Miller Hill Mall Stormwater Management Plan

Prepared for
South St. Louis Soil and Water Conservation District

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Executive Summary

The goal of this Stormwater Management Plan (Plan) for Miller Hill Mall is to provide a detailed strategy for mitigating the impacts of thermally enriched stormwater runoff from the Mall's 50 acres of impervious parking lot that discharges into Miller Creek.

Following are plan sheets that include the Master Concept Plan, the various features of the Concept Plan, and a cost breakdown for each feature.

1. Concept Master Plan: Stormwater and Interpretive Features
2. Concept Plan: North Lot Stormwater Features
3. Concept Plan: South Lot Stormwater Features and Impervious Surface Reduction
4. Concept Plan: South Lot Impervious Surface Reduction
5. Interpretive Concepts
6. Best Management Practice (BMP) Section Concepts
7. Concept Level Cost Estimate

The Master Concept Plan is discussed in greater detail in Section 5 of this report.

1 Concept Master Plan

Stormwater and Interpretive Features

- Rain Garden
- Tree Trench
- Impervious Surface Removal/ Restoration Plantings/Alternate Use Area
- Tree Planting
- Interpretive Areas
- Permeable Pavers

0 100 200 Feet

NORTH SEDIMENT POND

Trinity Rd

NorthStar Ford

Miller Trunk Hwy

RAIN GARDEN 1

CISTERN

EAST ENTRANCE

Barnes & Nobles

Dick's Sporting Goods

FOUNTAIN AREA

FOOD COURT

NORTH ENTRANCES

PLAY AREA

Sears

RAIN GARDEN 2

FIG. 2

FIG. 4

Younkers

STORMWATER PLAZA

Firestone Auto

JC Penney

FIG. 3

RAIN GARDEN 4 WITH MODIFICATIONS TO POND 4

MILLER CREEK

SOUTH SEDIMENT POND OUTFALL

SOUTH SEDIMENT POND

WEST OUTFALL

POND 4 OUTFALL

RAIN GARDEN 3 WITH MODIFICATIONS TO POND 3

Decker Rd

SIMON

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Clean Water Land & Legacy Amendment

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② Concept Plan

North Lot Stormwater Features

0 50 100 Feet

Benefits:

- Aesthetic improvement to a major mall entrance
- First inch of runoff is infiltrated
- 8% reduction in thermal load from West Outfall to Miller Creek
- Pond 2 re-vegetated to become “Rain Garden 2”
- Pond 1 expanded and re-vegetated to become “Rain Garden 2”
- No loss of parking spaces
- More trees throughout the parking lot

Rain Garden End Islands

Tree Trenches

RAIN GARDEN 2

TREE TRENCH

TREE TRENCH

END ISLAND RAIN GARDENS

RAIN GARDEN 1

TREE PLANTING

TREE PLANTING

END ISLAND RAIN GARDENS

END ISLAND RAIN GARDENS

TREE PLANTING

TREE PLANTING

North Entrances

SIMON

South St. Louis Soil & Water Conservation District

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③ Concept Plan

South Lot Stormwater Features and Impervious Surface Reduction

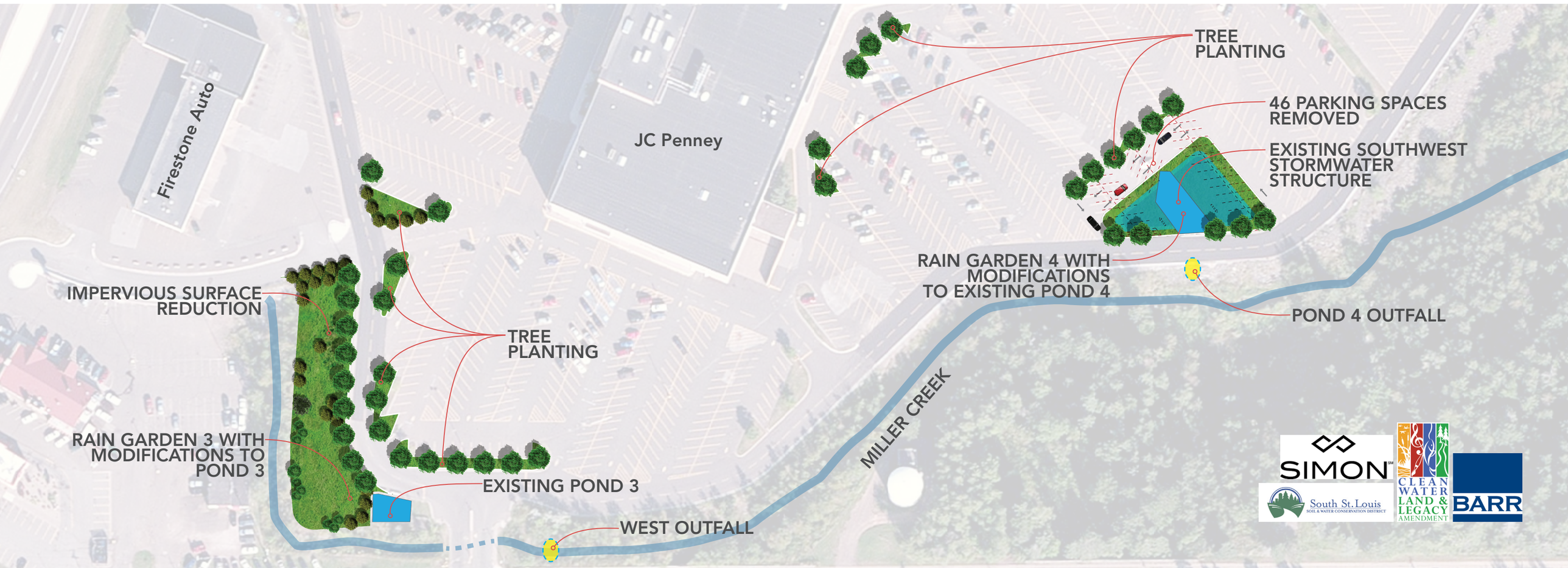
0 50 100 Feet

Benefits:

- Aesthetic improvement to a major mall entrance
- First inch of runoff is infiltrated
- 8% reduction in thermal load from West Outfall to Miller Creek
- 8% Reduction in thermal load from parking lot drainage to southwest Pond 4 Outfall
- More trees throughout the parking lot
- Reduction of ice on ring road near existing Pond 4
- Alternative use space and traffic calming created through impervious surface reduction.

Rain Garden

Impervious Surface Reduction as Ice Skating Rink Site Option



④ Concept Plan

South Lot Impervious Surface Reduction

0 50 100 Feet

Benefits:

- Aesthetic improvement to degraded and under utilized part of the parking lot
- Traffic calming through realignment of ring road to reflect current driver patterns
- Alternative use space created through impervious surface reduction

  Options Include:
  - Ornamental plantings
  - Picnic space
  - Lawn/flex space
  - Woodland or prairie restoration
  - Dog park

Farmer's Market Option

Restoration Plantings Option

Dog Park Site Option

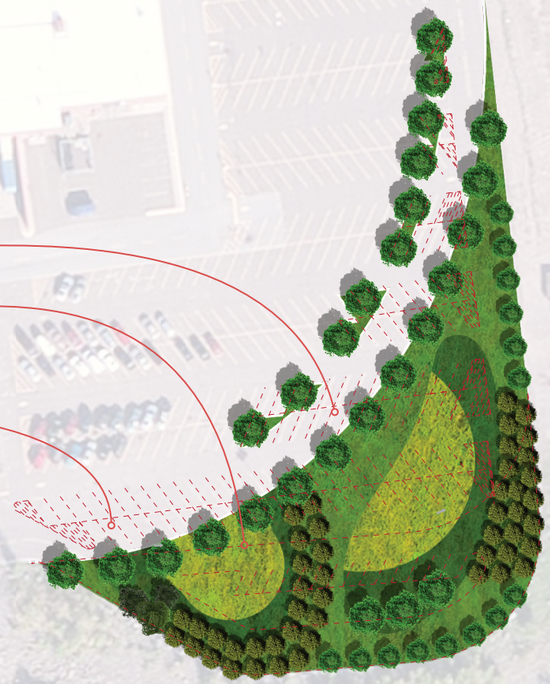
Sears

Younkers

125 PARKING SPACES REMOVED

MIXED RESTORATION PLANTINGS WITH GRASSES, TREES, AND SHRUBS

REALIGNED RING ROAD



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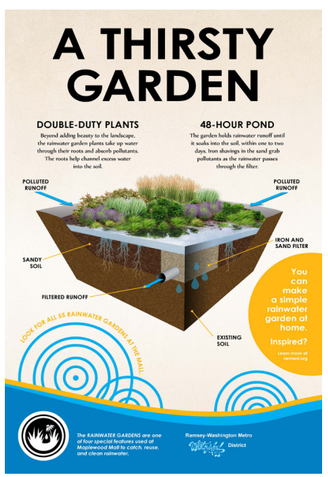
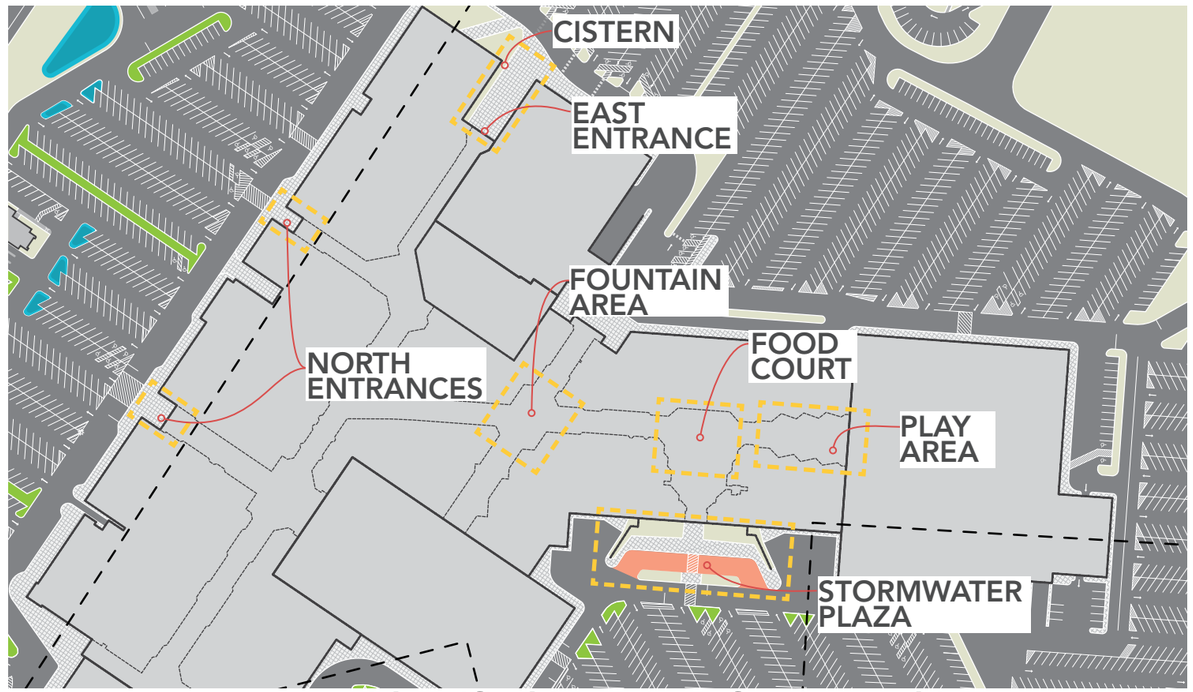
⑤ Interpretive Concepts

Opportunities for art and interpretation that connect Mall patrons to Miller Creek and the site features that protect it.

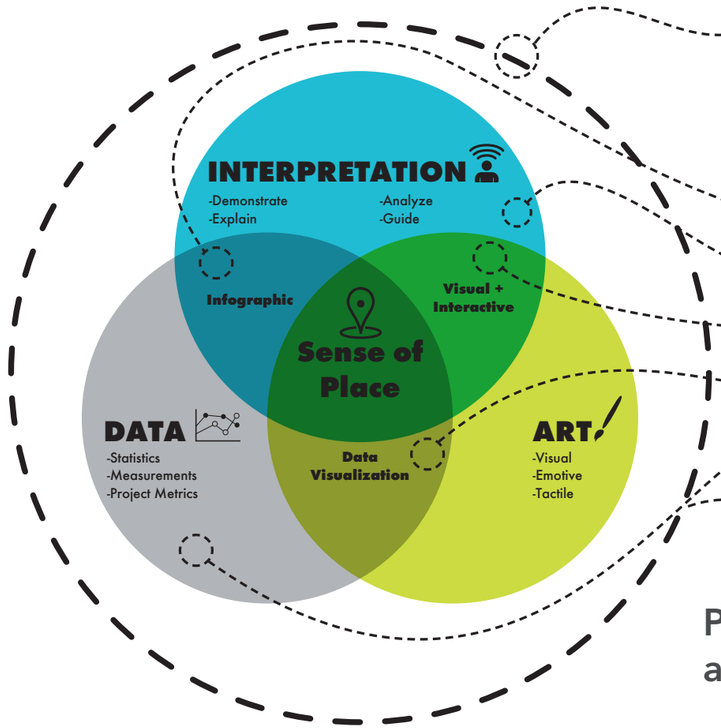
Project Logo Concept



Signage Example



Identified Locations for Art and Interpretation



Project Design

As part of the project it is important to layer multiple levels of education to help bring a sense of place and ownership. Interpretation, Data, and Art are the individual pieces that can help designers accomplish this goal.

- Informative graphics help people quickly understand project metrics through visual icons.
- Interpretive signage inform passersby about stormwater BMPs on site.
- Artistic landscape design makes the movement of stormwater visible and more interesting to site users.
- Interactive features, such as a fountain, make the site fun and compelling.
- Raw data associated with stormwater treatment BMPs are used to measure project progress or success.
- Temperature TMDL for Miller Creek Must be met for the project to succeed from an ecological stand point.

Project Interpretation and Art Approach

Example Stormwater Plaza
Maplewood Mall

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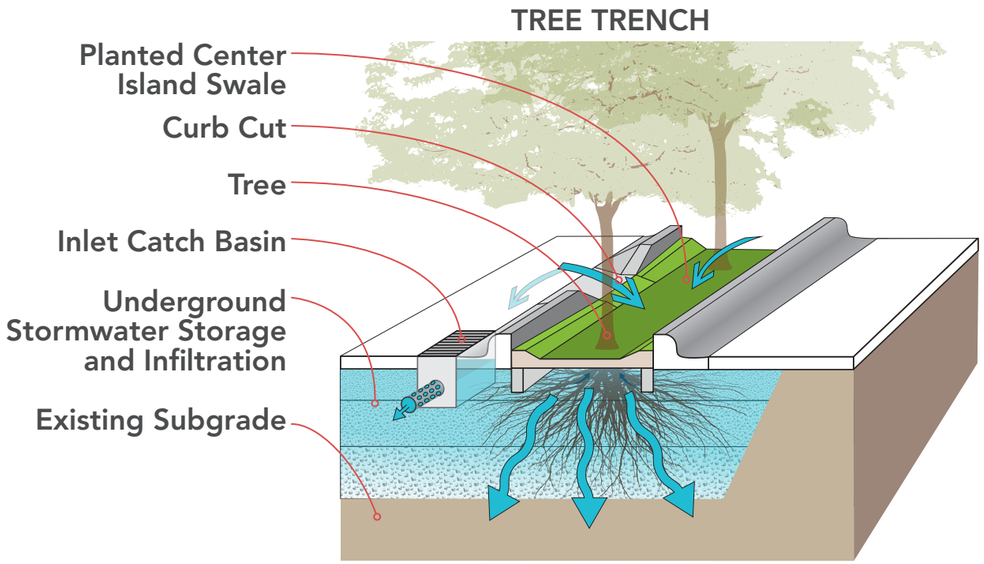
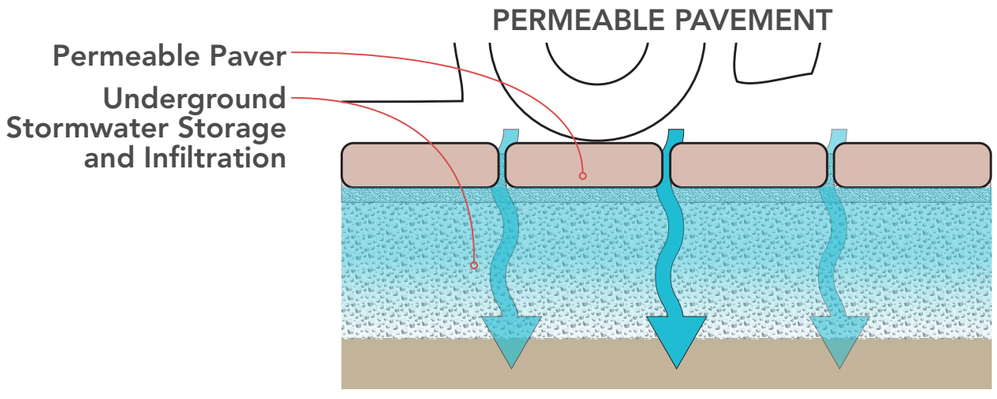
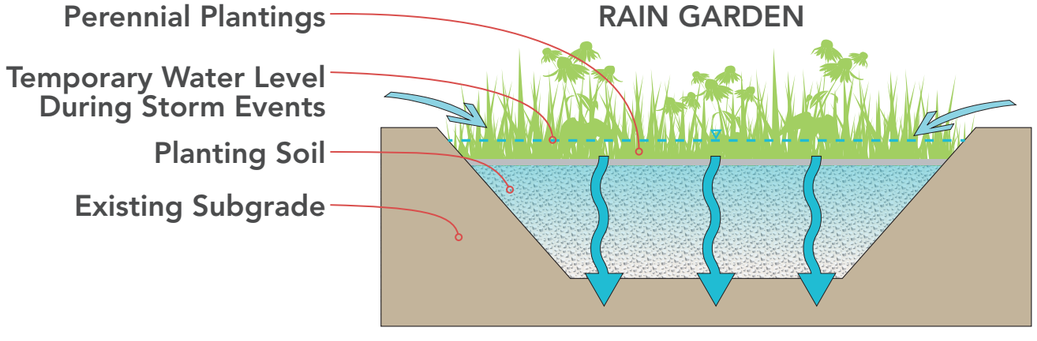
⑥ BMP Section Concepts

Section diagrams below conceptually represent how BMPs would treat stormwater runoff on site







⑦ Concept Level Cost Estimate

Cost estimates for site enhancements

Site Feature	Concept Level Cost Estimate
Phase 1	
End Island Rain Gardens in North Parking Lot	$380,000
Tree trenches in North Parking Lot	$240,000
Mill and Overlay Parking Lot Areas Tributary to Tree Trenches (16,000 SY)	$440,000
Tree Planting in North Parking Lot	$30,000
Stormwater Cistern at Barnes & Noble's/Dick's Entrance[1]	$150,000
Phase 1 Subtotal	*$1,240,000*
Phase 2	
Pond 1 Revegetation and Expansion (Rain Garden 1)	$100,000
Pond 2 Revegetation (Rain Garden 2)	$90,000
Pond 3 Rain Garden and Impervious Surface Reduction (2,200 SY)	$200,000
Mill and Overlay Parking Lot Areas Tributary to Existing Pond 3 (12,000 SY)	$320,000
Interpretive Signage Throughout the Mall Parking Lot and at Entrances	$100,000
Phase 2 Subtotal	*$810,000*
Phase 3	
Pond 4 Rain Garden	$510,000
Mill and Overlay Parking Lot Areas Tributary to Pond 4 (23,000 SY)	$610,000
Tree Planting Areas in Various Locations (other than Northwest Lot)	$70,000
Stormwater Plaza at Food Court Entrance including Porous Pavers[2]	$250,000
South Lot Impervious Surface Reduction (47,800 SF)	$100,000
Phase 3 Subtotal	*$1,540,000*
Total of All Phases	***$3,590,000***

The cost estimates for the features shown above are based on recent construction projects with similar features. All cost estimates (except mill and overlay) include 20% for contingency, as well as 25% for engineering design and construction administration and observation. Mill and overlay costs are included in degraded pavement areas that would be tributary to a proposed feature. Repaving these areas will lengthen the features' lifespans.

