planning Department staff were also used.

Table 2-2 St. Louis Park Land Use/Land Cover (LULC) and Imperviousness Calculations for 2000/2002 and 2020

Land Use Description	Land Use Impervious Percentage (based on average of 2000 and 2002 imperviousness data)	Area (acres)			Impervious Area (acres)		
		2000/2002	2020	Change	2000/2002	2020	Change
Commercial	82.1%	302	364	61	248	299	50
Industrial	70.4%	400	410	11	281	289	8
Office	69.1%	275	206	-69	190	142	-48
Highway ROW	60.8%	360	360	0	219	219	0
High Density Residential	59.2%	49	182	132	29	107	78
Medium Density Residential	50.5%	440	393	-46	222	199	-23
Institutional	47.2%	227	234	7	107	111	3
Highway ROW	40.2%	1,184	1,183	-1	476	475	0
Transportation (RR ROW)	35.6%	163	163	0	58	58	0
Low Density Residential	27.2%	2,319	2,495	176	631	678	48
Water	0.0%	155	155	0	0	0	0
Park/Vacant/ Undeveloped	14.9%	1,059	772	-287	158	115	-43
Commercial Mix**	82.1%	0	13	13	0	11	11
Mix**	59.2%	0	3	3	0	2	2
Total		6,935	6,935	0	2,620	2,705	85
Percent Imperviousness					37.8%	39.0%	

**Estimated

2.2 Watershed Imperviousness Determination

The MPCA and the University of Minnesota have developed GIS-based datasets that estimate imperviousness based on analysis of color-infrared Landsat photography (University of Minnesota). These datasets were developed for the following years for the Twin Cities Metropolitan Area: 1986, 1991, 1998, 2000, and 2002. Since there is no data available for 1988, an average of 1986 and 1991 city-wide imperviousness values were assumed to be adequate for estimating 1988 conditions. To estimate future imperviousness, the 2000 and 2002 imperviousness data were used to determine existing percent imperviousness for specific land uses within the City. These percentages were then applied to the city using land use data from the City's 2020 Comprehensive Plan.

Historical imperviousness was determined by overlaying the impervious layers onto the boundary of the City of St. Louis Park. The average impervious is calculated by determining the average value of all of the pixel values of the impervious layer that fall within the City (each pixel value has a value of zero to 100 corresponding to the percent imperviousness of the area represented by that pixel). However, some adjustments had to be made to the data to account for error that can be introduced for water surfaces. It was found that some water surfaces would return false positives for imperviousness. Therefore, water surface areas were identified using 1990 Metropolitan Council land cover data and 1991 aerial photos. A zero percent imperviousness was assigned to these water areas rather than the value in the imperviousness layer.

The impervious values calculated for 1986 and 1991 are summarized in Table 2-3. Table 2-3 shows about a 2 percent difference between the imperviousness estimates for 1986 and 1991. This difference is likely due to errors introduced in developing the imperviousness layer and less likely from any land use changes during the period. The average of the two years of data is 40.0%, which was used as the 1988 estimate of imperviousness for the loading assessment.

Table 2-3 St. Louis Park Imperviousness Calculations for 2000/2002 and 2020

Year	Total Area (acres)	Impervious Area (acres)	Citywide Impervious Percentage
1986	6,935	2,700	38.9%
1991	6,935	2,846	41.0%
2000	6,935	2,596	37.4%
2002	6,935	2,644	38.1%
2020*	6,935	2,681	38.7%
2020**	6,935	2,730	39.4%

*Estimate using 2000 imperviousness data estimates and comprehensive plan data
**Estimate using 2002 imperviousness data estimates and comprehensive plan data

The estimate of 2020 imperviousness was done in three steps:

1. Determination of a common land use classification system for "existing" (2000-2002) conditions and 2020

2. Estimation of imperviousness for these land use classes for the 2000 and 2002 time period using Landsat-based imperviousness data

3. Calculation of imperviousness estimates for 2020 by applying the imperviousness calculated for each of the common land use classes provided in the City's 2020 Comprehensive Plan

To estimate future imperviousness of the city (in 2020), an estimate of imperviousness for representative land uses were made for the 2000 and 2002 data sets. Once these values were determined, estimates could be calculated based on land uses in the City's 2020 Comprehensive Plan.

The first step in doing this involved the development of a consistent classification system for existing conditions and for the 2020 land use projections. A parcel-based GIS layer showing existing land use and expected land use in 2020 (based on the City's Comprehensive Plan) was developed by city staff. This data set provides a very detailed description of existing land uses for most of the cities parcels. It also provided a land use classification expected for the parcel in 2020. The 2020 Comprehensive Plan land use classes were more general than the detailed existing land use classes. Table 2-1 shows how the existing land uses relate to those assigned in the City's Comprehensive Plan. For some of the land use classes, the conversion of the existing land use classes was done manually, particularly with the MIX and CDO classes.

Water surfaces were designated by using the 2000 Metropolitan Council Land Use Layer. Adjustments were made to the water surface layer using 2004 USGS Aerial Photography, where necessary.

The existing land use data GIS layer, based on the land use classifications shown in last column of Table 2-1, was intersected with the imperviousness data for 2000 and 2002. Table 2-2 shows the results of this analysis for each land use class using an average of the 2000 and 2002 values to estimate future (2020) imperviousness.

The highest percent imperviousness occurs with the commercial land use (about 82 percent) and the lowest (not including water surfaces) was 15 percent for the Park/Vacant/Undeveloped land class. Note that the Park/Vacant/Undeveloped land class can have impervious areas such as park buildings,

parking lots and trails. The estimated average city wide imperviousness data for 2000 and 2002 is 37.8% (see Tables 2-2 and 2-3). The difference in imperviousness using the 2000 and 2002 data was approximately 1 percent.

The imperviousness calculated for each land use class using the 2000 and 2002 impervious layers was applied to those same classes as designated in the City's 2020 Comprehensive Plan. For example, if a parcel is shown to be "Commercial" in 2020, the commercial imperviousness percentage calculated using the average of the 2000 and 2002 data were applied for that parcel. In most cases there was no change in imperviousness (the land use did not change). However, in some cases the imperviousness of a parcel increased (such as a parcel currently designated low density residential converting to high density residential land use in 2020). In other cases there were parcels in the City where imperviousness was expected to decrease or not change. Table 2-2 provides a summary of land use areas and the calculation of the estimated imperviousness for 2020.

Table 2-2 provides the estimated 2020 imperviousness calculated using the average of the 2000 and 2002 land use impervious values shown in Table 2-3. The average imperviousness value shown for 2020 is approximately 39%. The estimates for all three time periods indicate that the imperviousness of the City will not change significantly from 1988 to 2020, and should stay within a range of approximately 2 to 4 percent, which is less than the standard error of the Landsat data (University of Minnesota).

2.3 Modeling Approach and Methodology for Loading Estimates

Complex models used to answer simple questions are not advantageous and simple models that do not model important or required physical processes are not useful. In keeping with the Permit conditions and guidance discussed in Section 1.2, our modeling approach was developed based on the following requirements:

- The loading assessment should include changes to pollutant loadings associated with changes due to past land use changes and changes due to anticipated land use changes

- The modeling will produce relative values, as the MPCA is more concerned with the average annual increases than about specific event increases. It is not as important to get the actual loads correct as it is to model consistently, showing the relative change in loads rather than the actual loads

- The assessment can include changes due to BMPs that have already been implemented, if increase in the loading since 1988 is explicitly stated, as well as changes due to BMPs that are planned to be implemented and written into the MS4's ordinances or other regulatory mechanisms

- The model does not need to calculate design features such as hydrographs, but can show removal rates based on design criteria, which can be just as useful for planning purposes. Design calculations may need to be run before implementation but often these can be run on a much smaller scale.

Currently, there are several water quality models available for simulating urban runoff and the treatment effectiveness of BMPs. Table 2-4 presents a qualitative comparison of several of the important attributes associated with some of the more common runoff water quality model capabilities based on the various selection criteria. The compiled model attributes and capabilities come primarily from peer-reviewed manuals (U.S. EPA, 1997; Burton and Pitt, 2001), with additional updated information based on our own experience and professional judgment. The water quality models included in the table are generally listed in increasing order of complexity (from left to right). For each attribute or selection criteria the models are categorized by possessing low, medium (intermediate) or high capabilities. Those capabilities that are not incorporated into a particular model, or were not applicable, were also indicated. Our approach for model selection for this assessment involved comparison of the advantages and limitations of the various models as they pertain to the Permit requirements, available data, and objectives of the city.