All costs estimates should be considered **concept level costs** that could vary greatly (increase or decrease) depending upon the final design that is pursued.

Construction phasing will depend on several factors: 1) the priorities of South St. Louis Soil and Water Conservation District and Simon Property Group and 2) the goals and limitations of the funding partners for the project.

[1] Assumes that decorative and interpretive features are included in the design of the cistern.

[2] Does not include a tile mural or cistern, but rather other infrastructure like crosswalks, interpretive signage, and decorative concrete.

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1.0 Background

The Miller Hill Mall is a significant regional shopping destination for people in Duluth and northeastern Minnesota. It is also one of the largest contiguous impervious sites in the Miller Creek Watershed (Figure 1), which is impaired for biota due to lack of coldwater assemblage.

Miller Creek is a designated trout stream that is approximately 9.9-miles long with a watershed of over 6,000 acres that is within both the city of Duluth and the city of Hermantown. The draft Total Maximum Daily Load (TMDL) Study (draft TMDL) has identified heated stormwater runoff as a major contributor to the creek's thermal load, which negatively impacts the creek's native brook trout population. A brief overview of the draft TMDL Study can be found in Appendix A.

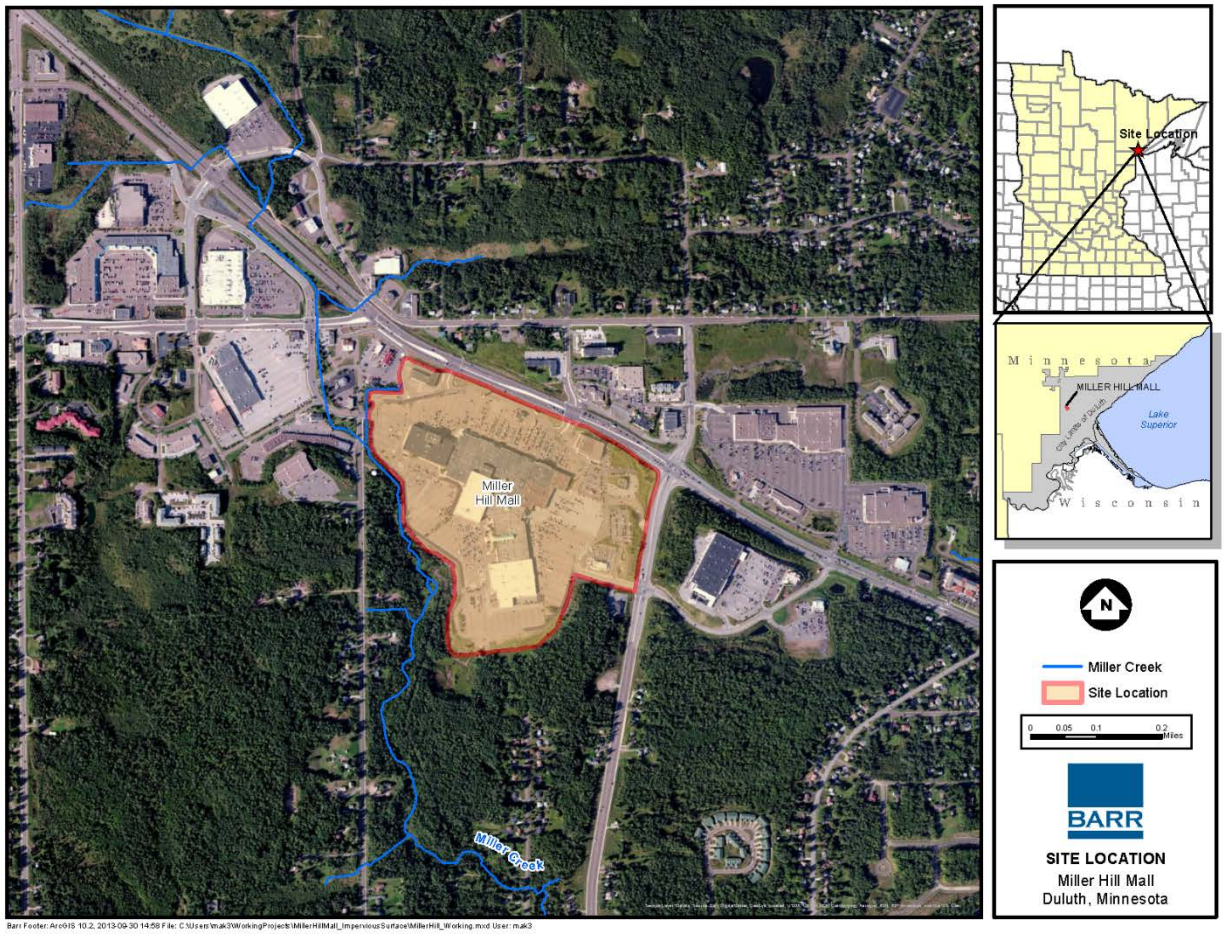

Figure 1 Miller Hill Mall located directly adjacent to Miller Creek, a designated trout stream

1.1 Plan Goal and Objectives

The goal of this Stormwater Management Plan (Plan) for Miller Hill Mall is to provide a detailed strategy for mitigating the impacts of thermally enriched stormwater runoff from the Mall's 50 acres of impervious parking lot that discharges into Miller Creek.

Of the five factors identified in the draft TMDL that lead to increased stream temperatures, this Plan aims to incorporate stormwater best management practices (BMPs) that will address three of these factors, including reduced impervious surfaces, increased baseflow / groundwater recharge, and increased shading. When referring to BMPs within this Plan, we are referring to green infrastructure features that manage stormwater.

This Plan objective includes identifying new stormwater BMPs (green infrastructure) for the site that are prioritized based on pollutant mitigation potential, costs, and Mall priorities. A sub-goal of this Plan, once the stormwater management practices are installed, is to serve as an example of effective temperature mitigation strategies for neighboring businesses and the thousands of people who visit the mall every week, all of whom can play a role in keeping Miller Creek cold enough to sustain its native brook trout population.

The long term goals of the implementation of this phased Plan include:

1. Retrofitting the Miller Mall Parking lot in a way that mitigates temperature and other non-point source pollutants.
2. Improving drainage on the Mall property to decrease future flooding and bypassing of the stormwater treatment structures.
3. Educating mall shoppers about the proximity of Miller Creek to the Mall and their role in preventing non-point source pollution.
4. Achieving quantifiable progress towards the Mall's Waste Load Allocation for the Miller Creek TMDL.

1.2 Site History

In order to construct Miller Hill Mall in 1972, bedrock was blasted and redistributed across the site in order to level a space for construction. Blastrock was pushed down western sideslopes, and the creek was moved further west. Appendix B-4 contains the results of a desktop geological study that estimates the extent and depth of the blastrock below the Mall's parking lot.

Figure 2 and Figure 3 show the land use changes around the Miller Hill Mall site between 1939 and 2013.

Figure 2 **1939 historic aerial image of the future Miller Hill Mall site overlaid with present day land parcel information**

Figure 3 **2013 aerial image of the Miller Hill Mall site**

The construction of Miller Hill Mall, along with other commercial developments throughout the area, changed the way that rainwater travels to Miller Creek. Impervious surfaces create flashier flows during storm events: higher peak flows, and lower base flows. These events result in higher loads of sediment and nutrients to the creek, as well as chlorides from road salts applied during the winter months. Also, asphalt parking lots heat up significantly during the summer months, transferring heat from the stormwater runoff as it flows across parking lots to Miller Creek. Figure 4 demonstrates how impervious surfaces change the way stormwater moves through a site.

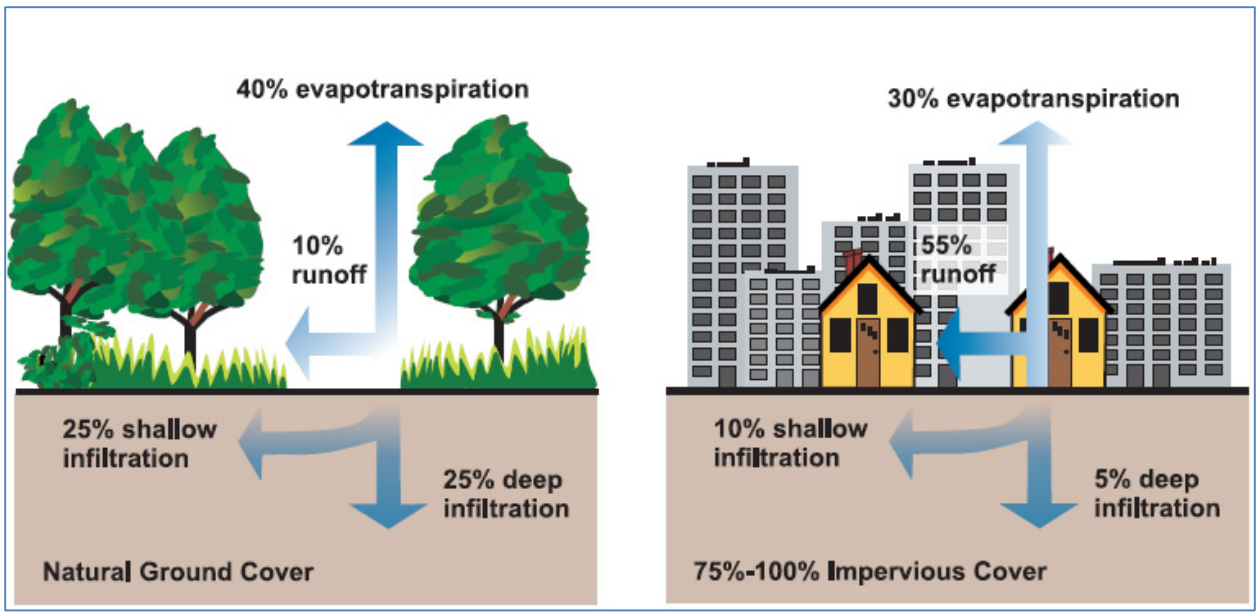

Figure 4 **Changes in surface runoff as the amount of impervious cover increases (image from the Federal Interagency Stream Restoration Working Group)**

The Mall's north and south sediment ponds were constructed in 1972 to accept runoff from 54% of the Mall's parking lot. In 2005, Miller Hill Mall incorporated several stormwater management features into its parking lot to comply with its NPDES permit (Appendix C). These features were primarily constructed to manage sediment and nutrient loads from the Mall parking lot before they reached the creek.

Today, there are three outfalls to Miller Creek from the Mall property:

- **West Outfall**—(which includes tributary drainage from Pond 3, Firestone, Ponds 1 and 2, the North Sediment Pond and some off-site properties, including a portion of Miller Trunk Highway)
- **Pond 4 Outfall**—(which includes a portion of the Mall's roof on its western side and a portion of the Mall's western parking lot)
- **South Sediment Pond Outfall**—(which includes the remaining portion of the Mall roof and the southern parking lot)

The location of these outfalls and their tributary areas are shown in the Concept Plan Figure 1, Figure 2, and Figure 3, as well as in Figure, below. In this figure, note that the West Outfall location is just southwest of Pond 3, where the Mall's small tributary channel meets the main run of Miller Creek.

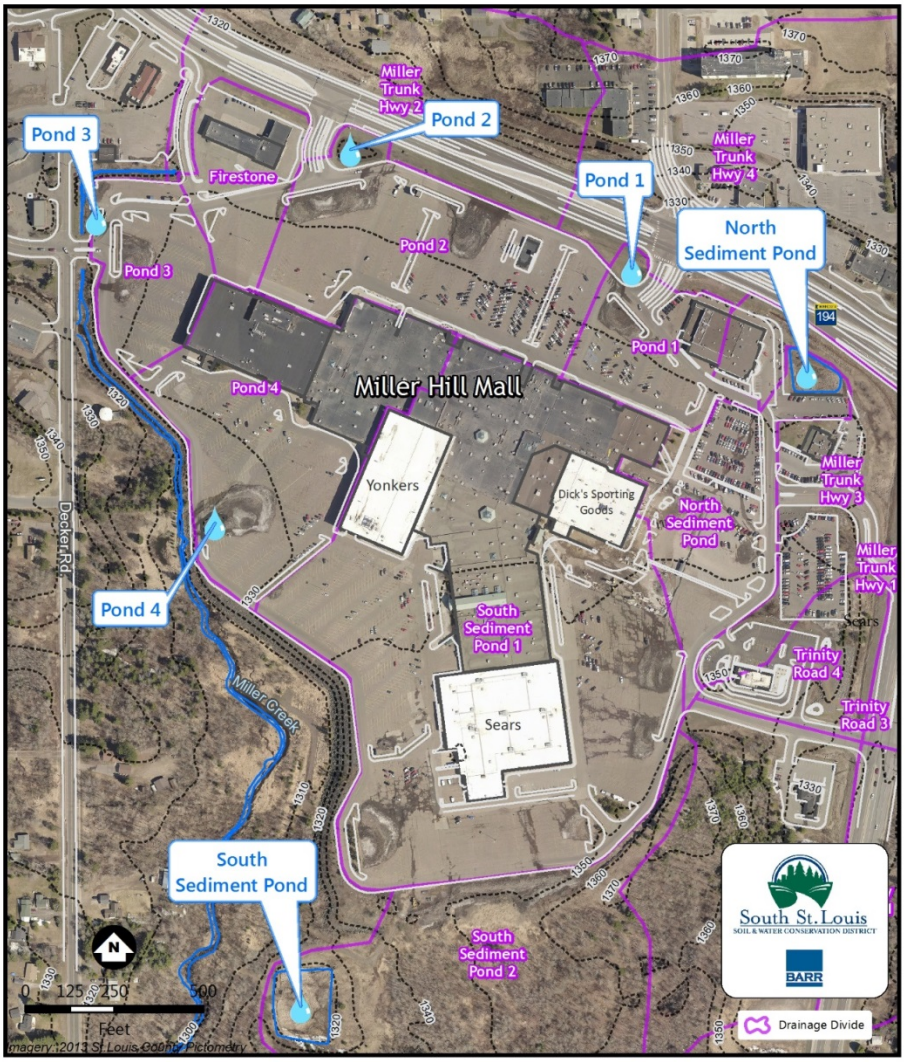

Figure 5 Existing stormwater features and their associated drainage areas at Miller Hill Mall

1.3 Green Infrastructure

Green infrastructure uses vegetation, soils, and other natural processes to manage stormwater near its source. When green infrastructure is interwoven throughout a watershed, these systems can manage stormwater in a way that mimics the natural environment by storing and/or infiltrating water. By integrating green infrastructure into the urban landscape, these systems can provide greater environmental benefits including flood protection, water quality improvements, air quality improvements, and habitat. Examples of green infrastructure include:

- **Rain gardens**—small detention and infiltration areas with amended soils that are often planted with native vegetation (or native cultivars) that are well suited for retrofits or existing development sites. These BMPs can also be built as filters in areas with poor soils. Larger rain gardens are sometimes referred to as "Bioretention Basins."

Photo Credits—rain gardens: Barr Engineering Co.

- **Tree trenches** – angular, load-bearing rock is used with a specified soil mix washed into the rock after compaction that allows the rock to support traffic and the soil (in the void spaces between the rocks) to support water uptake through tree roots. These systems both provide a quality growing medium for trees while also providing stormwater management benefits.

Photo Credits—tree trenches: Barr Engineering Co.

- **Bio-Swales** (including wet, dry, and filter strips) – grass or vegetated channels or strips that resemble a wide, gently sloping shallow trench that are commonly used in transportation, agricultural, and residential developments to reduce peak discharges.

- **Constructed wetlands** – constructed to mimic the stormwater benefits of natural wetland systems, though they are designed specifically for stormwater capture and filtration and do not typically have the full ecological services provided by natural wetlands

- **Green roofs** – vegetated rooftops that range in size and plantings and reduce stormwater runoff primarily through evapotranspiration

Photo credit: Green roofs: http://www.greenroofs.com "Target Center Arena, Minneapolis, MN"

- **Blue roofs** – non-vegetated rooftop structures that detain stormwater, and designed to more closely mimic natural hydrology of stormwater runoff by temporarily storing water on rooftops

Photo Credit—Blue roofs: www.nyc.gov "Types of Green Infrastructure"

- **Permeable pavers** – interlocking pavers with crushed aggregate that fills the spacing between each paver to allow water to infiltrate through the paver system

Photo Credit—permeable pavers: Barr Engineering Co.

2.0 Modeling

2.1 Hydrologic Modeling—XP-SWMM

Information from the topographic survey was used to develop an XP-SWMM (hydrologic and hydraulic) model for the Miller Hill Mall site that could evaluate how rainfall runs across the site and through the site's various existing stormwater features. Flow monitoring data collected by the South St. Louis Soil and Water Conservation District was used to calibrate the model. Calibrated stormwater flows were input into the MINUHET temperature model for the site described in Section 2.2

Figure 6 shows the results of the calibration for the "West Outfall" location at the site for a July 29, 2014 storm event.

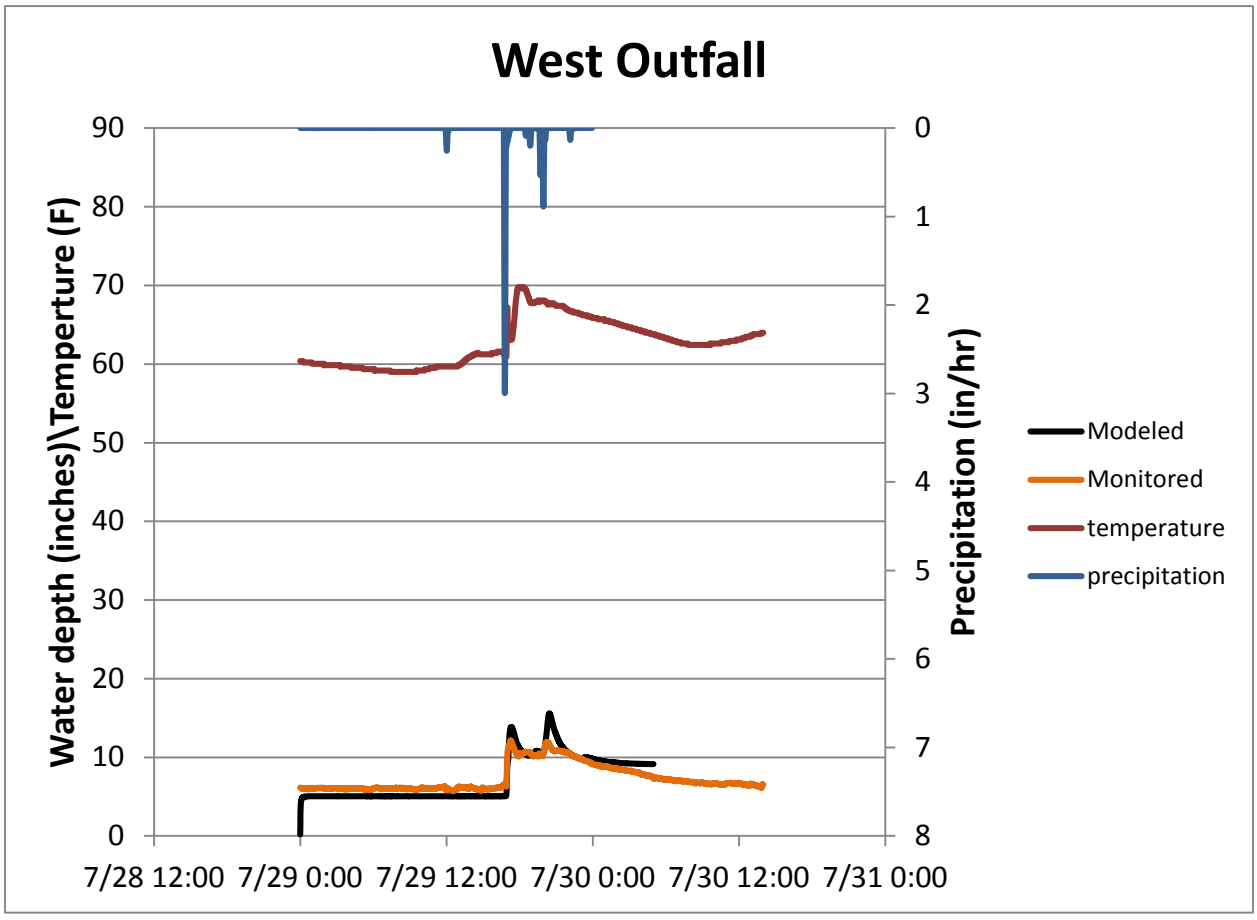

Figure 6 **XP-SWMM model calibration for the west outfall (near Pond 3) comparing "Modeled" and "Monitored" flows for a rain event on July 29, 2014**

2.2 Temperature Modeling – MINUHET

The thermal impacts of urbanized landscapes on downstream waterways are a function of the flow rate and the temperature of the surface runoff. The flow rate increases as the amount of impervious surface within the watershed increases (Figure 4); whereas the runoff temperature is a function of both the thermal characteristics of land surfaces and the temperature of the rainfall.