Table 2-4 shows that the only limitation with the P8 model, as it relates to the modeling requirements for the loading assessment, is that it is not intended to be used to determine pollutant loadings from non-urban land uses. However, the Simple Method, PONDNET and GWLF can be used to determine pollutant loadings from both urban and non-urban land uses. Both the Simple Method and PONDNET are typically used on an annual time scale. Table 2-4 also shows that the Simple Method, PONDNET and GWLF lack the ability to model the BMPs that would typically be considered for implementation by the City (such as vegetated drainage ways, extended detention, infiltration/filtration practices and street sweeping). SLAMM lacks a snowmelt runoff routine, does not have any capabilities for including baseflow in BMP analysis, and does not have the model output features contained in the P8 model. XP-SWMM is more complex, but is not in the public domain, is significantly more expensive, and BMP modeling is more cumbersome, less accurate and less intuitive than the P8 model.

Table 2-4 Comparison of Modeling Attributes/Capabilities by Selection Criteria

Criteria/Attributes		Simple Method	PONDNET	SLAMM	P8	GWLF	XP-SWMM
Time Scale	Annual	H	H	--	--	--	--
	Single Event	H	--	--	H	--	H
	Continuous	--	--	H	H	H	H
Hydrology	Runoff	L	L	H	H	H	H
	Baseflow	--	--	--	L	H	H
	Snowmelt	--	--	--	H	--	H
Pollutant Loading (Constituents)	Sediment (TSS)	H	--	H	H	H	H
	Nutrients	H	H	H	H	H	H
Pollutant Loading (Land Uses)	Urban	H	H	H	H	H	H
	Agricultural	H	H	--	--	H	--
Pollutant Routing	Transport	--	--	L	L	L	H
	Erosion	--	--	--	--	H	H
	Transformation	--	--	--	--	--	L
Hydraulic Flow Routing/Diversions		--	--	--	L	L	H
Model Output	Statistics	L	L	L	H	L	H
	Graphics	--	--	L	H	M	H
	Hydro/Pollutographs	--	--	--	H	--	H
	Format Options	L	L	H	H	H	H
	Sensitivity Analysis	--	--	--	H	--	--
Input Data	Requirements	L	L	M	M	M	H
	Calibration	L	L	L	M	L	H
	Default Data	L	H	H	H	H	M
	User Interface	L	L	H	H	H	H
GIS Compatibility		L	L	--	M	L	M
BMPs-General	Evaluation	--	H	M	H	L	H
	Design Criteria	--	H	L	H	--	H
Specific BMPs	Ponds/Wetlands	--	H	H	H	--	H
	Extended Detention	--	--	M	H	--	H
	Infiltration/Filtration	--	--	H	H	--	M
	Street Sweeping	--	--	H	H	--	M
	Others	--	--	H	H	--	L
Documentation	Peer Acceptance	H	H	H	H	H	H
	Technical Support	L	L	M	H	L	H
Cost	Software	L	L	M	L	L	H
	Use	L	L	M	M	M	H

H – High M – Medium (Intermediate) L – Low -- Not Incorporated (Not Applicable)

For this loading assessment, we have chosen to use the Simple Method to determine the pollutant loadings and runoff volumes from each of the land uses within each watershed and then use the P8 model to account for the effects of BMP implementation for the time periods of interest in the Permit conditions. In addition to the discussion associated with Table 2-4, the following information provides further justification for choosing the Simple Method/P8 model combination for the loading assessment modeling, in comparison to SLAMM, PONDNET, XP-SWMM, or some combination thereof:

- The Simple Method inputs can be directly derived within GIS
- PONDNET does not model TSS loadings and is only intended for modeling TP within wet detention ponds
- SLAMM is more detailed than P8 with respect to distinguishing source loading areas (such as driveways, parking lots, lawns, etc.), but P8 exceeds the capabilities of SLAMM when it comes to networking of watersheds/BMPs and many of the graphics and advanced output features
- P8 provides routines for performing sensitivity analyses and can also be run in design mode to determine required sizes of BMP(s) to meet treatment criteria
- P8 has the highest peer acceptance in Minnesota for urban runoff and BMP water quality modeling and enhancements have been supported by the MPCA
- P8 is free, user-friendly and easy to learn with its menu driven system
- P8 allows for some GIS compatibility via ASCII text file import of watershed data and export of results
- P8 models actual hourly precipitation and climatic data as it occurs, with its associated antecedent moisture conditions, while SLAMM only reads in the total precipitation and duration of each rainfall event and does not model actual runoff events in real-time with their associated antecedent moisture conditions
- Unlike SLAMM, P8 allows for hydrologic calibration within the program and can be calibrated/validated to time series runoff events continuously simulated from climatic data

While the City of St. Louis Park has conducted some monitoring of stormwater runoff and receiving water quality/quantity, none of the studies included monitoring of runoff from individual land uses or specific land cover types.