In order to understand and then reduce the thermal effects of the thermally enriched stormwater runoff on Miller Creek, the MINnesota Urban Heat Export Tool (MINUHET) simulation model was used to calculate the "heat export" for various storm events at the Miller Hill Mall site. MINUHET is a deterministic model that simulates both the flow and temperature of surface runoff from various land covers. This model simulates heat transfer processes in upland areas (e.g., watersheds) and through ponds, pipes, channels, and several other common BMPs.

Stormwater runoff from the Mall has three major outfalls to Miller Creek:

1. West Outfall
2. South Sediment Pond Outfall
3. Pond 4 Outfall

Therefore, to evaluate the runoff from the Mall using MINUHET, the site was divided into the areas tributary to each outfall. Figure 7, Figure 8 and Figure 9 show the model networks for the West Outfall, the South Sediment Pond Outfall, and the Pond 4 Outfall, respectively.

To model the heat export in MINUHET, three synthetic storms were used:

- Storm 1 1.1 inches over 1 hour (approx. a 2-year event)
- Storm 2 3 inches over 1 hour (approx. a 200-year event)
- Storm 3 2.8 inches over 24 hours (approx. a 5-year event)

These storms were chosen because they represent scenarios that tend to result in the highest thermal load from urban stormwater runoff in the hottest part of the summer.

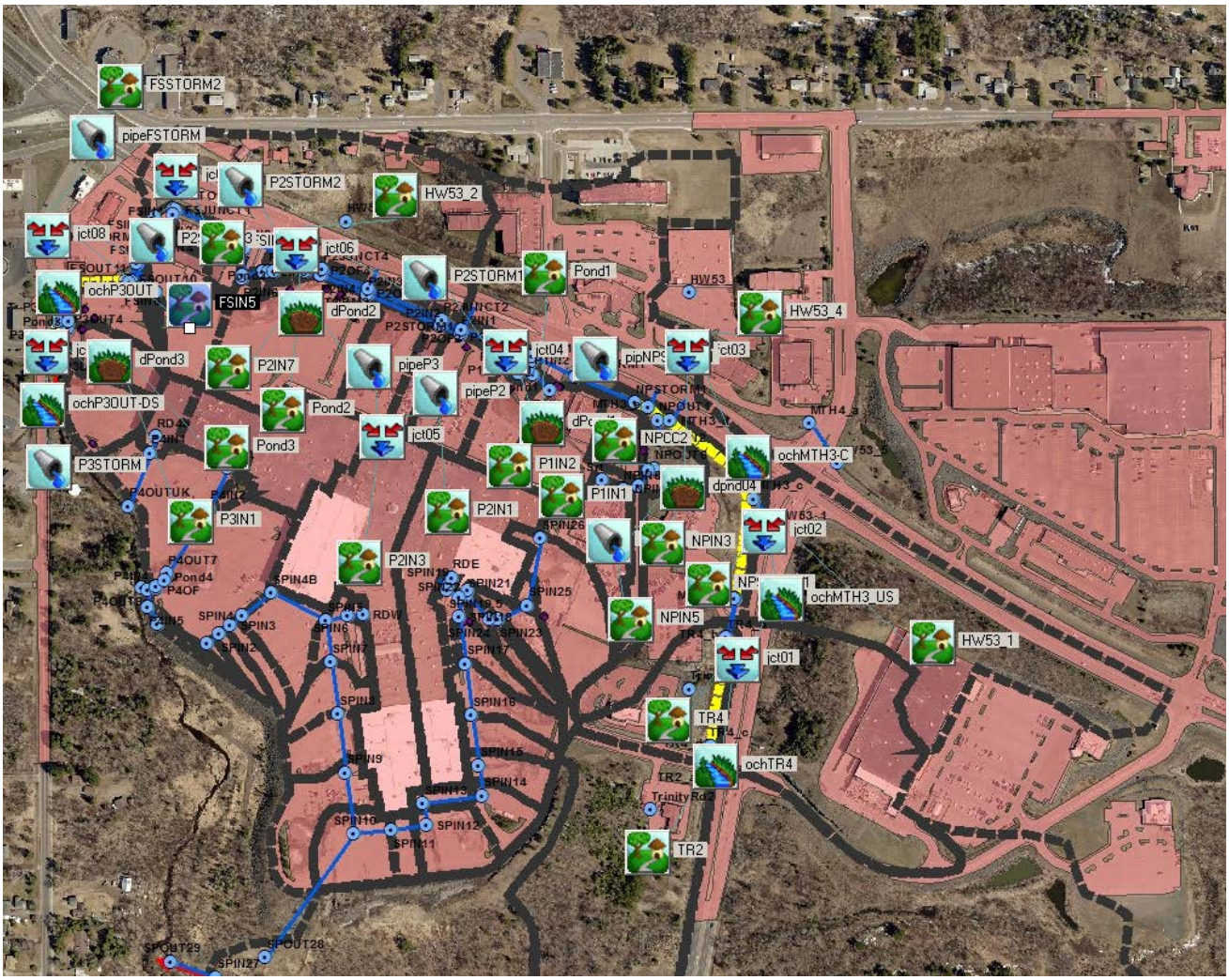

Figure 7 **Screen shot of the MINUHET model for the West Outfall tributary area of the Miller Hill Mall site**

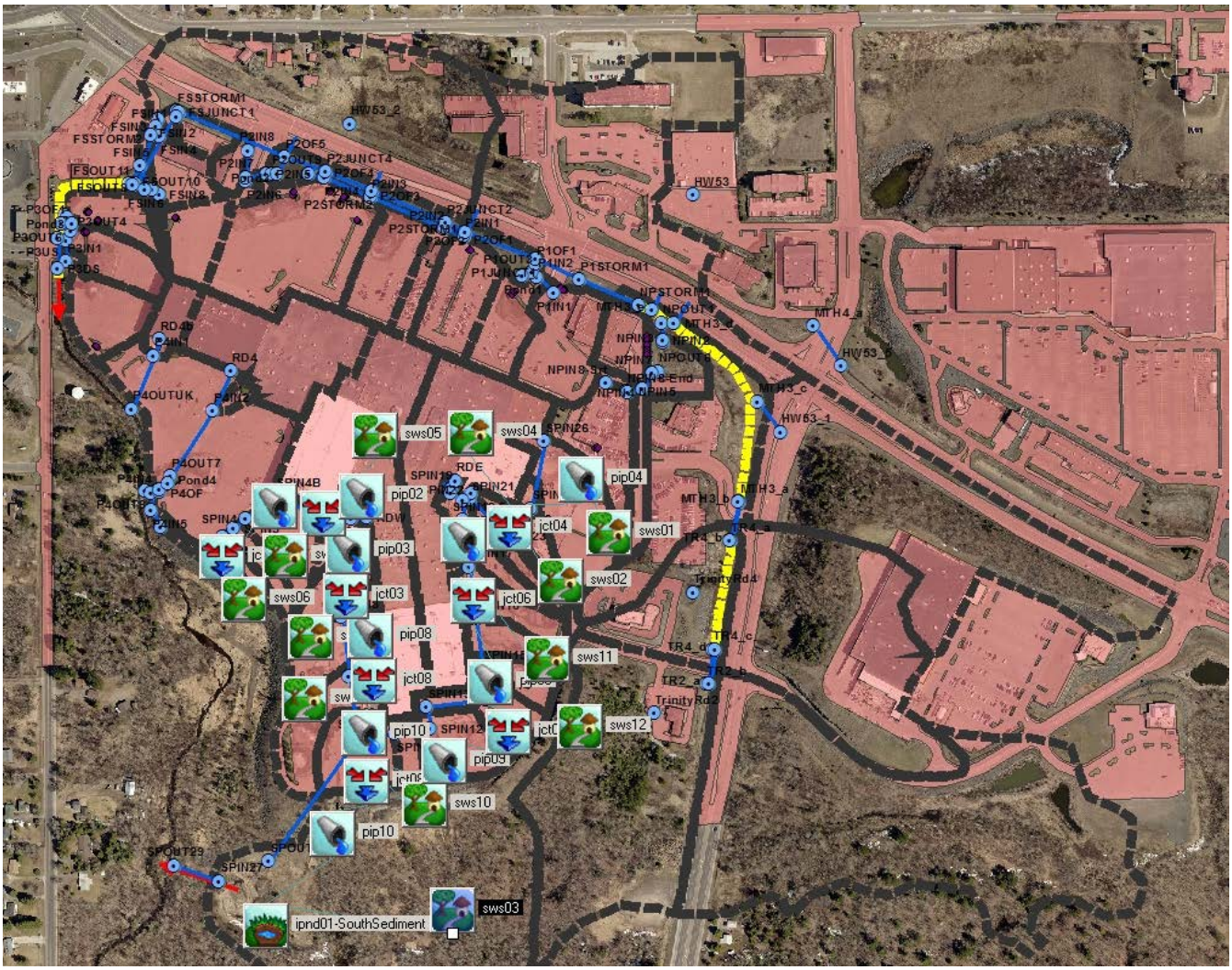

Figure 8 **Screen shot of the MINUHET model for the South Sediment Pond Outfall tributary area of the Miller Hill Mall site**

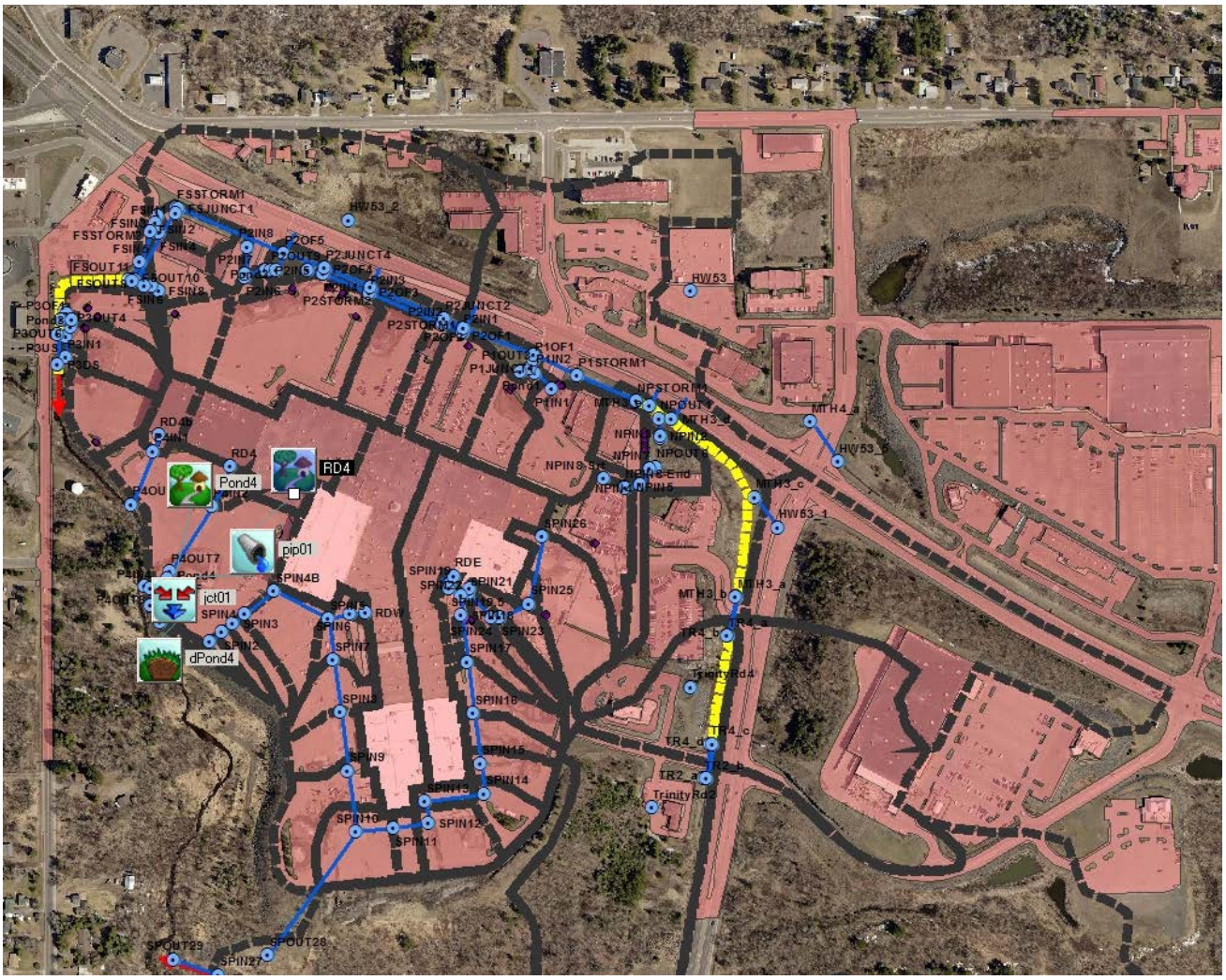

Figure 9 **Screen shot of the MINUHET model for the Pond 4 Outfall tributary area of the Miller Hill Mall site**

After the MINUHET models for these areas were calibrated using output from XP-SWMM and the temperature monitoring data, the existing thermal loads from each outfall area were then calculated for each of the three synthetic storms. Temperature monitoring was conducted in the same locations as the flow monitoring, for use in calibrating the MINUHET model. Details on temperature monitoring activities can be found in Appendix B-2.

The results are shown in Figure 10.

Figure 10 shows that:

- The West Outfall area is the largest thermal source area at the Mall (except for the Storm 1 scenario, in which it is essentially tied for first place, although the amount of heat export for this scenario is significantly lower than the other two scenarios). This thermal load comes from both

the Mall property and offsite areas. 60% of the runoff that reaches the west outfall is from the Mall property.

- The South Sediment Pond area is generally the second highest thermal load from the Mall. In general, stormwater ponds tend to warm water before they outflow, but in this case, there are a few cooling factors that tend to offset this effect in the South Sediment Pond. The pipes that deliver runoff to the South Pond are helping to cool runoff. They are deep in the ground, putting stormwater in touch with cool pipe materials before reaching the creek, which mitigates the higher temperatures that the asphalt transfers to the runoff at the surface of the parking lot. Also, much of the Mall roof drains to the South Sediment Pond. Runoff from the roof is cooler than runoff than runoff from the pavement, as roofing materials hold less heat (and therefore, have less heat to transfer) than asphalt.

- Compared to the West Outfall and South Sediment Pond Outfall areas, the area tributary to Pond 4 is much smaller and also includes a section of the Mall roof, putting its thermal load significantly lower than the other areas.

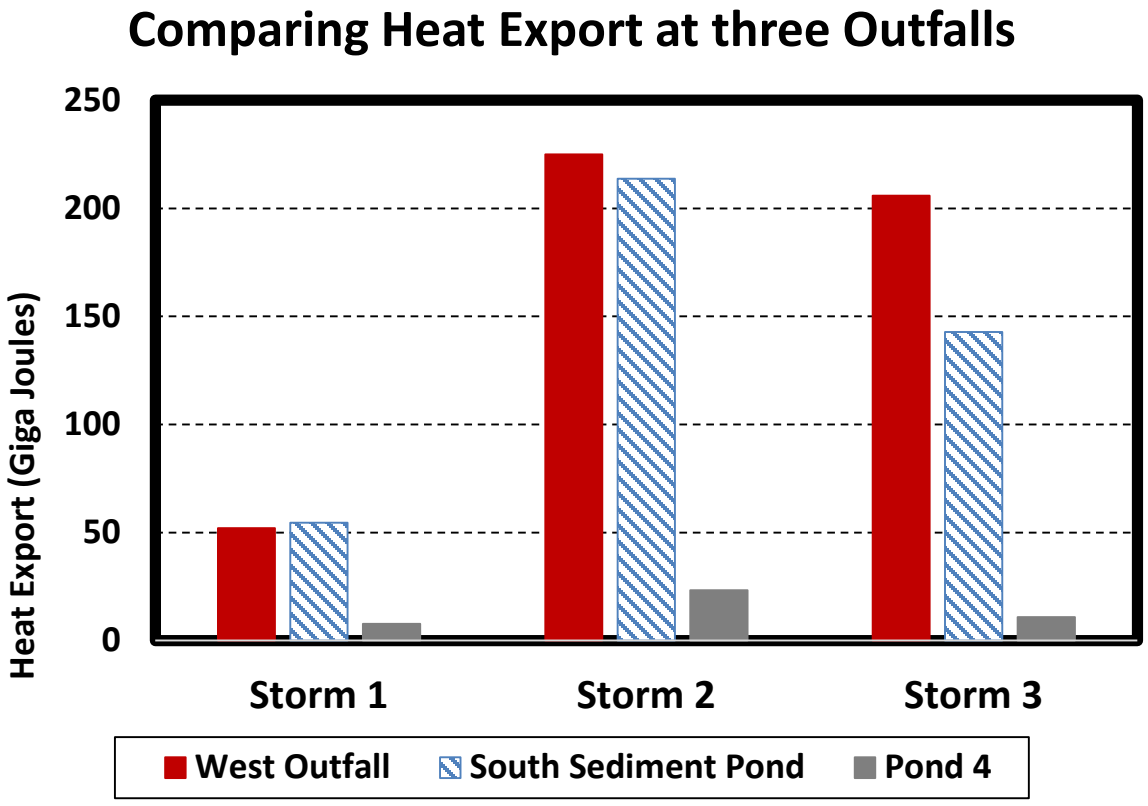

Figure 10 **MINUHET Modeling Output: Comparison of thermal loads from the West Outfall, South Sediment Pond Outfall and Pond 4 Outfall tributary areas across three synthetic storms**

This information, in combination with consideration of site constraints, was important to help guide where efforts in retrofitting green infrastructure BMPs across the Miller Hill Mall site should be focused. Using the calibrated model, and knowing site constraints, different infiltration scenarios could be run and compared to develop recommendations on the most impactful changes to the site.

Figure 11 shows the MINUHET model results from a series of model runs where a range of stormwater runoff depths from the West Outfall tributary area is infiltrated via rain gardens or tree trenches in the north parking lot. After a quarter of an inch of interception, there are diminishing returns on the percent reduction in heat transport from the West Outfall tributary area.

However, 1 inch of runoff was chosen to be the ideal infiltration target when considering pollutants such as sediment and phosphorus. It is typical to design green infrastructure BMPs to capture 1 inch of runoff from tributary areas, given that this depth represents the 90th percentile storm event. This means that if 1 inch of runoff is captured in a rain garden, tree trench, or other feature, then 90% of annual storm events have been captured by the feature. Also, the first inch of runoff is the most polluted part of the runoff event, so intercepting this "first flush" is an important goal. Lastly, maximizing the amount of infiltration in the north (and perhaps west) parking lots is important because, ultimately, options are limited in the South Sediment Pond tributary area due to the presence of shallow bedrock throughout the southern portion of the Mall parking lot. Given that the overall thermal wasteload reduction called for by the draft Miller Creek TMDL is 3%, an 8% reduction in the West Outfall tributary area offsets the limited capacity for thermal reduction via infiltration elsewhere on the site.

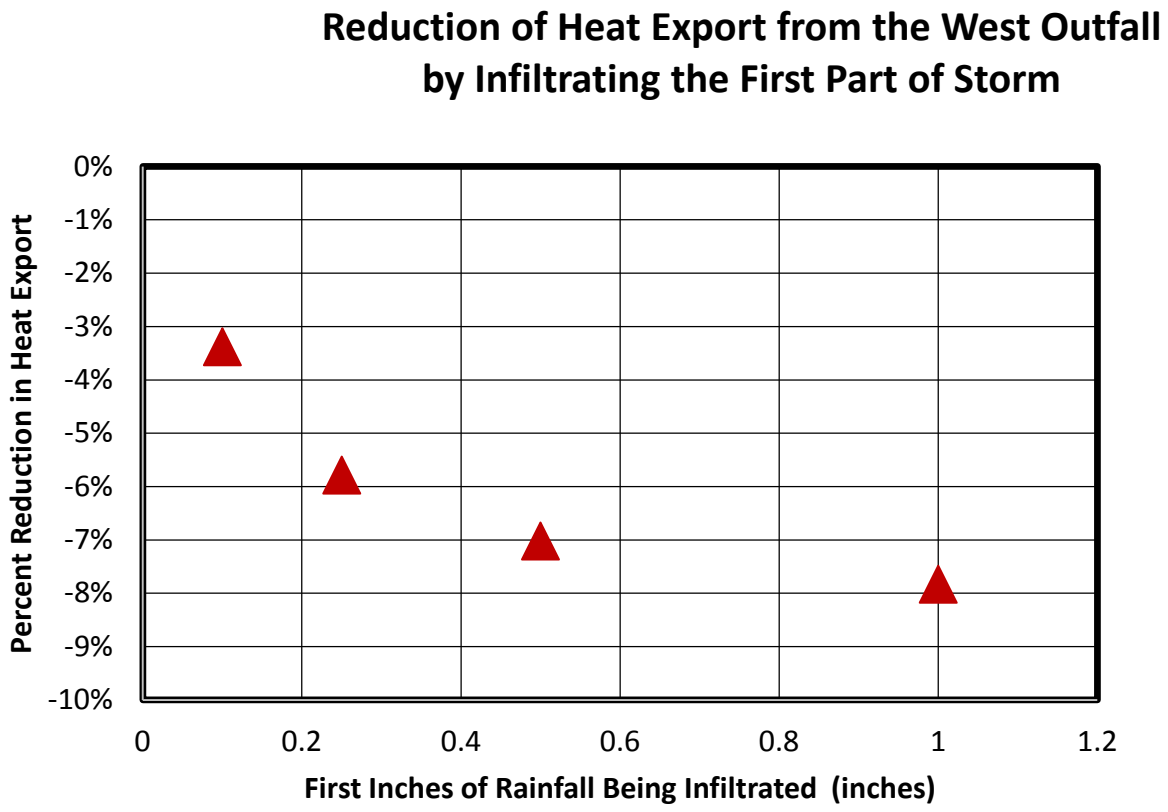

Figure 11 **Impact of infiltration in the West Outfall tributary area on percent reduction of heat transport**

3.0 Planning Meetings and Workshops

Numerous interested individuals and organizations have been involved with the development of this stormwater management plan. Specifically, the South St. Louis SWCD and the Miller Hill Mall/Simon Property Group staff have had a series of meetings throughout the development of this Plan with the Barr Engineering design team and other interested entities to better understand broader community needs and goals. The following meetings and attendees (organizations listed in parentheses) have occurred since the start of this project in April 2014:

- April 28, 2014 – project kickoff (Mall, SWCD, Barr)
- June 25, 2014 – survey and temperature monitoring (SWCD, Barr)
- August 13, 2014 – project check-in (Mall, SWCD, Barr)
- February 5, 2015 – status update (Mall, SWCD, Barr)
- May 7, 2015 – project update and design workshop planning (Mall, SWCD, Barr)
- June 3-4, 2015 – design workshop (Mall, SWCD, Barr, and 7 other organizations)
- September 9, 2015 – project funding opportunities (SWCD, Barr, City of Duluth)
- September 28, 2015 – educational and art features (Mall, SWCD, Barr)
- October 9, 2015 – project funding opportunities (Barr, City of Duluth)
- October 13-14 – Minnesota Water Resources Conference poster presentation (Mall, SWCD, Barr)
- November 3, 2015 – green infrastructure features in right-of-way (Barr, MnDOT)
- December 15, 2015 – draft green infrastructure design review (Barr, City of Duluth)
- February 24, 2016 – review of draft Miller Hill Mall Concept Plan (Mall, SWCD, Barr)

3.1 Design Workshop

The primary objective of the two-day design workshop (held on June 3 and 4, 2015) was to provide a project overview to a broader group of stakeholders (including a site walk as shown in Figure 12), discuss the combination of preferred stormwater features, and brainstorm ideas for inclusion of educational elements within design, signage, and other opportunities for public art (Figure 13).

Figure 12 **Day 1 of design workshop – site walk to allow participants to view the existing stormwater BMPs at the Miller Hill Mall**

Figure 13 **Day 2 of design workshop – brainstorming activities with participants in small groups**

A summary of the workshop, including a specific list of attendees and an overview of the various brainstorming activities, can be found in Appendix D. A "Dot-mocracy" exercise was used to allow participants to first brainstorm the goals for the stormwater management plan and then vote (using dots) on their priority project goals. Based on the Dot-mocracy results (Appendix D), the following are the top stormwater management plan features that were identified:

1. Aesthetics
2. Education
3. Runoff reduction (temperature)
4. Connection to Miller Creek
5. Public art

Another brainstorming technique called "brainsprinting" was used to generate concise ideas about what they would like visitors to learn or experience when they come to the Miller Hill Mall. The words generated during this activity were captured in a word cloud shown in Figure 14.

Figure 14 **A word cloud generator illustrates the words most frequently mentioned during the design workshop**

The final brainstorming activity provided participants with an opportunity to discuss and record their favorite ideas for the Mall site in small groups. Blank site plans where provided for each group, which marked them up with various features related to green infrastructure/stormwater management, education, art, transportation, community access, and other topics of interest to participants (Figure 15). Each group then took turns presenting their marked up site plans to the entire group.

Figure 15 **Example marked up site plan from the design workshop of one group's ideas of the various features (e.g., green infrastructure, education, art, transportation infrastructure, community access, etc.) that could be evaluated in the Stormwater Management Plan for the Miller Hill Mall**

4.0 Public Education and Art

Participants at the design workshop provided a variety of input and unique ideas for the stormwater management plan at the Miller Hill Mall. This information was combined and distilled into the following areas that are described in further detail below—approaches to public education, thematic elements to include in the final design, educational and art features inside the mall and at mall entrances, and stormwater features, or other engaging elements displayed in the Mall parking lot.

4.1 Preferred Approaches to Public Education

There were a number of desired outcomes expressed by the design workshop participants that were categorized into the following five broad topics, which are listed below.

1. **Branding** – establishing a sense of identity for the project at the Mall and beyond that ties the retrofitted site into the broader community and the natural environment.

2a. **Interpretive signage** – telling the story of the project and explaining what people are seeing (or what they cannot see) with any elements that are incorporated into the Mall site and beyond.

2b. **Emotive/artistic interpretation** – incorporating emotional, metaphorical, or inspirational features that make water and its movement across the landscape visible and interesting.

3. **Data** – utilizing infographics, real time displays or other information that can be powerful when linked to art features.

4. **Public Relations** – communicating in advance of any construction to build anticipation that something good and exciting is coming to the Mall site (rather than warning visitors of an upcoming hassle).

Figure 16 shows examples of education and art features.

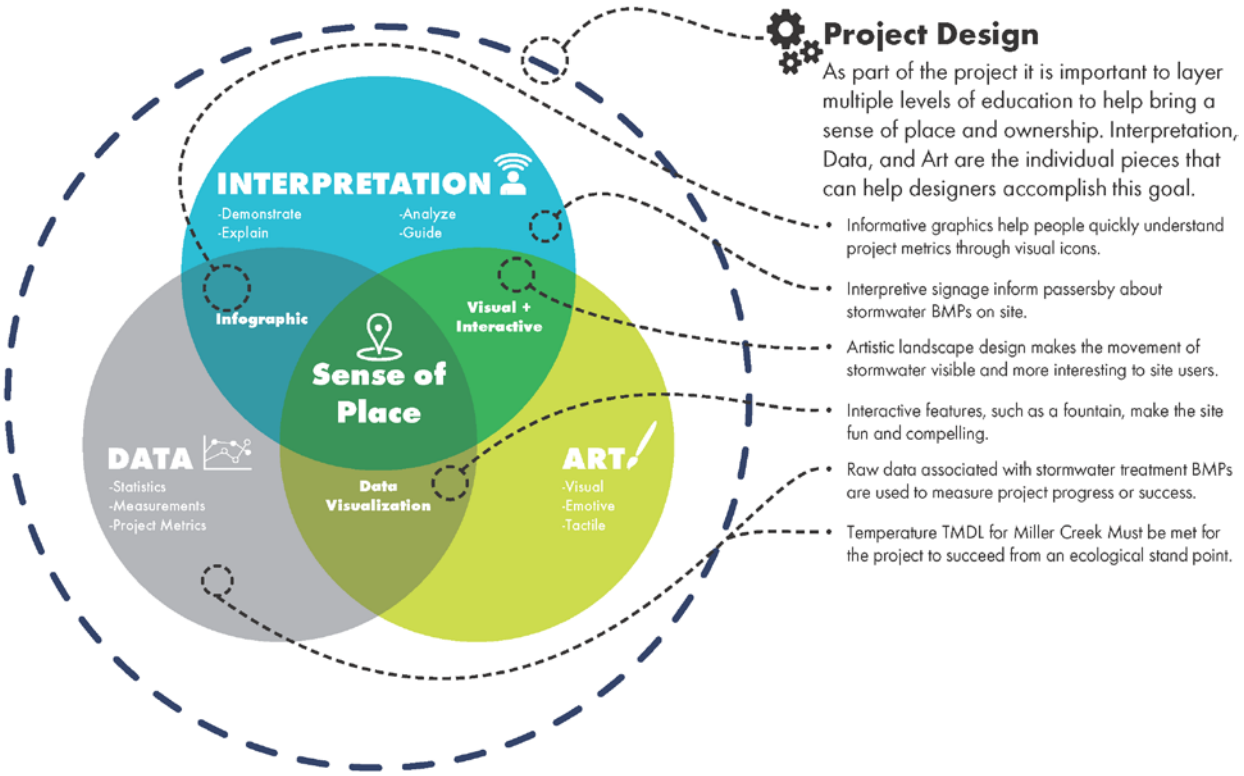

Figure 16 **Examples of education and art features that could be incorporated as part of retrofitting the Miller Hill Mall site to address water quality concerns**

4.2 Thematic Elements

Several general themes emerged from the design workshop and include the following:

- Representation of the Miller Creek *ecosystem*, which incorporates more than just the native brook trout.
- Creation of a "North Woods" atmosphere that ties the Mall with Duluth and the local environment.
- Representation of the "City in Nature" that highlights how the Mall can be a good neighbor to both the city of Duluth and the natural environments.
- Description of the "Neighborhood" in terms of who lives within the watershed that the Mall is located within (e.g., people, plants, animals, etc.).
- Incorporation of native vegetation, such as evergreen, spruce, birch, sedges, native spirea, and blueberries.

4.3 Locating Design Elements Inside and at Mall Entrances

The Mall provides a unique opportunity to reach a broad array of visitors, many of whom may not typically seek out activities that are outdoor or nature-based. Therefore, capturing visitors' attention at the entrances and inside of the Mall were identified as valuable opportunities to reach a diverse audience for stormwater educational elements. Within the Mall, there was interest in features such as fountains or play-spaces that could utilize real time displays or signage to engage and educate visitors.

Below are some examples of potential design elements that could be incorporated at the entrances:

- Themed entrances highlighting a distinctive and local animal or native plant.
- Distinctive materials or designs, such as using sandblasted concrete with a distinctive symbol or pattern.
- Artwork such as murals (tile, painted, or other).
- Locally relevant materials such as native stone (as bollards), timber, or blastrock incorporated into the design.
- Cairns or other signposts that could indicate direction or mileage to other North Shore landmarks (such as Gooseberry Falls, Lake Superior, Gunflint Trail, Superior Hiking Trail).
- Plantings with native local plants and trees.
- Cistern with interactive elements.

4.4 Parking Lot Features

Design workshop participants expressed interest in a variety of features that could be incorporated to improve the Mall's existing parking lot. These features include:

- *Green infrastructure* – rain gardens and tree trenches.
- *Improving vault ponds (Ponds 3 and 4)* – aesthetic/artful improvements and/or as pretreatment for other project BMPs.
- *Wayfinding* – tie parking lot navigation into a theme that could include local animals or biomes
- *Recreation/transportation* – incorporate a walking trail either around the parking lot, around the building, and/or in surrounding wooded areas that connect with nearby neighborhoods.
- *Events* – potential to locate community events, such as a farmer's market, in the southern parking lot.

5.0 Phased Implementation Plan

5.1 BMP Recommendations

After synthesizing all of the data collection, modeling results, feedback at meetings and the design workshop, and consideration of existing site issues and constraints, the following themes emerged as design guidance (shown on the Concept Master Plan sheets (1-6) of the Executive Summary). Proposed cross sections for the green infrastructure features recommended throughout the site are also included on the Concept Master Plan's sheet 6. A concept level cost estimate and phasing is also included on sheet 6 (shown under item #7).

West Outfall Tributary Area:

The main recommendation of this Miller Hill Mall Stormwater Management Plan is to focus on the areas tributary to the West Outfall for the most significant reduction of stormwater temperature, by:

- Converting existing green space and painted islands to rain gardens (where appropriate).
- Expanding existing green space to capture more water in rain gardens (Pond 1).
- Improve existing features (replanting Ponds 1 and 2).
- Implementing tree trenches upstream of Ponds 1 and 2.
- Planting trees in existing islands.
- Adding a rain garden adjacent to Pond 3 so that an inch of runoff from the tributary area is intercepted between the new rain garden and the existing Pond 3.
- Reduction of underutilized impervious surfaces near Pond 3.

The Concept Master Plan shows retrofit BMPs that would capture the first inch of runoff from the entire West Outfall tributary area (Mall property only), resulting in an 8% reduction of thermal load from the West Outfall to Miller Creek.

Optional Improvement to Pond 4 Area

Changes could be made to Pond 4 that would increase stormwater treatment capacity and temperature reduction through the addition of a rain garden around the existing Pond 4. The Concept Master Plan's sheet 3 indicates an option that would capture approximately 0.7 inch of stormwater runoff from Pond 4's tributary parking lot (the parking space loss required to capture a full inch was considered prohibitive).

Although this option would require the conversion of 46 parking spaces to rain garden, this change provides the following improvements to the Mall parking lot:

- The inlet to the existing Pond 4 would move to its upstream side, preventing runoff from passing over the ring road before entering the pond on the downstream side, as it does now, creating icy conditions during winter months.
- While this area contributes the smallest thermal load of the three outfall areas due to its size, these improvements would reduce the thermal load from the Pond 4 tributary parking lot area by 8%.
- This is the only location in the Mall's parking lot where the creek itself is actually visible. As such, placing an aesthetically pleasing green infrastructure feature in this area could be a significant opportunity for public education as well as a draw to a side of the Mall that currently gets less attention from patrons.

South Sediment Pond Tributary Area

Limited changes are recommended for the South Pond's tributary area, given the fact that implementation of BMPs is constrained by areas of shallow bedrock throughout this part of the Mall's parking lot. However, some impervious surface reduction and rerouting of the ring road is recommended for the southwest corner of the parking lot in order to calm traffic and to reduce the amount of stormwater runoff from the southern end of the Mall's parking lot. Other project goals can be pursued here (examples include a farmers' market/dog park or restoration area). Also, the creation of an educational and interactive "Stormwater Plaza" at the Mall's food court entrance is seen as a significant opportunity.

5.2 Educational and Interpretive Features

Opportunities for educational and interpretive features at the Mall are shown in the Concept Master Plan's sheet 5.

5.3 Concept Level Cost Estimates per Phase

The cost estimates shown for the various features involved in each phase (shown in the Concept Master Plan's sheet 7) should be considered *concept level cost estimates*, and are subject to change based on final design. Also, phasing is presented here as one option moving forward. Phasing can be changed as funding opportunities arise, using any combination of the features shown in the table. Mill and overlay paving costs are included for the areas tributary to the tree trenches and most of the rain gardens for the following reasons:

- The pavement in these areas is in poor condition
- Repaving at the same time as BMP construction lengthens the lifespan of the BMPs by lessening the particulate load on the features.

- Repaving after or before construction of the BMPs damages the threshold between the pavement and the BMP. Disturbing/reconstructing the area all at once allows pavement and BMP materials to age on the same timeline.

5.4 Special Considerations for Next Steps: Site-Specific Soils Investigation

In October, 2015, as a part of this Miller Hill Mall Stormwater Management Plan, a test pit excavation was completed within the north side of the parking lot to visually inspect the substrate material below the pavement to a depth of 4 feet (Figure 17). The test pit was completed in collaboration with the Mall's mill and overlay paving project, which ensured that the pavement was removed prior to excavating the test pit. The results from a sieve analysis confirmed the soil classification of gravelly sand with silt.

Figure 17 Test pit excavation within the north side of the Mall parking lot

The fact that significant portions of the Mall's parking lot are sitting atop blastrock offers a potentially unique opportunity that could benefit Miller Creek. If retrofit BMPs are design to intercept stormwater from the parking lot and infiltrate the water into the subgrade, the stormwater will be either removed (through plant uptake or infiltration) or cooled. Even if the stormwater does not truly infiltrate, but is only filtered through the blastrock, by allowing stormwater to pass through the blastrock before it reaches the creek, the temperature of the stormwater could be significantly cooled.