Following the initial assessment of TSS, TP and volume contributions with the Simple Method, the benefit that future BMP implementation will have on the flow, TP and TSS loadings is assessed within the city limits using the P8 water quality modeling for developments based on P8 model design criteria examples that are indicative of the ordinances and design standards that are currently in place by the City, the watershed management organizations, the Wetland Conservation Act and the MPCA. Based on the available data, combining the Simple Method and P8 Model for the loading assessment ensures full compliance with the Permit requirements, for the following reasons:

- The Simple Method ensures that a consistent method for calculating average annual volumes and loadings will be applied to all land uses to produce relative values across the two times periods of interest, as discussed in the Permit and Guidance Manual (see Sections 1.1.1 and 1.2.2.1 of this report)

- The P8 Model simulations of volume and pollutant loading reductions associated with BMP implementation, according to the various ordinances and design standards that were in place when development occurred, is consistent with the Permit conditions and Guidance Manual and provides a consistent method for calculating relative removal rates as suggested in Section 1.2.2.1 (which includes the following excerpts from the Guidance Manual, "The model…can show removal rates based on design criteria… Design calculations may need to be run before implementation but often these can be run on a much smaller scale.)

- Excludes the effects that natural wetlands would have on improving the storm water quality within each watershed, which ensures that the loading assessment estimates that include BMPs (discussed in Section 2.4) do not take credit for treatment by natural wetlands

- The city will not have to revise and update existing P8 models to exclude the effects of natural wetlands or collect significantly more data on every BMP to develop new P8 models for the rest of the city, which would represent significantly more cost for a product that would not provide a "distinction between what is desirable and what is required. The MPCA chose a level [in its loading assessment requirements] that will prevent undue burden while still developing useful information." (MPCA Guidance Manual, 2006)

The loading assessment modeling results were summarized for the City to show the Simple Method loading and volume estimates for each time period, as well as the loading and volume estimates after applying the P8 model design criteria examples to the future conditions, based on the minimum ordinances and design standards that are expected to be in-place when the various developments or redevelopments occur.

2.3.1 Average Annual Flow Volume

The conversion of land areas to urban land uses leads to changes in watershed hydrology and pollutant load rates. The areal increase in impervious surfaces in urban areas over undeveloped rural and natural land uses leads to greater surface water runoff volumes. The increased runoff coupled with human activities increases the types of pollutants and delivery rate of these pollutants to surface waters. Impermeable surfaces shed water as surface runoff which reduces the infiltration and evapotranspiration components of the hydrologic cycle. Surface runoff in urbanized areas is generally directed to storm sewers and other conveyance systems to rapidly move the large volumes to receiving waters and prevent flooding. This section provides a general discussion about the methodology used to quantify the amount of runoff from the various land uses in the St. Louis Park watersheds during the two time periods of interest for the Permit conditions.

As previously discussed, the Simple Method was used to estimate the average annual runoff volumes, which in turn, are also used to calculate the TP and TSS loadings, for the various land uses present within the St. Louis Park watersheds. In the urbanized portion of each watershed, average annual runoff volume was calculated using the following relationships (as described in Schueler, 1987):

Annual Runoff Coefficient [RC] = 0.05 + ((0.009) x (Impervious Fraction) x 100)

Annual Runoff Volume (acre-feet) = RC x Annual Rainfall (inches) x Urban Area (acres) / 12

As previously discussed, there is no monitoring data available for runoff volumes or quality from individual land uses or specific land cover types within the city. The annual rainfall amount of 29.41 inches was used for this analysis, based on the long-term (1971-2000) average annual precipitation measured at the Minneapolis-St. Paul International Airport and published by NCDC.

2.3.2 Total Phosphorus and Total Suspended Solids

As previously discussed, there is no monitoring data available for runoff volumes or quality from individual land uses or specific land cover types within the city. Since the city is fully urbanized, the TSS and TP average annual runoff concentrations were assumed to be 100 mg/L and 0.33 mg/L,

respectively, based on the median Nationwide Urban Runoff Program (NURP) studies concentrations cited by Athayede et al. (1983).