The test pit revealed more or less what was expected—the upper layer was a mix of sands, silts and larger aggregates (soil type) with larger, irregularly-sized blastrock in the lower layers (photo see Figure 17). It is expected that at lower depths, the subgrade is largely only irregularly sized blastrock. However, if this is

not the case, and stormwater is directed through blastrock mixed with finer particles, this presents a risk of destabilizing the pavement at the surface as finer particles are washed out of the neighboring subgrade by the stormwater. To avoid this risk, it will be important to take soil borings at each of the proposed new BMP locations so that the ultimate BMP cross sections ensure that stormwater will pass directly into the clear blastrock layers of the parking lot (or are directed into an underdrain that carries the water away), to prevent laterally destabilizing the pavement at the surface in nearby areas. Soil borings in areas specifically slated for reconstruction should be the first step in the next phase of the project.

6.0 References

American Rivers. 2004. Catching the Rain: A Great Lakes Resource Guide for Natural Stormwater Management.

South St. Louis Soil and Water Conservation District. 2011. Total Maximum Daily Load Study – Miller Creek (draft).

Minnesota Pollution Control Agency. Stormwater Management – Low Impact Development and Green Infrastructure. https://www.pca.state.mn.us/water/stormwater-management-low-impact-development-and-green-infrastructure

Appendix A

Total Maximum Daily Load (TMDL) Study Overview

Total Maximum Daily Load (TMDL) Study Overview

Miller Creek was placed on Minnesota's 303(d) Impaired Waters List in 2002 due to temperature (and thus biota) impairments. A TMDL Study was completed between 2006 and 2011 by the South St. Louis Soil & Water Conservation District (SWCD) for the Minnesota Pollution Control Agency. The TMDL water quality standard was set at 19° C (66° F) for the maximum weekly average temperature for brook trout growth (representing chronic exposure) and 24° C (75° F) for the daily maximum temperature for survival of short term exposure (representing acute exposure).

For the study, Miller Creek was divided into upper and lower sections (Figure A-1). TMDLs were assigned to each section and five flow regimes were evaluated: high, moist, mid, dry, and low. It was determined that mitigation efforts should focus on the "low" and "dry" flow regimes, which correlated with the most observed temperature exceedances.

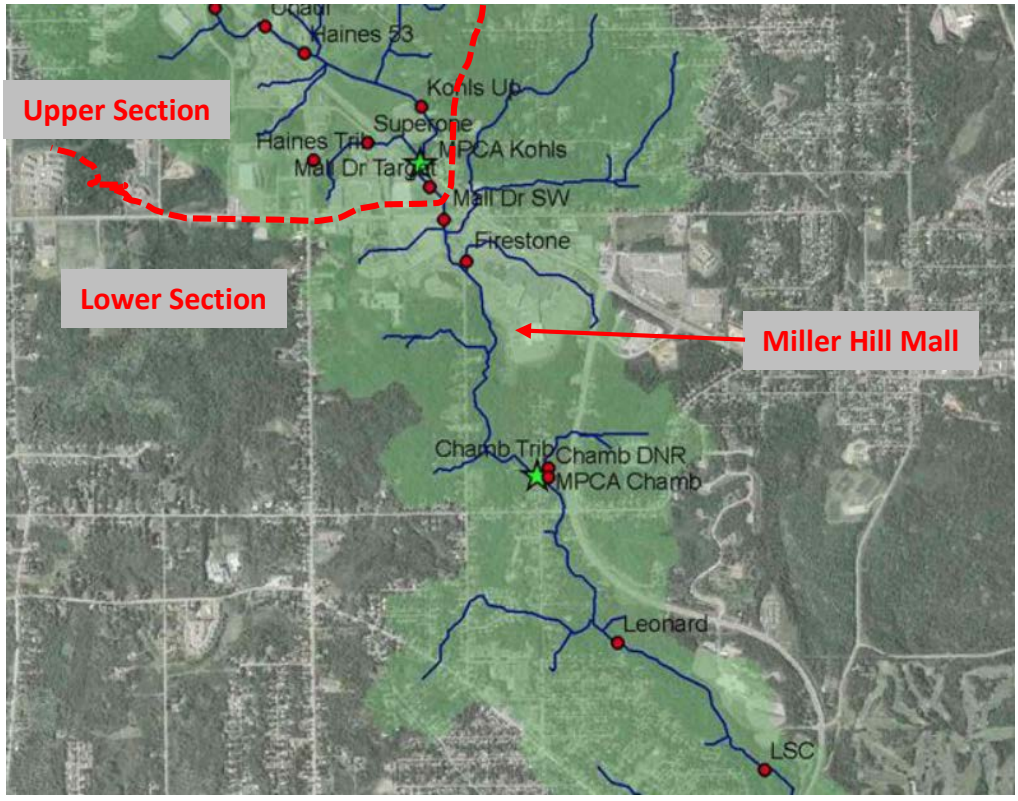

Figure A-1 Miller Creek TMDL Study temperature monitoring locations near Miller Hill Mall

Between the Duluth International Airport and the Miller Hill Mall, several reaches of Miller Creek have been heavily impacted by commercial development and stream channel modifications (approximately 22% of the land cover within the Miller Creek watershed is impervious surfaces). Near the Mall area, the stream has been ditched and runs between roads and parking lots. There are also several bridge crossings, culverts, and stormwater outfalls that impact Miller Creek by narrowing the riparian corridor and providing little canopy cover for the stream (Figure A-2).

Figure A-2 Exposed blastrock on the south side of the Mall's parking lot directly adjacent to Miller Creek (located on the right in the photo)

With a temperature TMDL, the pollutant of concern is heat and the Miller Creek TMDL study focused on quantifying heat exports. There are a number of anthropogenic pollutant sources that were identified, including stormwater runoff from impervious areas, stream channelization and ditching, wetland filling and modification, and removal of riparian areas. Natural pollutant sources include atmospheric heating, particularly in reaches with little or no canopy.

Trout cannot tolerate temperatures much greater than 24° C, so water temperature is essential to their survival. Miller Creek, similar to other streams located along the north shore of Lake Superior, have very little groundwater input, which makes them more susceptible to warm runoff from impervious surfaces or from direct solar radiation. The results of the TMDL study showed that the temperature of Miller Creek is directly influenced by atmospheric heat transfer during dry weather periods, by stormwater runoff during larger wet weather, and by both mechanisms during small rainfall events. The Mall, along with eight other entities within the Miller Creek watershed, was assigned a Waste Load Allocation (WLA) as part of the effort to address the creek's temperature problem.

Appendix B

Data Collection

B-1 Information from Miller Hill Mall

B-2 Temperature Modeling

B-3 Topographic Survey

B-4 Desktop Studies – Geological and Flow Path Evaluations

B-5 Water Quality

B-6 Test Pit Excavation Sieve Size Analysis

B-1 information from Miller Hill Mall

Throughout the development of the Stormwater Management Plan, the Miller Hill Mall staff have been very supportive and enthusiastic partners. For the successful design and implementation of green infrastructure retrofit project, it is critical to have such a collaborative property owner and project partner. The Mall has made all of their relevant documents available to the project team, which included the following type of information:

- plans for the existing stormwater ponds and sand filters
- soil borings
- utility information
- plans, survey, and other building documents
- capital investment plans

Additionally, a variety of monitoring, sampling, and testing was completed on the Mall property (discussed in more detail below). Mall staff were essential in coordinating the schedule of the planned maintenance and other capital improvement work to allow project team members access to either observing the work (e.g., stormwater pond maintenance cleaning, Figure B-1 and Figure B-2) and/or conducting testing activities during the work (e.g., test pit). Finally, Mall staff have been very engaged and responsive during project meetings and workshops, providing valuable input and perspectives.

Figure B-1 Pond 1 sand filter maintenance (2014)

Figure B-2 Pond 4 concrete vault (sand filter) maintenance (2014)

B-2 Temperature Monitoring

The South St. Louis SWCD collected temperature monitoring data between July and September of 2014 using Hobo temperature loggers (Figure B-3) The temperature loggers were placed in the following locations and shown in (Figure B-4).

- The storm sewer outfall located at point A
- The outlet of Pond 4 (point B)
- The storm sewer outlet discharging into Pond 4 (point C)
- The South Sediment Pond outlet (point D)
- The storm sewer outlet discharging into the South Sediment Pond (point E)
- The North Sediment Pond outlet (point F)

Figure B-3 Hobo temperature logger secured to storm sewer outlet discharging into Pond 4

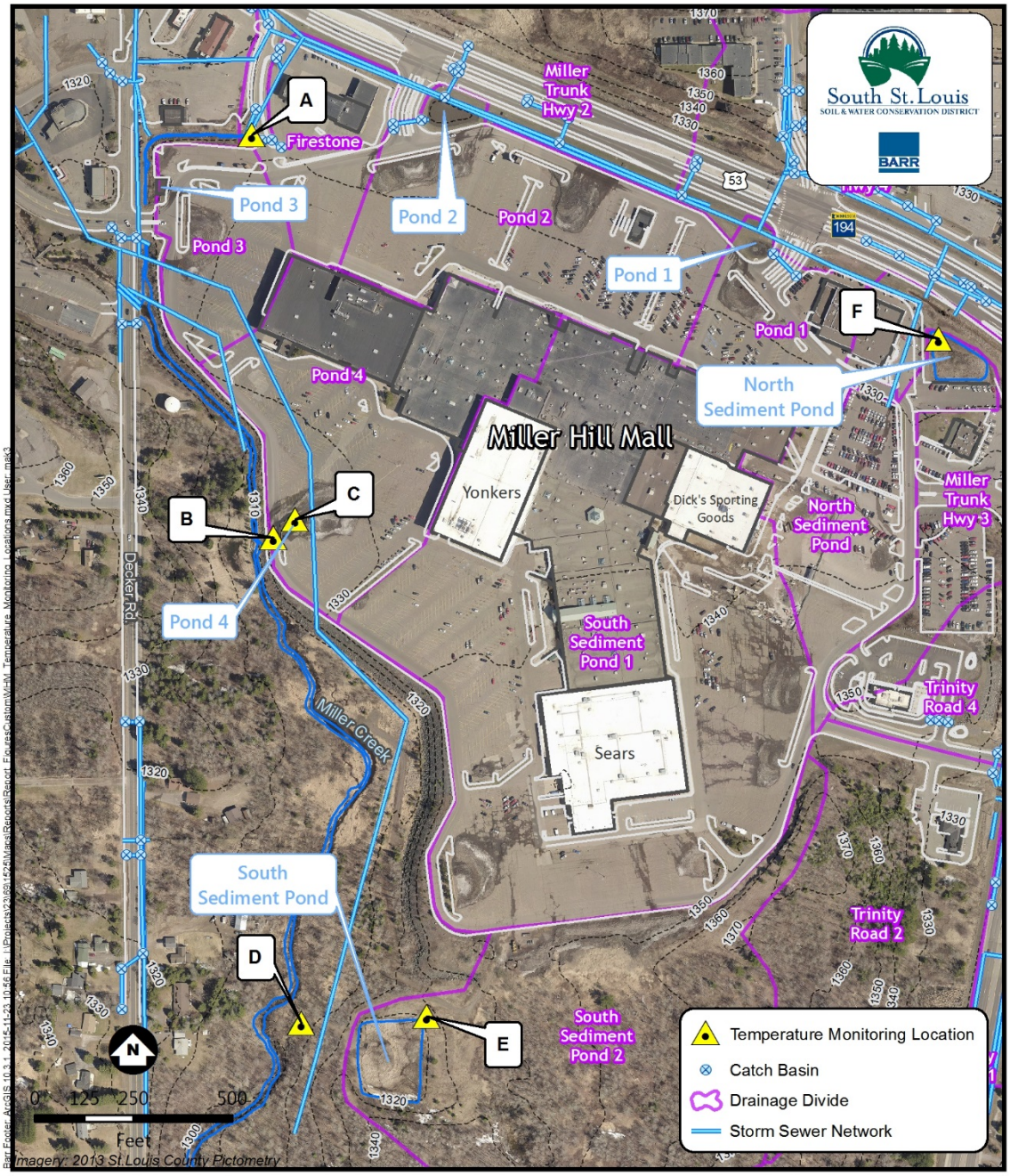

Figure B-4 Temperature monitoring locations at Miller Hill Mall (points A through F)

B-3 Topographic Survey

In summer and fall of 2014, the South St. Louis SWCD completed topographic surveys of the existing stormwater BMPs including stormwater ponds 1 and 2, the north and south sediment ponds, and the sand filters (ponds) 3 and 4 (Figure B-5) A variety of data was collected on the different stormwater features, including:

- storm sewer structures
- roof drains
- curb cuts
- sanitary manhole structures
- hydrants and gate valves
- topography of existing BMP and/or pond features
- topography of the slope from the Mall parking lot to Miller Creek
- Signs, light poles, vegetation, and other features in the parking lot

This information was used to confirm the drainage areas (Figure B-6) for each stormwater feature as well as for the development of the stormwater modeling (XP-SWMM).

Figure B-5 Photos of the topographic survey of an outlet near the Firestone building (west outfall, left) and an inlet structure between Ponds 1 and 2 (right)

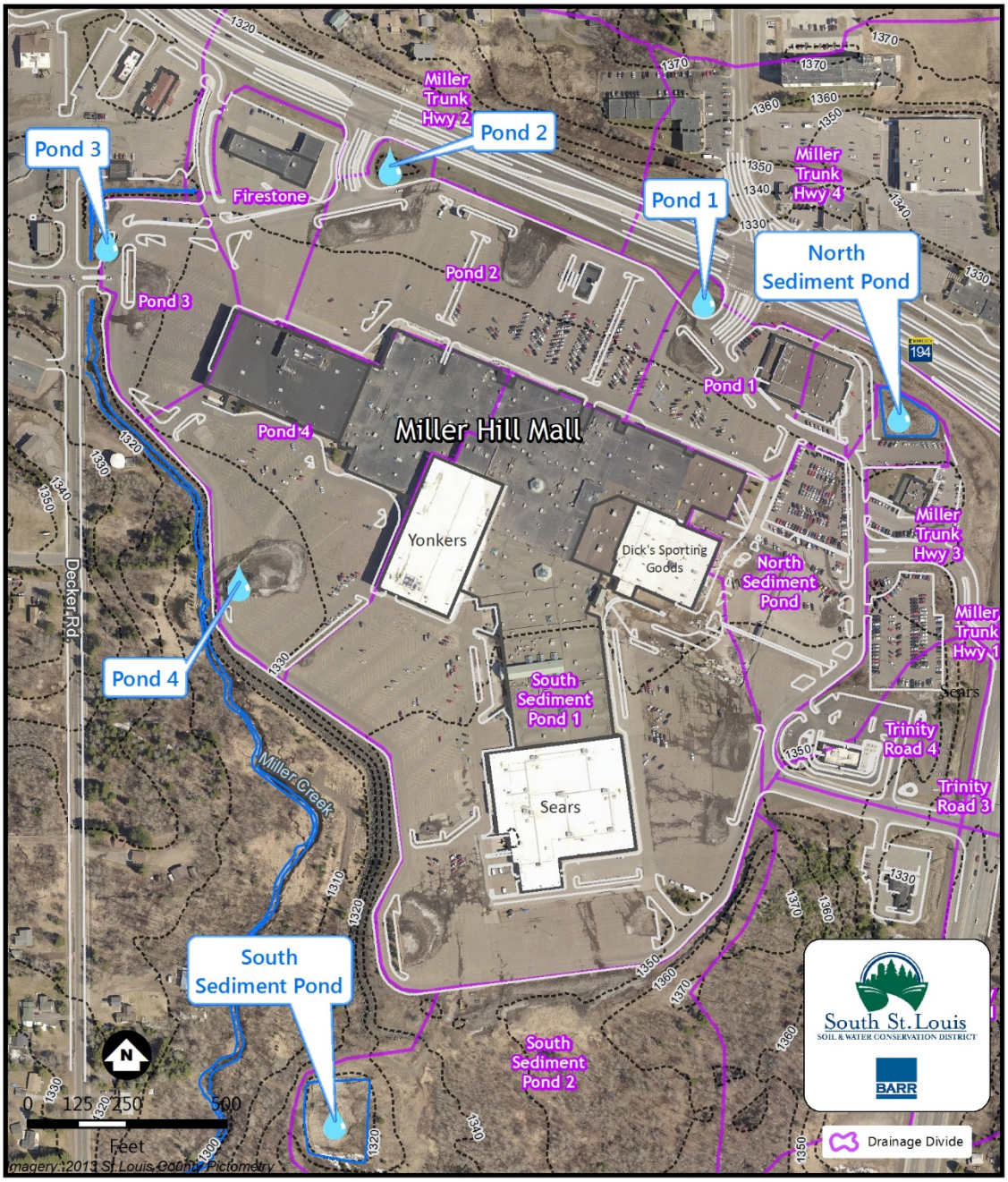

Figure B-6 Existing stormwater features and their associated drainage areas at Miller Hill Mall

B-4 Desktop Studies—Geological and Flow Path Evaluations

Historic topographic maps, photographs, and geologic data were evaluated to better understand the pre-development geologic features and surface water flow paths of the site. The Miller Hill Mall first opened in 1973 and was built on a site that was dominated by bedrock, with two knobs of bedrock outcroppings located directly within the footprint of today's Mall (as shown by the 1953 contour lines in (Figure B-7). The original Mall construction required blasting the bedrock outcroppings and then pushing the blast rock outwards to create the parking lots that surround the Mall. Based on soil boring data from the construction of the stormwater ponds, as well as from historical contours, an estimate of the blast rock depth was approximated from 5- to 30-feet deep, as shown in Figure B-7

In addition to approximating the depth of the blastrock fill, it was also important to evaluate the pre-development flow paths where ravines or other natural depressions may have historically concentrated surface water. With this information, potential subsurface flow paths were identified that may be indicative of the route water may take if infiltrated below the surface of the parking lot.

Figure B-7 Pre-development geologic features and surface flow paths

B-5 Water Quality

In August 2015, water quality sampling was conducted in two locations near the Mall property. The first location was at the base of the steep embankment (exposed blastrock) located on the west side of the Mall parking lot (south of Yonkers) and the second location was from Miller Creek, located adjacent to the first sampling location. The objective was to sample water that had been in direct contact with, or downgradient of, the blastrock that is located beneath Miller Hill Mall and its parking lot. The following memorandum provides a summary of the water quality results from three samples that were collected on August 7, 2015.

Overall, the water quality data corresponded to concentrations expected from Minnesota water quality, with the noted exception of higher iron and manganese values observed in one of the samples taken within the embankment.

Internal Memorandum

To: Project Folder
From: Kelly Neppl and Mehgan Blair
Subject: Miller Hill Mall Embankment Water Quality Results
Date: September 29, 2015
Project: 23691525.00
c: Jeff Lee and Heather Wright Wendel

Site Descriptions

This summary provides the results of water quality sampling conducted in the Miller Creek watershed near the Miller Hill Mall. The objective of the sampling was to sample water that was in direct contact with, or downgradient of the rock feature embankment on the west side of the Miller Hill Mall parking lot (Sample 1 and Sample 2) and a background sample from Miller Creek (Sample 3). The sampling event took place during the later summer, after a total of 1.44 inches of rain within the previous 48 hours. Water quality sampling was conducted on August 7, 2015. Calibration and post-calibration of the YSI water quality monitoring meter was performed for field measurements. The water samples were submitted to Pace Analytical Services in Virginia, Minnesota, where they were analyzed for major ions and a subset of trace metals

Sample 1 Photos: Embankment Sample

Photo 1

Photo 2

Photo 1: Facing down towards a shallow, still pool of water (approximately 6 inches in depth) between of the embankment toe.
Photo 2: Facing northwest towards Sample 1 embankment sampling location.

Sample 2 Photos: Embankment Sample

Photo 3

Photo 4

Photo 3: Facing down towards a shallow, still pool of water (approximately 3 inches in depth) between of the embankment toe.
Photo 4: Facing northwest towards Sample 2 embankment sampling location. Approximately ten feet within the Sample 1 location.

Sample 3 Photos: Miller Creek Channel Sample

Photo 5

Photo 6

Photo 5: Facing southwest. Entrance of Miller Creek channel where Sample 3 was obtained.
Photo 6: Facing west looking upstream of the Sample 3 sample location of Miller Creek.

Results

Table 1 provides a summary of the water quality results of the three samples. Sample 1 and Sample 2 were obtained from shallow water pools collected at the toe of the embankment that was in contact with the rock embankment. Sample 3 was obtained downgradient of the rock embankment within the Miller Creek channel, which was surrounded with grasses, cattails, and reeds.

Parameter concentrations from the embankment samples (Sample 1 and Sample 2) were almost invariably higher than the Miller Creek channel sample (Sample 3). To evaluate potential infiltration impacts, water quality data was compared to criteria as listed under part Minnesota Chapters 7050.0420 for trout waters as Class 1B, 2A, 3B, 4A, 4B, 5 and 6. Observations of criteria exceedance are included in Table 1, and discussed below:

- Field parameters: Sample 1 had a higher pH than the criteria. This sample slightly exceeded the specific conductivity criteria.
- Chloride: Both embankment samples (Sample 1 and Sample 2) had higher chloride concentrations than multiple criteria. The water sampled from this area is sodium-chloride dominated, which is consistent with the proximity of the sampling locations to parking lots that are frequently treated with rock salt.
- Copper: An unfiltered sample from the Sample 2 location had copper concentrations higher than the most stringent criteria. It is also possible that copper is supplied to the area from vehicle traffic, which is known to contribute trace metals such as antimony, cobalt, copper, lead, nickel, and zinc to adjacent watersheds, due to brake pad wear, vehicle exhaust, deterioration of paint and other automobile sources (Thorpe and Harrison, 2008).
- Iron and manganese: The geochemical properties of iron and manganese are often considered together, because both occur in abundance in most natural waters. All of the samples (Sample 1, Sample 2, and Sample 3) had concentrations of iron (total) and manganese (total and dissolved) higher than criteria. The unfiltered fraction from the Sample 2 location had the highest concentration for these parameters. Particulate matter is likely contributing to these constituents in un-filtered ("total") samples, and could also be contributing colloidal material (<0.45µm) to the filtered samples,. It is also possible that sampling from shallower (<3 inches in depth), stagnant water that is depleted in oxygen can mobilize iron and manganese. The dissolved fractions for manganese in Sample 1 and Miller Creek channel correspond with the mean levels (214 µg/L) observed in Minnesota ground waters (Lundy and Soule, 2012).
- Phosphorus: All of the samples (Sample 1, Sample 2, and Sample 3) had phosphorus concentrations higher than the criteria. The highest concentrations were observed in the Miller Creek channel. Although phosphorus loading statewide is commonly attributed to runoff from pastures and croplands, other nonpoint sources include urban runoff and non-agriculture rural runoff can contribute to this nutrient loading. (Minnesota Pollution Control Agency, 1999).
- Sulfate: Sulfate associated with both embankments samples were higher than the water quality standard, however, this criteria is applicable to water used for production of wild rice.

Overall, these data correspond to concentrations expected from Minnesota water quality, with the noted exception of higher iron and manganese values observed within Sample 2.

References

Lundy, J., and Soule, R., 2012. Memo: Initial Assessment of Manganese in Minnesota Groundwater. Minnesota Department of Health, p. 1-4.

MPCA, 1999. Baseline Water Quality of Minnesota's Principal Aquifers – Region 1, Northeastern Minnesota. Minnesota Pollution Control Agency, 71 pp.

Thorpe, A., and Harrison, R.M, 2008. Sources and properties of non-exhaust particulate matter from road traffic: A review. Science of the Total Environment, v. 400, p. 270-282.

Table 1. Results of Miller Creek Embankment and Channel Samples to Criteria.

					Location	**1**	**2**	**3**
					Approximate Depth	**6 inches**	**3 inches**	**Channel**
					Sample Type	**Embankment #1**	**Embankment #2**	**Miller Creek**
					Date	**8/07/2015**	**8/07/2015**	**8/07/2015**
Parameter	Analysis Location	Total or Dissolved	Minnesota Surface Water 2A Chronic 7050 - 100 Hardness	Minnesota Surface Water 3B State Waters 7050	Minnesota Surface Water 4A State Waters 7050			
Effective Date			01/24/2012	04/01/2008	04/01/2008			
Exceedance Key			Underline	*Italic*	Shade			
Field Parameters								
Dissolved oxygen	Field	NA	(2)			6.95 mg/l	6.46 mg/l	6.28 mg/l
pH	Field	NA	8.5 pH units	6.0 - 9.0 pH units	6.0 - 8.5 pH units	**8.86 pH units**	7.24 pH units	7.39 pH units
Redox (oxidation potential)	Field	NA				83.1 mV	59.7 mV	71.0 mV
Specific Conductance @ 25 ºC	Field	NA			1 mmhos/cm	1.017 mmhos/cm	0.829 mmhos/cm	0.351 mmhos/cm
Temperature	Field	NA				11.67 deg C	12.94 deg C	16.58 deg C
Trace Metals								
Cobalt	Lab	Dissolved	2.8 ug/l			< 0.86 ug/l	< 0.86 ug/l	< 0.86 ug/l
Cobalt	Lab	Total	2.8 ug/l			< 0.86 ug/l	2.0 j ug/l	< 0.86 ug/l
Copper	Lab	Dissolved	9.4 HD CF ug/l			5.7 ug/l	5.8 ug/l	3.6 ug/l
Copper	Lab	Total	9.8 HD ug/l			7.4 ug/l	17.1 ug/l	5.8 ug/l
Iron	Lab	Dissolved				131 ug/l	120 ug/l	265 ug/l
Iron	Lab	Total				**472 ug/l**	**5050 ug/l**	**1330 ug/l**
Manganese	Lab	Dissolved				**273 ug/l**	**102 ug/l**	**51.9 ug/l**
Manganese	Lab	Total				**212 ug/l**	**2280 ug/l**	**181 ug/l**
Nickel	Lab	Dissolved	158 HD CF ug/l			1.7 ug/l	1.2 ug/l	0.87 ug/l
Nickel	Lab	Total	158 HD ug/l			1.5 ug/l	3.6 ug/l	1.6 ug/l
Zinc	Lab	Dissolved	105 HD CF ug/l			3.3 j ug/l	4.0 j ug/l	4.8 j ug/l
Zinc	Lab	Total	106 HD ug/l			< 2.0 ug/l	10.5 ug/l	7.0 ug/l
Major Ions								
Alkalinity, total, as CaCO3	Lab	NA				92.8 mg/l	72.6 mg/l	60.8 mg/l
Calcium	Lab	Dissolved				65.5 mg/l	44.2 mg/l	24.5 mg/l
Calcium	Lab	Total				56.6 mg/l	45.0 mg/l	25.4 mg/l
Chloride	Lab	NA	230 mg/l	*100 mg/l*		***358 mg/l***	***260 mg/l***	73.9 mg/l
Fluoride	Lab	NA				0.14 mg/l	0.13 mg/l	0.13 mg/l
Hardness, as CaCO3	Lab	NA		250 mg/l		213 mg/l	168 mg/l	97.2 mg/l
Magnesium	Lab	Dissolved				19.8 mg/l	13.4 mg/l	7.9 mg/l
Magnesium	Lab	Total				17.3 mg/l	13.6 mg/l	8.2 mg/l
Potassium	Lab	Dissolved				3.0 mg/l	2.3 mg/l	1.7 mg/l
Potassium	Lab	Total				2.9 mg/l	2.5 mg/l	2.0 mg/l
Sodium	Lab	Dissolved			(1)	188 mg/l	127 mg/l	32.6 mg/l
Sodium	Lab	Total			(1)	164 mg/l	126 mg/l	35.0 mg/l
Sulfate, as SO4	Lab	NA			10 Wild Rice mg/l	24.5 mg/l	17.7 mg/l	9.7 mg/l
Nutrients								
Nitrogen, Nitrate + Nitrite, as N	Lab	NA				0.79 mg/l	0.72 mg/l	0.20 mg/l
Nitrogen, Nitrate as N	Lab	NA				0.72 h mg/l	0.68 h mg/l	0.23 bh mg/l
Phosphorus, total, as P	Lab	NA	0.012 (3) mg/l			0.018 mg/l	0.075 mg/l	0.079 mg/l

(1) 60% of total cations as milliequivalents per liter.
(2) 5.0 mg/l as a daily minimum. This dissolved oxygen standard may be modified on a site-specific basis according to part 7050.0220, subpart 7, except that no site-specific standard shall be less than 5 mg/l as a daily average and 4 mg/l as a daily minimum. Compliance with this standard is required 50 percent of the days at which the flow of the receiving water is equal to the 7Q. This standard applies to all Class 2B waters except for those portions of the Mississippi River from the outlet of the Metro Wastewater Treatment Works in Saint Paul (River Mile 835) to Lock and Dam No. 2 at Hastings (River Mile 815). For this reach of the Mississippi River, the standard is not less than 5 mg/l as a daily average from April 1 through November 30, and not less than 4 mg/l at other times.
(3) Designated lake trout lakes in all ecoregions (lake trout lakes support natural populations of lake trout, Salvelinus namaycush). See guidance for additional designations

Wild Rice Applicable to water used for production of wild rice during periods when the rice may be susceptible to damage by high sulfate levels.

B-6 Test Pit Excavation Sieve Analysis Report

The sieve analysis report is shown below.

AMERICAN ENGINEERING TESTING, INC.

CONSULTANTS
• ENVIRONMENTAL
• GEOTECHNICAL
• MATERIALS
• FORENSICS

REPORT OF SIEVE ANALYSIS

PROJECT: MILLER HILL MALL
BARR PROJECT NO. 23/69-1525.00

REPORTED TO: BARR ENGINEERING
ATTN: HEATHER WRIGHT WENDEL, PE

AET JOB NO.: 07-06110

DATE: NOVEMBER 13, 2015

SAMPLE NO:	1	**DATE SAMPLED:**	11-05-15
AET LAB CONTROL NO:	--	**DATE RECEIVED:**	11-05-15
SOURCE OF MATERIAL:	Existing	**DATE TESTED:**	11-06-15
LOCATION SAMPLED:	On-site Test Pit	**INTENDED USE:**	--
SOIL CLASSIFICATION:	Gravelly Sand with Silt (SP-SM)		
TEST METHOD:	ASTM: C117 / C136		

SIEVE SIZE OR NUMBER	PERCENT PASSING BY WEIGHT	SPECIFICATION
37.5 mm (1½")	100	
25.0 mm (1")	82	
19.0 mm (¾")	80	
12.5 mm (½")	77	
9.5 mm (⅜")	74	
4.75 mm (#4)	67	
2.0 mm (#10)	56	
850 µm (#20)	45	
425 µm (#40)	33	
180 µm (#80)	16	
150 µm (#100)	15	
75 µm (#200)	10.2	

CONFORMANCE: Informational.

American Engineering Testing, Inc.

Reported by
Jonathan Gabriel
Laboratory Supervisor

Reviewed by
Taryn J. Erickson
Geotechnical Engineer

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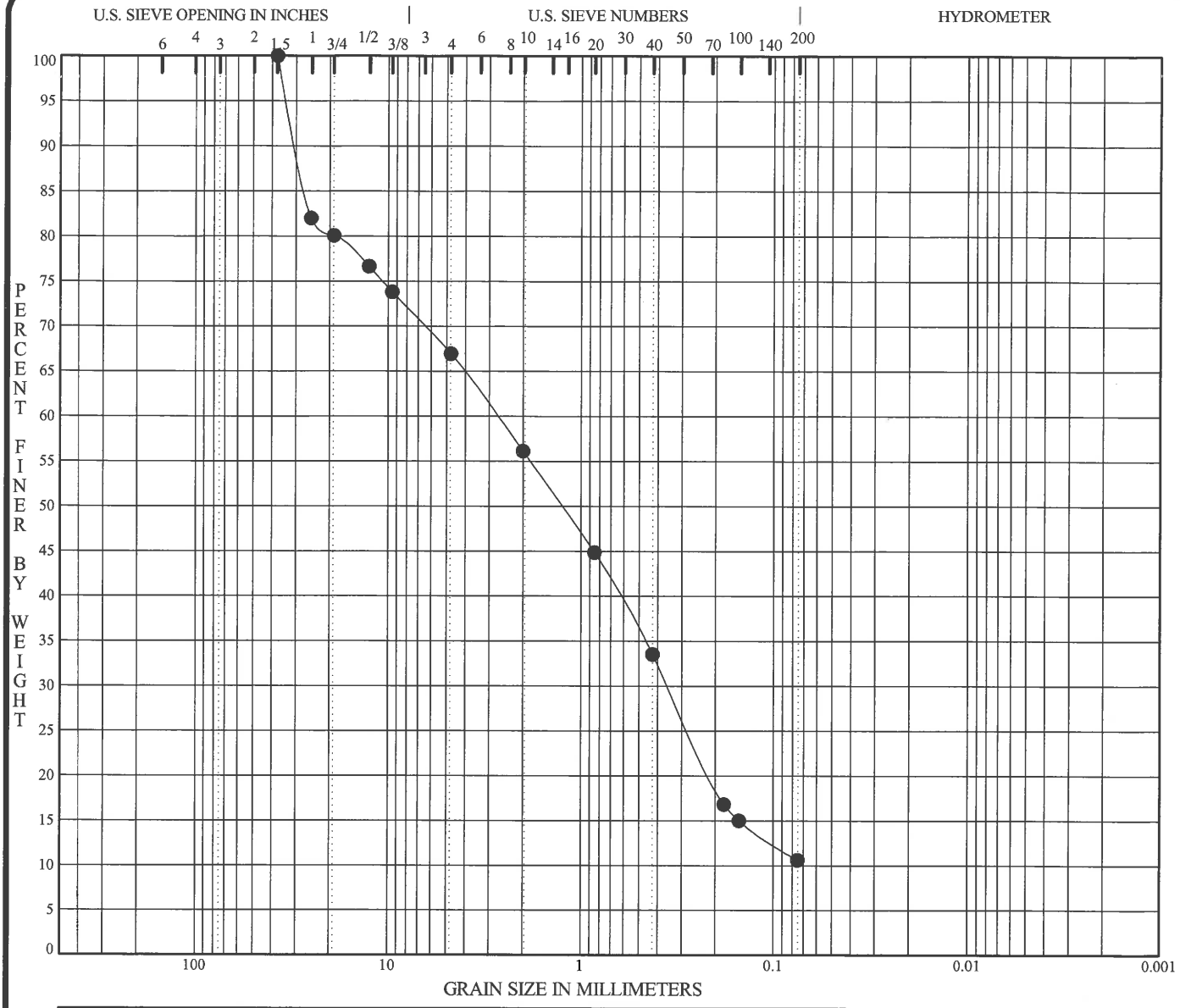


COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	MC%	LL	PL	PI	Cc	Cu
●	1	0.0	Gravelly Sand with Silt (SP-SM)	5				0.68	39.9

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	1	0.0	37.50	2.72	0.354		33.0	56.4	10.6	

PROJECT **Miller Hill Mall; Barr Project No. 23/69-1525.00; Duluth, MN**

JOB NO. **07-06110**

DATE **11/5/15**

AMERICAN ENGINEERING TESTING, INC.

GRADATION CURVES

Appendix C

Existing NPDES Industrial Stormwater Permit for Miller Hill Mall

STATE OF MINNESOTA

Minnesota Pollution Control Agency

Industrial Division

National Pollutant Discharge Elimination System (NPDES)/
State Disposal System (SDS) Permit MN0056979

PERMITTEE:	Simon Properties Group LP
FACILITY NAME:	Miller Hill Mall
RECEIVING WATER:	Miller Creek (Class 1B,2A,3B,4A,4B,5,6 water)

CITY OR TOWNSHIP:	Duluth	**COUNTY:**	St. Louis
ISSUANCE DATE:		**EXPIRATION DATE:**	

The state of Minnesota, on behalf of its citizens through the Minnesota Pollution Control Agency (MPCA), authorizes the Permittee to operate a disposal system at the facility named above and to discharge from this facility to the receiving water named above, in accordance with, and in compliance with the requirements of this permit.

The goal of this permit is to reduce pollutant levels in point source discharges and protect water quality in accordance with Minnesota and U.S. statutes and rules, including Minn. Stat. chs. 115 and 116; Minn. R. chs. 7001, 7050, 7053, 7060, and 7090 and the U.S. Clean Water Act.

This permit is effective on the issuance date identified above, and supersedes the previous permit that was issued for this facility on January 7, 2004. This permit expires at midnight on the expiration date identified above.

Signature: _____

Jeff Udd, P.E.
Supervisor, Water Quality Permits Unit
Water Section
Industrial Division

for Minnesota Pollution Control Agency

Submit DMRs to:
Attention: Discharge Monitoring Reports
Minnesota Pollution Control Agency
520 Lafayette Rd N
St Paul, MN 55155-4194

Submit Other WQ Reports to:
Attention: WQ Submittals Center
Minnesota Pollution Control Agency
520 Lafayette Rd N
St Paul, MN 55155-4194

Questions on this permit?

- For DMR and other permit reporting issues, contact: Belinda Nicholas, 651-757-2613.
- For specific permit requirements or permit compliance status, contact: John Thomas, 218-723-4928.
- General permit or NPDES program questions, contact: MPCA, 651-282-6143 or 1-800-657-3938.

Table of Contents

Facility Description

The Miller Hill Mall is a regional shopping center located southwest of the intersection of Miller Trunk Highway (to the north) and Trinity Road (to the east) Duluth, St. Louis County, Minnesota. The site is bordered to the southwest by Miller Creek, a listed trout stream.

The shopping mall is a 110 acre site with sixty-eight acres of impervious parking lot and roadway surfaces. The waste streams regulated by this permit consist of snow melt and rainfall runoff from the property. The original treatment system collected runoff from approximately 54% of the impervious area, including the 1988 mall expansion and one-third of the original mall area. The storm water collection and treatment system was subsequently expanded to address the remaining forty-six percent of the site's impervious surface. This work was substantially completed in the fall of 2005. During the previous permit cycle, the runoff treatment system was upgraded and expanded to capture and treat runoff from the remaining 46% of the impervious area, including the impervious area around Firestone Service Center and the JC Penney roof.

The wastewater authorized for discharge by this permit consists of storm water runoff from the property. Storm water management at the complex consists of two sediment ponds with point source discharges to Miller Creek, four infiltration basins, and the 'Firestone Treatment' System. The original treatment system consisted of two storm water retention basins (South and North Ponds) each having oil skimming and trash collection devices. These two systems collected and treated storm water runoff from approximately fifty-four percent of the property's impervious surface. The South Sediment Pond is located approximately 267 feet to the southwest of the Miller Hill parking lot, south of the entrance to the Sears store. This system captures storm water from about twenty-three acres of parking lot. Treated storm water is discharged to Miller Creek, located immediately to the west of the South Sediment Pond. This pond operates as a dry sediment pond with a baffle or skimming device. When full, the wet surface area of the pond is approximately 0.9-acres. The maximum depth of the pond is approximately seven feet. The outlets from this pond consist of a sand filter, a baffled-concrete vault, and an emergency spillway, all of which discharge to Miller Creek that is some 180-feet to the west.

The sand filter and the baffled concrete vault serve as the principal outlet that treats storm water. Storm water passes through the sand filter where sediment and smaller particulates are trapped before flowing into a small gallery of embedded pipe. This pipe gallery is connected to the baffled, concrete vault that allows storm water to flow through the earthen dike of the sediment pond. The baffled, concrete vault has two chambers where debris, litter and sheens are trapped before discharging downstream through the earthen berm. An earthen spillway allows storm water to flow past the sand filter and concrete vault when runoff rates and volumes exceed the sediment pond design capacity.