The TSS and TP loadings from the City were then calculated according to the following equation:

TSS and TP Load (lbs.) = Concentration (mg/L) x *Annual Runoff Volume (acre-feet)* x *2.72*

2.3.3 BMP Implementation Modeling

As previously discussed, P8 water quality modeling was used to assess the benefit that expected future BMP implementation would have on the flow volume, TP and TSS loadings within the city limits for developments and redevelopments based on the ordinances and design standards that control the treatment efficiency of the BMPs. The NURP pond BMP design requirements have controlled the treatment efficiency of the BMPs associated with each new development and will be the minimum design requirements that control the treatment efficiency for BMPs that are implemented through 2020 for the city. The NURP design scenario was run in P8 for a hypothetical low-density residential development with 25% imperviousness and a commercial development with 80% imperviousness to obtain a range of treatment efficiencies, as well as the average efficiency, that would be expected for the same design standard. For the NURP design scenario, the P8 Model estimated average TP and TSS load reductions of 56% and 87%, respectively. It was assumed that a negligible volume reduction would be realized from implementation of the NURP design requirements.

As a result, the NURP design scenario has been used to conservatively represent the results of the loading assessment, following future BMP implementation. The loading assessment results do not attempt to quantify the amount of stormwater treatment that has occurred in the past. As discussed in Section 2.2, a parcel-based GIS layer showing existing land use and expected land use in 2020 (based on the City's Comprehensive Plan) was developed and reviewed by city staff to determine whether redevelopment, for those parcels with changing land use, would result in increased or decreased imperviousness. This review indicated that approximately 723 acres of the city would undergo redevelopment between 2000/2002 and 2020, with approximately 157 acres experiencing increased imperviousness and the remaining 566 acres experiencing decreased or no change in imperviousness. For this analysis, it was assumed that the 723 acres of future redevelopment area would receive stormwater treatment that meets or exceeds the NURP design requirements, so the loading assessment results provide the city-wide TP and TSS loadings with and without the reductions attributed to the aforementioned NURP design scenario.

2.4 Results and Discussion

Table 2-5 shows the overall results of the loading assessment modeling, which were summarized for the city to show the Simple Method loading and volume estimates for each time period (without BMPs), as well as the future loading and volume estimates after applying the P8 model NURP design criteria (with BMPs), based on the parcel-based GIS coverage that showed all of the areas that are expected to redevelop in the city.

2.4.1 Average Annual Flow Volume

Table 2-5 shows that the total average annual flow volume from the city has not increased or changed significantly since 1988 and would continue to remain approximately the same by 2020, regardless of the future BMP implementation, since it was assumed that no volume reduction would be realized from implementation of the NURP design requirements. The flow volumes estimated for current and future (2020) conditions are approximately 4 and 2 percent lower than the estimated flow volume for 1988.

2.4.2 Total Phosphorus

Table 2-5 shows that the TP loading from the city has not increased or changed significantly since 1988 and would continue to remain approximately the same by 2020. Without implementation of BMPs, the TP loading estimated for current and future (2020) conditions are approximately 4 and 2 percent lower than the estimated TP loading for 1988. Table 2-5 also shows that by 2020, the TP loading should be approximately 9 percent lower than the 1988 condition, with future BMP implementation following the NURP design requirements for redevelopments.

2.4.3 Total Suspended Solids

Table 2-5 shows that the TSS loading from the city has not increased or changed significantly since 1988 and would continue to remain approximately the same by 2020. Without implementation of BMPs, the TSS loading estimated for current and future (2020) conditions are approximately 4 and 2 percent lower than the estimated TP loading for 1988. Table 2-5 also shows that by 2020, the TSS loading should be approximately 13 percent lower than the 1988 condition, with future BMP implementation following the NURP design requirements for redevelopments.

Table 2-5 St. Louis Park Nondegradation Loading Assessment Summary

TIME PERIOD	WATERSHED TOTAL RUNOFF (acre-feet)	WATERSHED TP YIELD (LBS)	WATERSHED TSS YIELD (LBS)
Without BMPs			
1988	6,811	6,113	1,852,452
Current	6,511	5,843	1,770,691
2020	6,665	5,982	1,812,605
With Future BMP Implementation			
2020	6,665	5,536	1,603,031

2.4.4 Other BMPs and Considerations Not Included in the Loading Assessment

The results of the Loading Assessment with BMP implementation present the estimated volumes and pollutant loading estimates associated with the minimum structural BMP requirements for future developments or redevelopments. There are several other structural and nonstructural BMPs that have been, or will continue to be, implemented in the city that, collectively, would also be expected to make significant reductions in volume and pollutant loadings beyond those indicated in Table 2-5. These BMPs include the following:

- Capital Improvement Program projects specifically designed for water quality improvement
- The lawn fertilizer phosphorus ban
- Street sweeping program
- Public education/participation/outreach
- Illicit discharge detection and elimination
- Pollution prevention/good housekeeping measures for municipal operations
- Public nuisance ordinance controlling pet waste
- Shoreland zoning ordinances controlling setbacks and requiring buffers for all public waters and wetlands

In addition, there are other assumptions that were made about BMP implementation considered in the Loading Assessment that were especially conservative, which meant that the 2007 and 2020 loadings, with BMP implementation, shown in Table 2-5 were higher for the following reasons:

- There is increased seepage to groundwater from storm water pretreatment measures and wet detention ponds
- Disconnection of impervious surfaces from drainageways

3.0 Nondegradation Report

3.1 BMP Selection Considerations for Development

The loading assessment indicates that implementation of watershed BMPs within the City of St. Louis Park, both in the past and as planned for the future, will ensure that the TP and TSS loads from the city will be reduced and the runoff flow volumes will not increase or slightly decrease between 1988 and 2020. As a result, the following sections of the Nondegradation Report discuss how BMPs, incorporated into the current SWPPP, will address and mitigate any localized increases in average annual flow volume and TP or TSS loading, as far as is reasonable and practical.

The following sections also include discussion about the BMP selection considerations, the alternatives that were evaluated, and the basis for the selected BMP approach for both new development and retrofits of existing development. The BMP selection considerations primarily consist of stream morphology/channel erosion, wetlands and source water protection.

3.1.1 Stream Morphology/Channel Erosion

While much of the storm water runoff generated in the St. Louis Park watersheds is conveyed to the lakes, streams and wetlands via storm sewer, there are some open channels within these watersheds, in addition to the streams, that could be subject to channel erosion due to increased flow volumes. In general, channels with culvert crossings experiencing localized increases in flow volume would still have controlled the peak flows since the policy in the St. Louis Park Comprehensive Water Resources Management Plan (CWRMP) (St. Louis Park, 2001) would have required rate control due to new development. As previously discussed, the loading assessment shows that runoff flow volumes have not increased or may have experienced a slight decrease between 1988 and 2020. As a result, with the exception of portions of Minnehaha Creek, the city has not observed significant channel erosion.

Both the St. Louis Park WRMP and the zoning ordinance require minimum structural setbacks and stormwater management along stream corridors, which will provide further protection for the physical and biological integrity within each watershed. Erosion and sedimentation control plans will be reviewed and enforced by the City for all new development and redevelopment. The City may prohibit work in areas having steep or very steep slopes and high erosion potential where the impacts of significant erosion cannot be protected against or mitigated in accordance with the erosion control regulations contained in the City's Zoning Ordinance. In addition, St. Louis Park will

continue to educate landowners and residents of existing developments about the importance of maintaining existing stream buffers.

Future implementation of infiltration practices represents another BMP alternative that may be reasonable and practical. However, the city's policies will need to include flexibility for new developments and redevelopments that have site constraints that would otherwise limit the BMP feasibility or cost-effectiveness and/or lose excessive amounts of useable space due to infiltration storage volume requirements.

3.1.2 Wetlands

This section addresses, as far as is reasonable and practical, the potential negative impacts of increased storm water discharge volumes that have caused increased depth and duration of inundation of wetlands having the potential for a significant adverse impact to a designated use of the wetland.

The Permit uses terms such as "designated uses" and/or "functions and values" which come from MPCA rules. The term "significant adverse impact" in the Permit is based on the existing water quality standards and applicable rules. The term implies "significant adverse impact to a designated use" of the water, as defined in water quality standards. The following rules apply to wetland mitigation. Wetland mitigation maintains nondegradation of wetland designated uses. The wetland mitigative sequence incorporates the following principles in descending order of priority:

1. Avoid the impact altogether by not taking a certain action or parts of an action;

2. Minimize the impact by limiting the degree or magnitude of the action and its implementation, and by taking affirmative actions to rectify the impact and reduce or eliminate the impact over time; and

3. Mitigate the unavoidable impact to the designated uses of a wetland by compensation. Compensatory mitigation shall be accomplished in the following descending order of priority of replacement:

    a. Restoration of a previously diminished wetland; and

    b. Creation of a wetland.

If compensatory mitigation is accomplished by restoration or creation, the replacement wetland shall be of the same type and in the same watershed as the impacted wetland, to the extent prudent and

feasible. Compensatory mitigation shall be completed before or concurrent with the actual physical alteration of the wetland affected by the proposed project to the extent prudent and feasible.