The North Sediment Pond is located near the junction of Trinity Road and Miller Trunk Highway/US Hwy 53, to the east of North Star Ford and to the north of the Perkins restaurant. The storm water treatment system includes the main basin, principal and emergency spillways, embankments, sand filter and rock gabion basket. The pond does not include an impervious liner allowing for infiltration of storm water collecting in the pond. Treated storm water is discharged to the Mall's perimeter drainage way, west along Miller Trunk Hwy, and then south at the western edge of the Firestone building, and then carried along the northwestern drainage ditch along Decker Road to Miller Creek (near the juncture of Mountain Shadow Drive and Mall Drive).

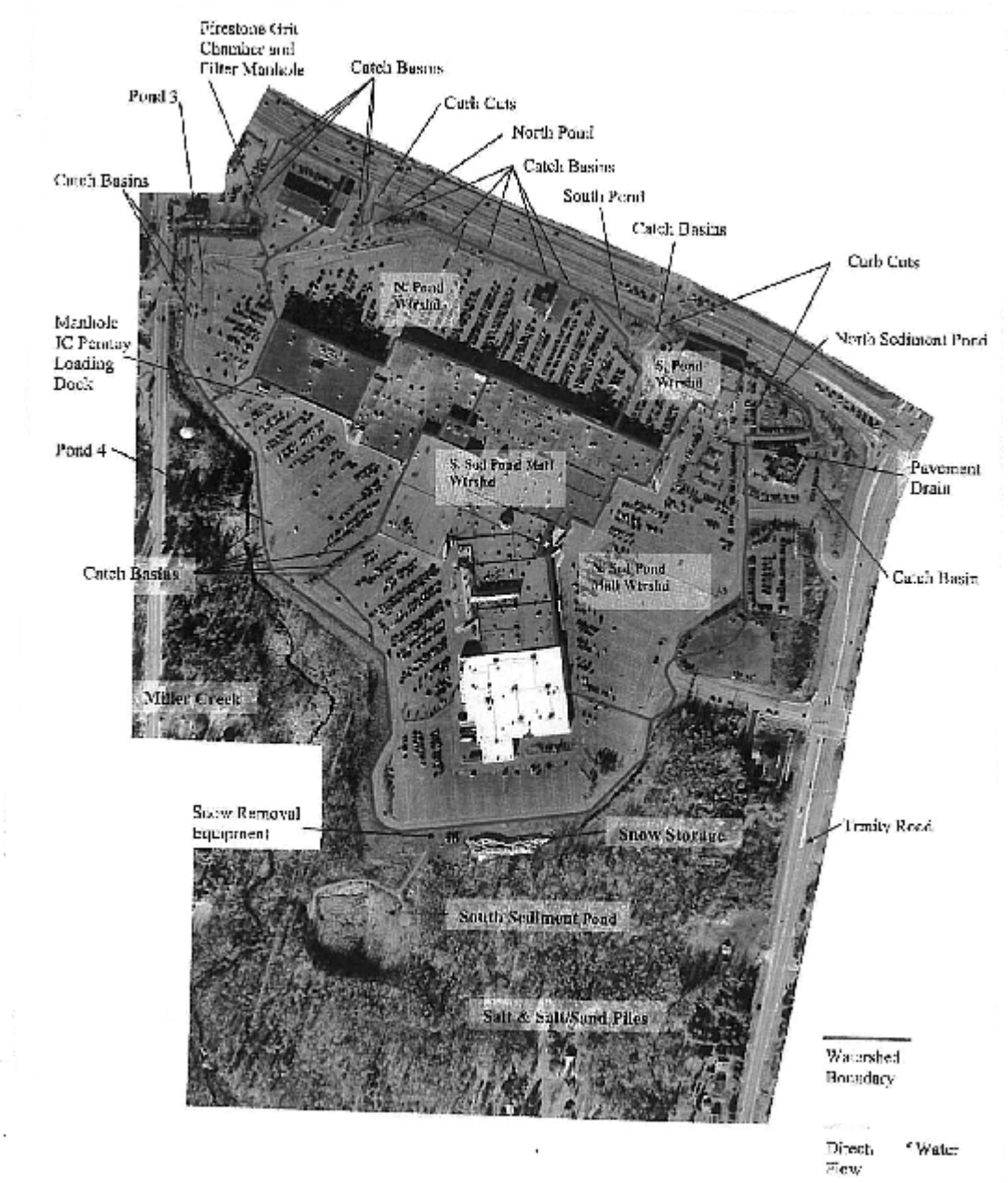
Pond One Sand Filter is located between Miller Trunk Hwy and the outer ring road of Miller Hill Mall across from Cottonwood Road. The treatment system consists of a sand filter with a geo-textile filter fabric beneath the sand filter. Sand in the pond is cleaned as sediment accumulation dictates. This system was designed for infiltration and does not discharge to surface water. Pond Two Sand Filter is located near the Firestone Mall Entrance between the outer ring road of Miller Hill Mall and Miller Trunk Highway. The treatment system consists of a sand filter with a geo-textile filter fabric beneath the sand filter. Sand in the pond is cleaned as sediment accumulation dictates. This system was designed for infiltration and does not discharge to surface water. Pond Three Sand Filter is located adjacent to the Decker Road entrance, to the west of Miller Hill Mall. The treatment system consists of a sand filter and two catch basin sumps which are cleaned when accumulated with sediment. This pond features a concrete vault. This system was designed for infiltration and does not discharge to surface water.

The final treatment system, known as the Firestone Treatment system, consists of two components which are located around the Firestone building. For the first component of the Firestone Treatment System, there are three catch basin sumps, located to the north along the parking lot curb, and one manhole sump from the Firestone Building drain to the grit chamber that captures coarse particles. The grit chamber in turn drains to the filter manhole that captures the fine particles. The filter manhole then drains to Miller Creek that begins in a ditch just south of the filter manhole.

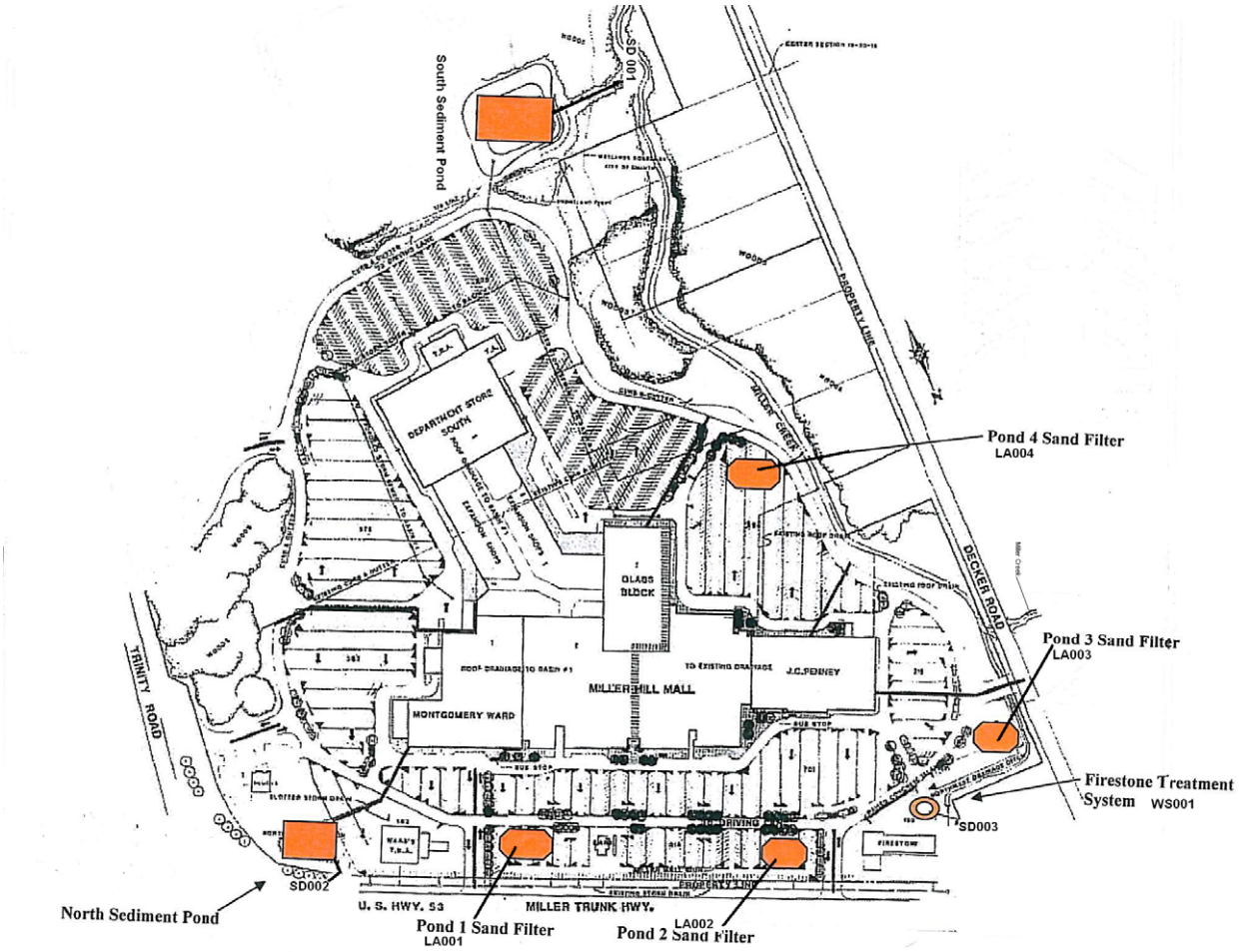
With the second component, two catch basin sumps located northeast of the Firestone Building at the east entrance to the Firestone parking lot drain to the south where it connects with another storm sewer pipe and catch basin. This storm sewer pipe then drains to Pond 2.

Miller Hill Mall's storm water treatment system includes three point source discharges to Miller Creek. Miller Creek is listed in Minn. R. 7050.0470, Subp. 1.A. (140) with water use classifications: 1B, 2A, 3B. Miller Creek is identified in Minn. R. 6264.0050 as a designated trout stream. In accordance with Minn. R. 7050.0420, trout waters are also classified as 4A, 4B, 5, and 6.

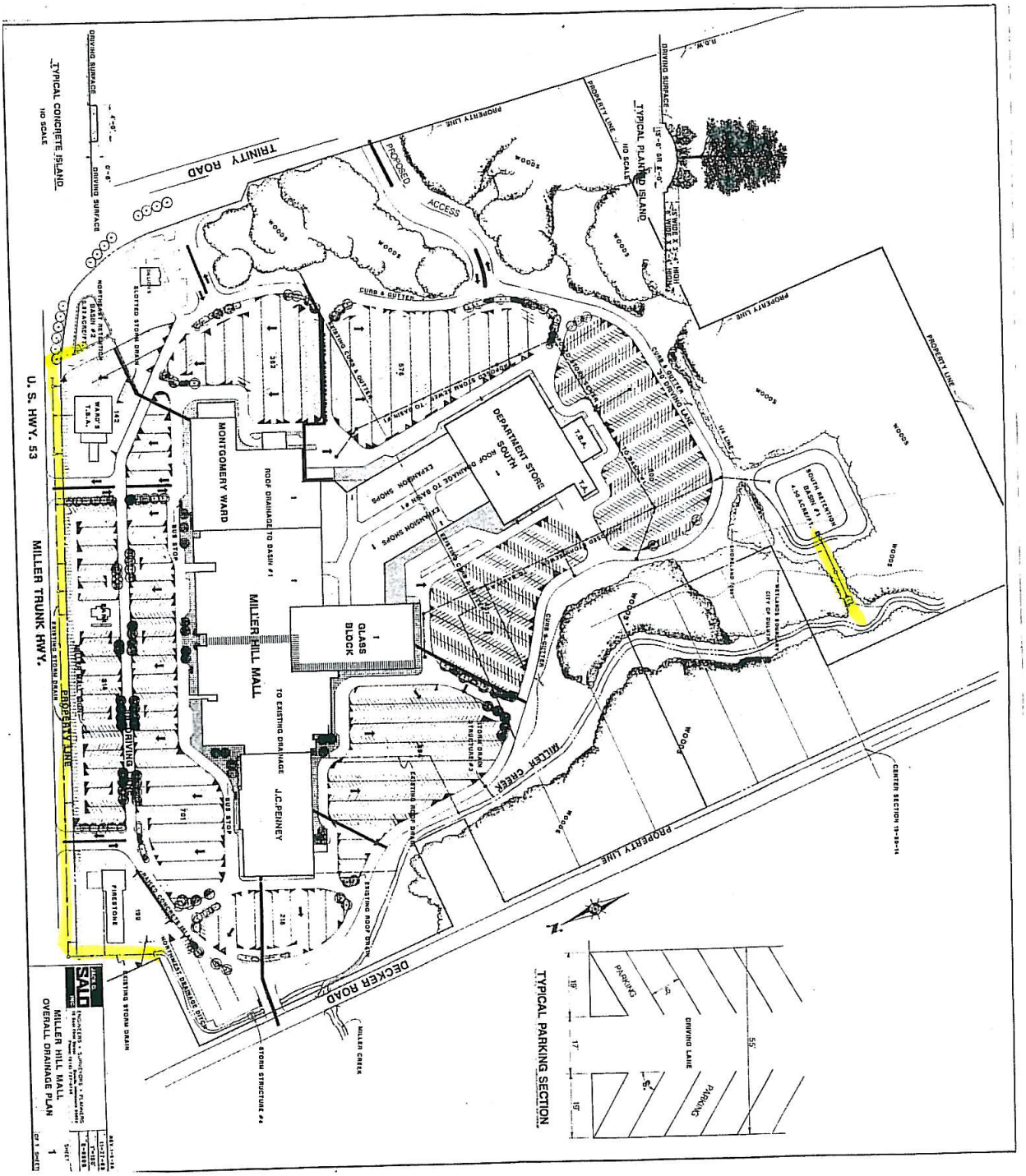
Facility Catch Basins System



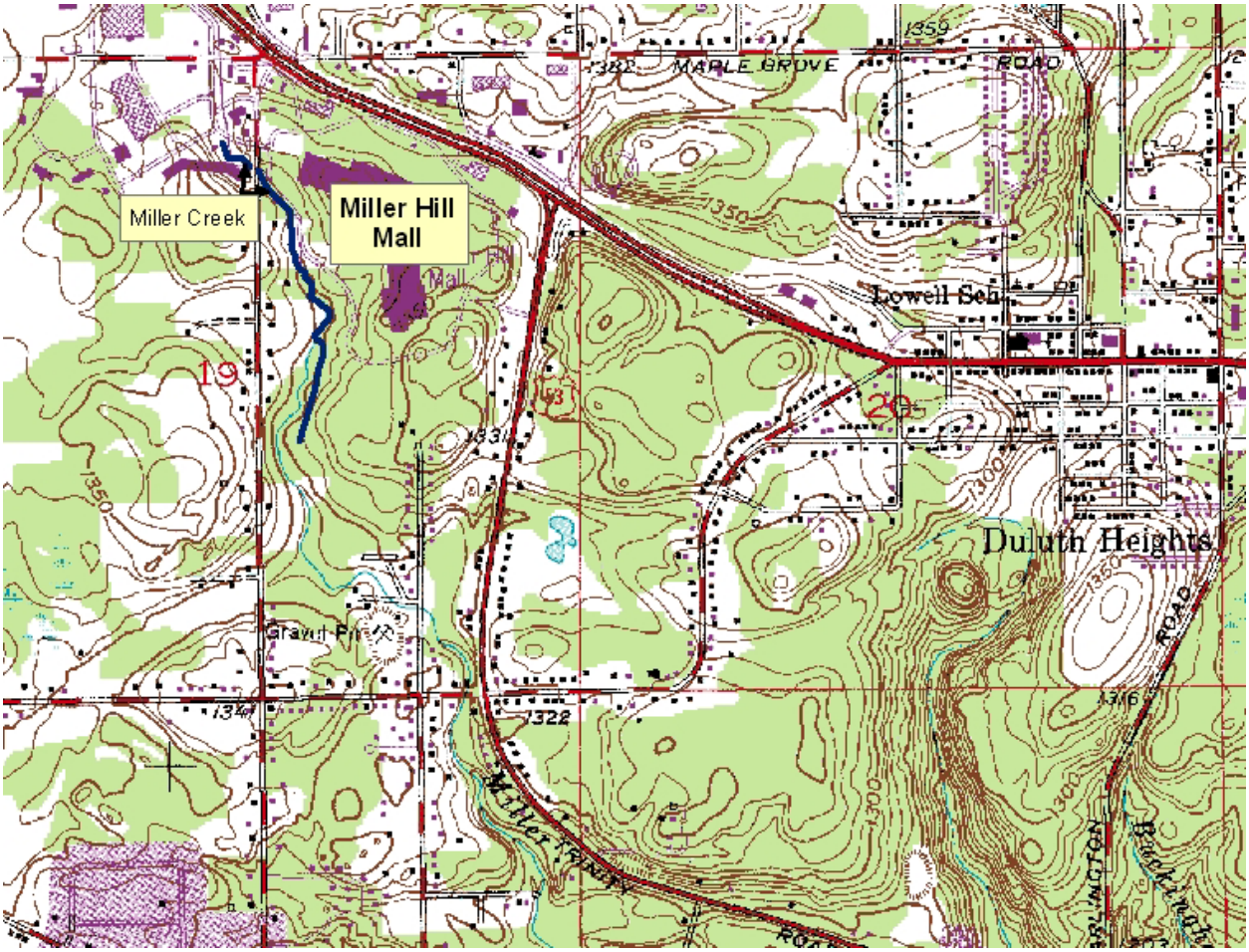
Site Sketch Showing Treatment Systems/Outfalls



Miller Hill Mall Overall Drainage Plan



USGS Quad Map Showing Facility Location and Proximity to Miller Creek



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Land Application Stations

Station	Type of Station	Local Name	PLS Location
LA001	MNG49 Stormwater, Non-discharging	Pond 1 Sand Filter	SW Quarter of the NE Quarter of the NE Quarter of Section 19, Township 50 North, Range 14 West
LA002	MNG49 Stormwater, Non-discharging	Pond 2 Sand Filter	SW Quarter of the NW Quarter of the NE Quarter of Section 19, Township 50 North, Range 14 West
LA003	MNG49 Stormwater, Non-discharging	Pond 3 Sand Filter	NW Quarter of the NW Quarter of the NE Quarter of Section 19, Township 50 North, Range 14 West
LA004	MNG49 Stormwater, Non-discharging	Pond 4 Sand Filter	NE Quarter of the SW Quarter of the NE Quarter of Section 19, Township 50 North, Range 14 West

Surface Discharge Stations

Station	Type of Station	Local Name	PLS Location
SD001	Stormwater, Non-specific Runoff	South Sediment Pond	NW Quarter of the NW Quarter of the SE Quarter of Section 19, Township 50 North, Range 14 West
SD002	Stormwater, Non-specific Runoff	North Sediment Pond	NE Quarter of the NE Quarter of the NW Quarter of Section 19, Township 50 North, Range 14 West

Waste Stream Stations

Station	Type of Station	Local Name	PLS Location
WS001	Internal Waste Stream	Firestone Treatment System	NW Quarter of the NW Quarter of the NE Quarter of Section 19, Township 50 North, Range 14 West

Miller Hill Mall
Limits and Monitoring Requirements

The Permittee shall comply with the limits and monitoring requirements as specified below.