The City of St. Louis Park has deferred the local governmental unit (LGU) responsibility for wetland management to the Minnehaha Creek Watershed District and the Bassett Creek Watershed Management Commission. The LGUs requires full sequence evaluation for impacts of a wetland alteration and provides wetland mitigation and replacement requirements. The City will not allow any mowing, burning, or other non-filling related alteration to an existing wetland without the City's expressed written approval.

As discussed in Section 1.2.1.3, the WCA does allow for ten categories of exemptions to the requirements and does not have jurisdiction over all wetlands that are considered waters of the state. In the few projects where the requirements of the WCA are not as comprehensive as MPCA water quality standards, then the requirements of the NPDES permit will require an LGU to make a determination that will also satisfy Minn. R. 7050.0186. As a result, St. Louis Park will reference both the WCA and Minn. R. 7050.0186 requirements for wetland protection in the zoning ordinance and CWRMP.

The City believes it is reasonable and practical to continue to implement BMPs that are consistent with or equivalent to the NURP design criteria, for future redevelopment projects. Combining the BMP requirements with the existing policies and ordinances for setbacks, buffers and storm water management represents the most reasonable and practical means of preventing significant adverse impacts to the designated use of wetlands in the City of St. Louis Park.

3.1.3 Source Water Protection Areas

All 11 of the St. Louis Park drinking water wells have high aquifer sensitivity and the source water protection areas in the city have variable vulnerability. As a result, the city will define the appropriate measures that will reduce the threat to drinking water to the maximum extent practicable. These measures will be developed in accordance with the Minnesota Department of Health's, Evaluating Proposed Storm Water Infiltration Projects in Vulnerable Wellhead Protection Areas, and the MPCA's, Minnesota Stormwater Manual guidance for potential stormwater hotspots. Infiltration practices will not be allowed within the 1-year time-of-travel (emergency response zone) Drinking Water Supply Management Area (DWSMA).

3.2 Retrofit and Mitigation BMP Options

The city currently applies its water quality policies to redevelopments that are greater than 2.5 acres or create more than 1 acre of additional impervious surfaces. Erosion control permits are required for projects that disturb more than 5,000 square feet or move more than 50 cubic yards of soil. The City believes it is reasonable and practical to continue to implement BMPs that are consistent with or equivalent to the NURP design criteria, for future redevelopment projects. Implementation of these practices is expected to fully mitigate past increases in storm water runoff volume and further improve receiving water quality and habitat. Variances to some of the requirements may occasionally be granted in the case of hardships or when site conditions do not allow for proper or successful BMP implementation.

3.3 Cost/Benefit, Social and Environmental Considerations

Kuo et al. (1988) determined that extended wet detention ponds provided the most cost-effective performance, compared to infiltration trenches and porous pavements, to control storm water quantity and quality. Weiss et al. (2007) determined that constructed wetlands provide the most cost-effective treatment for TSS and TP, compared to wet basins, sand filters, bioretention filters and infiltration trenches, if land acquisition costs are ignored. If land acquisition costs are factored into the analysis, wet basins would typically become more cost-effective in comparison to constructed wetland and bioretention systems. Ignoring land acquisition costs, Wossink and Hunt (2003) determined that the following BMPs would be expected to have decreasing levels of cost-effectiveness for treatment of TP loadings: bioretention in sandy soils, stormwater wetlands or wet ponds, bioretention in clay soils, and sand filters.

The City intends to continue to implement BMPs that are consistent with or equivalent to the NURP design criteria, at a minimum, based on the cost-benefit considerations for future redevelopment projects.

3.4 Implications of Impaired Waters for Addressing Loading Assessment

The MPCA's Draft 2008 impaired waters listings indicate that Cobblecrest, Windsor, Sweeney, Twin Lake, Bass Lake, Lake Hiawatha and Lake of the Isles receive storm water runoff from St. Louis Park and do not meet the MPCA's water quality standards for excess nutrients. The MPCA's water quality standard that pertains to lakes for excess nutrients, requires that the average summer (May-

September) total phosphorus concentration be maintained at or below 40 µg/L. While it is expected that the MPCA will adopt a new shallow lakes standard of 60 µg/L, some of these city lakes may still have total phosphorus concentrations that will exceed the applicable water quality standards for nutrients. The Minnehaha Creek Watershed District Comprehensive Water Resources Management Plan (2007) calls for an annual phosphorus load reduction of 172 lbs. from the City of St. Louis Park to ensure that the water quality standards will be met in Lake Hiawatha. Table 2-5 shows that there is a TP load reduction of 446 lbs. expected from the City of St. Louis Park with continued implementation of BMPs that are consistent with or equivalent to the NURP design criteria, for future redevelopment projects.

The Environmental Protection Agency (EPA) requires that the MPCA develop and submit Total Maximum Daily Load (TMDL) studies for each water body that they have on the impaired waters list. TMDL studies are used to determine what the maximum allowable pollutant loadings are for each water body without exceeding the water quality standards. The allowable pollutant loading is then allocated to each of the NPDES-permitted (including MS4s) and non-regulated sources of pollutants in the watershed. TMDL studies to be completed for Cobblecrest, Windsor, Twin Lake, Bass Lake, Brownie Lake, and Lake of the Isles may require that the City provide further reductions in total phosphorus loadings to these water bodies to comply with the MPCA's water quality standards.

Minnehaha Creek is on the impaired waters list for biota-fish, fecal coliform and chloride. The biota listing may be due to poor water quality or poor fish habitat associated with flows or excess turbidity. As a result, pollutant load allocations associated with the creek impairments would also require the city to reduce nutrient and/or sediment loadings, while possibly addressing flow volume and peak runoff rates. The fecal coliform and chloride listings will require a more detailed assessment of the specific sources of these pollutants in a TMDL study before the City can develop an approach to meet the future wasteload allocations.

It is conceivable that the pollutant load allocations developed as part of future TMDL studies will dictate that the city will need to provide further loading reductions, beyond those currently projected in the nondegradation load assessment. As a result, as TMDL studies are implemented, the City's SWPPP will also consider all reasonable and practical BMPs given the potential implications of future TMDL allocations associated with the impaired waters that are receiving storm water discharge. Since the City is fully developed, the City's SWPPP will also consider reasonable and practical BMPs for redevelopment projects.

4.0 Proposed SWPPP Modifications

This section describes the modifications that are proposed for City of St. Louis Park SWPPP, based on the results of the loading assessment and discussion in the nondegradation report.

The loading assessment and nondegradation report were completed assuming that future BMP implementation would follow the NURP design criteria, at a minimum. As necessary, the city will update its development review policies, standards and procedures, as cited in the SWPPP. The City's current approach for storm water management from the SWPPP has ensured the following:

- Receiving water quality should be improved for lakes, wetlands and streams in St. Louis Park
- Channel erosion and stream morphology changes will be proactively managed
- Further protection will be provided for the physical and biological integrity of the stream and wetland corridors
- Limiting bounce and duration of inundation in the city's wetlands to preserve the functions and values for each type of wetland classification
- Where feasible, rules will be applied to redevelopment to mitigate impacts from storm water runoff, including TSS, phosphorus, and volume
- The City will encourage a disconnect from impervious surfaces to the City's drainage system

In addition, the SWPPP will be modified to address further protection for the impaired waters within the city or downstream of the city as TMDLs and their associated implementation plans are developed.

In the few projects where the requirements of the WCA are not as comprehensive as MPCA water quality standards, then the requirements of the NPDES permit will require an LGU to make a determination that will also satisfy Minn. R. 7050.0186. As a result, St. Louis Park should reference both the WCA and Minn. R. 7050.0186 requirements for wetland protection in the St. Louis Park Zoning Ordinance and the CWRMP. Based on the Nondegradation Report, no changes are proposed for the SWPPP at this time.

5.0 Comments on Proposed Nondegradation Report

5.1 Local Water Authority Comments on Proposed Nondegradation Report

Prior to submittal to the MPCA, the City of St. Louis Park submitted its draft Nondegradation Report submittal to the appropriate local water authorities (the Bassett Creek Water Management Commission and the Minnehaha Creek Watershed District) in time to allow for their review and comment. The Nondegradation Report explaining the proposed BMPs and the entire SWPPP was also made available to the local water authorities. The following sections summarize the comments received from the local water authorities on the draft Nondegradation Report submittal.

5.1.1 Bassett Creek Water Management Commission (BCWMC)

Since the loading assessment showed that there was no increase in pollutant loadings or flow volume, the BCWMC decided there is no need to perform additional review and did not have any comments on the draft Nondegradation Report.

5.1.2 Minnehaha Creek Watershed District (MCWD)

There were no comments received on the draft Nondegradation Report submittal.

5.2 Record of Decision on the Comments

Since there were no comments, the draft Nondegradation Report submittal was not revised.

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