SD 001: South Sediment Pond

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Chloride, Total	Monitor Only	mg/L	Calendar Month Average	Mar-May	Grab	1 x Month	
Flow	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Estimate	1 x Month	2
Flow	Monitor Only	MG	Calendar Month Total	Jan-Dec	Estimate	1 x Month	3
Oil & Grease, Total	10	mg/L	Calendar Month Average	Mar, Jun, Oct	Grab	1 x Month	4
pH	Monitor Only	SU	Single Value	Mar, Jun, Oct	Grab	1 x Month	1
Solids, Total Suspended (TSS)	30	mg/L	Calendar Month Average	Mar, Jun, Oct	Grab	1 x Month	

SD 002: North Sediment Pond

Parameter	Limit	Units	Limit Type	Effective Period	Sample Type	Frequency	Notes
Chloride, Total	Monitor Only	mg/L	Calendar Month Average	Mar-May	Grab	1 x Month	
Flow	Monitor Only	mgd	Calendar Month Average	Jan-Dec	Estimate	1 x Month	2
Flow	Monitor Only	MG	Calendar Month Total	Jan-Dec	Estimate	1 x Month	3
Oil & Grease, Total	10	mg/L	Calendar Month Average	Mar, Jun, Oct	Grab	1 x Month	4
pH	Monitor Only	SU	Single Value	Mar, Jun, Oct	Grab	1 x Month	1
Solids, Total Suspended (TSS)	30	mg/L	Calendar Month Average	Mar, Jun, Oct	Grab	1 x Month	

Notes:
1 -- Analyze immediately. Samples shall be taken during periods of discharge from the oil skimmer.
2 -- Flow estimate based on average of individual rainfall event precipitation measurements.
3 -- Flow estimate based on sum of individual rainfall event precipitation measurements.
4 -- Samples shall be taken during periods of discharge from the oil skimmer.

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Chapter 1. Special Requirements

1. Special Requirements

Total Maximum Daily Load (TMDL) study

1.1 The entire reach of Miller Creek, from its headwaters to its outlet into Lake Superior, is included in the agency's Sec. 303(d) list of impaired waters. The impairment, lack of cold water assemblage, is based on a trout population at less than what would be expected for a natural trout stream. Suspected causes/stressors contributing to the impairment include: heat, chloride, suspended solids (sand and other small particles), and high flows after storm events (flashing) causing erosion contributing to loss of habitat. A Total Maximum Daily Load (TMDL) study is underway for Miller Creek with a targeted completion date for 2011. During the life of this permit, it may become necessary to reopen the permit to incorporate conditions relevant to the TMDL.

1.2 Should the completed TMDL indicate the need for any water quality-based limitations and/or monitoring requirements, this permit may be modified, or alternatively revoked and reissued to incorporate controls.

1.3 The operation and maintenance of the Firestone Treatment System is referenced in the Storm Water Ponds Operation and Maintenance Manual dated from July 2004 written by Liesch Consulting Company specific for Miller Hill Mall. The maintenance and scheduled cleaning of the Manhole Filter, Catch Basin Sumps, and Grit Chamber are referenced under Subject(s): Inspection, Maintenance, and Cleaning under Section: Firestone Treatment System. Director of Operations and Maitenance staff are in charge of the cleaning and maintenance.

1.4 The Facility must keep records of worksheets and inspection sheets for a minimum of three years at the Facility for reference. Photographs taken for visual history regarding the inspection of equipment are also to be kept for a minimum of three years.

Chapter 2. Surface Discharge Stations

1. Requirements for Specific Stations

1.1 SD 001: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance.

1.2 SD 002: Submit a monthly DMR monthly by 21 days after the end of each calendar month following permit issuance.

2. Sampling Location

2.1 The South Sediment Pond is designated as Outfall SD 001. The South Sediment Pond is located approximately 267 feet to the southwest of the Miller Hill parking lot, south of the entrance to the Sears store.
Samples for Station SD 001 shall be taken at a point representative of the discharge to Miller Creek.

2.2 The North Sediment Pond is designated as Outfall SD 002. Samples for this station shall be taken at a point representative of the discharge to the drainage ditch.

3. Sampling Frequency

3.1 The permittee shall sample the discharges to surface water at a minimum of once per calendar quarter. At least one sample shall be taken in Spring as representative of a snowmelt event.

3.2 Site observations shall occur on a quarterly basis. At least one inspection/observation per year shall occur during a precipitation and/or major snow melt event.

3.3 If the permittee monitors more frequently than required, the results and the frequency of the additional monitoring shall be reported on the Discharge Monitoring Report form for that reporting period and included in the Annual Stormwater Report.

3.4 A request for decrease in sampling frequency and/or removal of monitoring criteria shall not be submitted until at least two full calendar years have past since the permittee started monitoring and submitting storm water discharge data.

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Chapter 2. Surface Discharge Stations

3. Sampling Frequency

3.5 At the request of the permittee, the MPCA shall re-evaluate the need for storm water monitoring and make a determination consistent with MPCA and TMDL pollutant level data needs.

3.6 The permittee may request a reduction in the monitoring frequency and/or the removal of one or more of the monitoring requirements.

4. Sampling Protocol

4.1 Samples and measurements required by this permit shall be representative of the permitted activity.

4.2 The Permittee shall conduct storm water sampling from all outfalls and/or locations discharging to surface water, including storm sewers which convey storm water to surface waters, in accordance with this permit and the SWPPP.

4.3 Samples should be examined in clear glass or clear plastic container so that all visual monitoring criteria can be observed.

4.4 Samples shall be collected by grab, or by automated sampler, from a discharge resulting from a storm event with at least 0.1 inch of precipitation (defined as a measurable event), provided that the interval since the preceding measurable storm event is at least 72 hours. The 72 hour storm interval is waived when the preceding measurable storm did not yield a measurable discharge, or if the Permittee can document that less than a 72 hour interval for the facility is representative for local storm events during the sampling period.

4.5 COLLECTION OF GRAB SAMPLES BY AUTOMATIC SAMPLER.
The following method shall be used if automatic samplers are used for collecting stormwater for sampling. Programming for collecting grab samples is specific to the type of automatic sampler. All facility personnel who collect stormwater samples using automatic samplers should be properly trained in operation of the sampler before doing so. Several different types of automatic samplers are available for stormwater sampling. However, the following guidelines should be followed when sampling regardless of the type of sampler used. All equipment must be properly cleaned, particularly the tubing and sample containers. Deionized water should be drawn through the sampler to remove any residuals prior to taking samples. Tubing should also be periodically replaced to avoid algae or bacterial growth. Additionally, a distilled/deionized water blank sample should be taken at each outfall sampled to determine if contamination of stormwater samples by the sampling equipment has occurred. Samplers should be used in exact accordance with the manufacturers instructions. All sampler calibration and maintenance data should be kept on site with the SWPPP.

4.6 The permittee shall sample consistent with the requirements of this permit.

4.7 MANUAL GRAB SAMPLE COLLECTION.
Manual grab samples should be collected by inserting a container under or downstream of a discharge with the container opening facing upstream, and with the opening of the container completely immersed under water, whenever possible. Small containers (ideally 250 ml to 750 ml or approximately 8 to 24 ounces in size) are recommended in order to be able to submerse the container opening under water while still collecting an adequate sample size to make a correct visual inspection. In most cases the sample container can be held in hand while the sample is collected. Less accessible outfalls may require the use of poles and buckets to collect grab samples. Take the grab from the horizontal and vertical center of the outfall. If sampling in a channel, (i.e., ditch, trench, rill) avoid stirring up bottom sediments. Avoid touching the inside of the container to prevent contamination. Transfer sample to a clear glass or plastic container if using another container such as a bucket to collect a sample from a less accessible location. If taking samples from multiple outfalls, label containers with outfall identification prior to taking samples. Make sure samples are securely capped until examination.

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Chapter 2. Surface Discharge Stations

4. Sampling Protocol

4.8 Samples may be taken manually by grab method. Automated sampling may also be used to obtain samples. The automatic sampling device may either collect one grab sample during the first 30 minutes of discharge or a series of samples collected throughout the discharge period, combined as a composite sample. Automated sampling over the discharge period may be either flow or time interval composited. When composite, or average for those constituents which cannot be composited, sampling is used the sampling should continue over the full period of discharge, or as close to the full period of discharge as feasible. (Automated composite sampling, either by flow or time interval, is a preferred method for sample collection. Automated composite sampling over the full discharge period provides a better representation of the quality of the total effluent discharged and, in many cases, may lower parameter discharge concentration values.)

5. Surface Discharges

5.1 Floating solids or visible foam shall not be discharged in other than trace amounts.

5.2 Oil or other substances shall not be discharged in amounts that create a visible color film.

5.3 The discharge shall not degrade the aquatic habitat, which includes the waters of the state and stream bed, in any material manner.

5.4 The discharge shall not cause or contribute to a material increase in undesirable slime growths or aquatic plants, including algae.

5.5 All discharges to surface waters shall:
- o Be free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life;
- o Be free of discoloration that causes nuisance or adversely affects beneficial uses;
- o Not contain floating material in amounts that cause nuisance conditions or adversely affect beneficial uses.

5.6 The permittee's discharge shall not seriously impair or endanger the normal fishery and lower aquatic biota upon which it is dependent, nor shall the discharge materially alter the species composition. The propagation or migration of the fish and other biota normally present shall not be prevented or hindered by the permittee's discharge.

5.7 The Permittee shall install and maintain outlet protection measures at the discharge station as necessary to prevent erosion, scouring and/or sediment transport.

5.8 The discharge shall not in any manner render the receiving water unsuitable for recreational activities in and on the water.

5.9 Irrespective of numeric effluent limitations contained herein [or lack thereof], the pollutant levels in the discharge shall not impair the receiving water (Miller Creek) for its designated uses.

6. Discharge Monitoring Reports

6.1 The Permittee shall submit monitoring results for discharges in accordance with the limits and monitoring requirements for these stations. If no discharge occurred during the reporting period, the Permittee shall check the "No Discharge" box on the Discharge Monitoring Reports (DMR).

Chapter 3. Waste Stream Stations

1. Sampling Location

1.1 Samples for Station WS 001 shall be representative of the area serving the second component of the Firestone Treatment System.

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Chapter 3. Waste Stream Stations

2. Sampling Frequency

2.1 Site observations shall occur on a quarterly basis. At least one inspection/observation per year shall occur during a precipitation and/or major snow melt event.

Chapter 4. Land Application Stations

1. Sampling Location

1.1 Pond 1 Sand Filter is identified as LA 001. This designation shall be used for pond observations.

1.2 Pond 2 Sand Filter is identified as LA 002. This designation shall be used for pond observations.

1.3 Pond 3 Sand Filter is identified as LA 003. This designation shall be used for pond observations.

1.4 Pond 4 Sand Filter is identified as LA 004. This designation shall be used for pond observations.

2. Sampling Frequency

2.1 Pond observations shall occur on a quarterly basis. At least one inspection/observation per year shall occur during a precipitation and/or major snow melt event.

Chapter 5. Stormwater Management

1. Authorization

1.1 The Permittee and/or the permittee's authorized representative shall have legal authority to manage the stormwater collection and treatment facilities described herein, including the authority to make capital BMP improvements as necessary and to contract for storm water pond dredging and sediment removal and disposal, parking lot sweepings, etc.

1.2 This permit authorizes the treatment and disposal of storm water limited to the description provided herein.

2. Prohibited Discharges

2.1 This permit does not authorize discharges from sites for which Environmental Assessment Worksheets or Environmental Impact Statements are required, in accordance with Minn. R. ch. 4410, until that environmental review is completed.

2.2 This permit does not authorize the discharge of sewage, wash water, scrubber water, spills, oil, hazardous substances, or equipment/vehicle cleaning and maintenance wastewaters to ditches, wetlands or other surface waters of the state.

3. Stormwater Pollution Prevention Plan

3.1 The SWMP shall include a description of how stockpiled sand and de-icing salt will be managed at the facility to minimize exposure to storm water and snowmelt runoff. Designated locates for salt storage shall be indicated on the site map.

3.2 The Permittee shall develop and/or organize a Storm Water Management Plan. The Storm Water Management Plan shall include at a minimum, all operations and maintenance manuals, a copy of this permit, documentation of training received by appropriate staff persons, a schedule for site sweepings, schedules for sampling and observations, and the stormwater monitoring plan.

3.3 The SWMP sahll include a description of where snow stockpiles will be maintained and how solids in the snow melt from those stockpiles will be handled. Designated locations for snow stockpiles shall be indicated on the site map.

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Chapter 5. Stormwater Management

3. Stormwater Pollution Prevention Plan

3.4 The storm water management plan shall include a site map indicating drainage patterns, the outline of the drainage area specific for each storm water treatment unit [i.e., North and South Sediment ponds, Ponds 1-4 Sand Filters, and the Firestone Treatment system] and the location of all storm water treatment structures. The map or drawing must be of suitable scale and quality to show the required information.

4. Stormwater Monitoring Plan

4.1 The permitting shall develop and implement a Stormwater Monitoring and Sampling Plan.

4.2 At a minimum the Stormwater Monitoring Plan (Plan) shall include:
a. Identification of staff responsible for conducting stormwater sampling and visual inspections.
Identification of each sampling location by its unique identifying number. The permittee shall include the unique identifying numbers on reports kept on-site and those submitted to the MPCA.
b. A discussion on representative sampling including how the Permittee determined the monitoring points.
c. Specific procedures for sample collection and handling.
d. A visual observation checklist.
e. Identification of parameters for analysis, holding times and preservatives, laboratory quantitation levels, and analytical methods, and procedures for sending samples to a laboratory.
f. Procedures for DMR completion, summarization for the annual stormwater reports and submittals to the MPCA.

4.3 Personnel involved in stormwater sampling shall be properly trained to do so and shall also be trained in all facility safety procedures as they apply to stormwater sampling. Staff involved in sampling should:
a. Be familiar with the outfall locations and outfall identification numbers.
b. Be familiar with local rainfall and snowmelt drainage patterns.
c. Know proper procedures for measuring rainfall.
d. Be knowledgeable in proper sample collection and preservation procedures.

Where practicable the same individual should carry out the collection and examination of discharges for the entire permit term.

5. Inspection and Maintenance

5.1 If the findings of a site inspection indicate that BMPs are not meeting the objectives as identified in the Operation and Maintenance Manual [adversely impacting the nearby Miller Creek] corrective actions must be initiated within 30 days and the BMP restored to full operation as soon as field conditions allow.

5.2 The permittee shall indicate the name of the inspector, date and time of the inspection on the inspection form.

5.3 Inspections shall be documented and a copy of all documentation shall remain on the site and be available upon request. The inspection form added as an appendix to this permit may be used for recording inspection results.

5.4 Inspections shall be conducted by appropriately trained personnel at the facility site, as described herein. The purpose of inspections are to: 1) determine whether structural and non-structural BMPs require maintenance or changes, 2) evaluate the completeness and accuracy of the O&M Manual, 3) ensure accumulated sediments will not impede the system's ability to operate effectively.

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Chapter 5. Stormwater Management

5. Inspection and Maintenance

5.5 The following compliance items will be inspected, and documented where appropriate:

a. evaluate the site to determine that the O&M Manual accurately reflects site conditions as described therein, and document any inaccuracies;

b. evaluate the effectiveness of the BMPs and/or treatment components to ensure that they are functioning properly and according to design; and

c. during inspections conducted during precipitation and/or snowmelt events, the permittee shall determine if the runoff is discolored or otherwise visibly contaminated.

5.6 An appropriately trained inspector must, at a minimum, be knowledgeable in storm water pollution prevention goals and activities and the collection and treatment facility's operation and maintenance manual. The inspector shall have had the necessary training to assess conditions at the site that could impact storm water quality and be able to assess the effectiveness of the site's systems of pollutant treatment, removal and/or control.

6. Sedimentation Basin Design and Construction

6.1 Sediments shall be disposed of in a manner which shall not impact receiving water quality.

7. Best Management Practices (BMP)

7.1 The Permittee shall also take all reasonable steps to prevent or control pollutants in the storm water discharges.

7.2 The permittee shall maintain a regular schedule for the clean-out of accumulated sediments. At a minimum, each site shall be inspected in the fall to ensure sufficient capacity for sediment loadings associated with the Spring flush. It is suggested that an annual clean-out occur in the fall prior to freeze-up conditions.

7.3 More stringent controls may be required when necessary to ensure protection of the receiving stream for its designated used.

8. Reporting

8.1 The Permittee shall submit the monitoring results in accordance with the effluent limit sampling and monitoring requirements found on the Limits and Monitoring page. These monitoring results shall be submitted on a Discharge Monitoring Report (DMR) form provided by the MPCA. The information must be recorded in the specified areas on the form and in the units specified

8.2 The Permittee shall, upon request of the Agency, submit within a reasonable time the information and reports that are relevant to compliance with this Permit, including the Storm Water Management Plan, Storm Water Monitoring Plan, Operation & Maintenance Manual(s), inspection/observation reports, original laboratory sheets from analyses conducted on the waste streams, and treatment component plans and specifications.

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Chapter 5. Stormwater Management

9. Records

9.1 Records Retention

1. The Permittee shall retain:
a. A copy of this permit,
b. A copy of the permit coverage letter,
c. Records of all sampling information specified for Sample Documentation,
d. Inspection/Observation reports including documentation specified under the Inspection/visual observation headings of this Chapter.
e. Any other documentation of compliance with permit requirements,
f. All equipment calibration records,
g. All treatment component maintenance records,
h. All original recordings for continuous sampling instrumentation,
i. Copies of all laboratory reports as described in Sampling Plan,
j. Copies of all reports required by this permit,
k. Records of all data used to complete the application for this permit, and
l. Any records that can substantiate compliance with this permit.

9.2 The Permittee shall maintain the following records for the period of permit coverage:

a. dates of inspections;
b. findings of inspections;
c. corrective actions taken;
d. documentation of all changes to the Plan; and,
e. a copy of annual reports.

9.3 The Permittee shall retain the documents onsite for a minimum of three years. The Permittee shall extend the period of records retention during the course of any unresolved litigation regarding the discharge of pollutants by the Permittee, or when requested by the Agency.

10. Notification

10.1 If the Permittee discharges stormwater into a municipal storm sewer, the Permittee shall notify the operator of the municipal storm sewer of the existence of this permit.

11. Definitions

11.1 "Non-stormwater discharge" means any discharge not comprised entirely of stormwater discharges authorized by a NPDES permit.

11.2 "Runoff" means any liquid that drains over land from any part of a facility.

11.3 "Structural BMPs" refers to the installation of devices that will reduce or eliminate pollutants to storm water through installation of permanent structural devices to treat or control runoff. Examples of structural BMPs include but are not limited to installation of storm water diversion berms or channels; sedimentation basins (retention or detention basins); oil/water separators; grit chambers; roofs, awnings or buildings to cover significant material.

11.4 "Best Management Practices" (BMP) means practices to prevent or reduce the pollution of the waters of the state, including schedules of activities, prohibitions of practices, and other management practices and also includes treatment requirements, operating procedures and practices to control plant site runoff, spillage or leaks, sludge, or waste disposal or drainage from material storage, as defined in Minn. Rules pt. 7001.1020, subp. 5.

Examples of BMPs can be found in Protecting Water Quality in Urban Areas, MPCA 1989, and Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices, U.S. EPA 1992.

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Chapter 5. Stormwater Management

11. Definitions

11.5 "Non-structural BMPs" refers to practices that will reduce or eliminate pollutants to storm water and do not require installation of permanent structural devices to treat runoff. Examples of non-structural BMPs include but are not limited to parking lot and street sweeping; employee training; changing material handling practices; installation of silt fence, minimizing materials exposed to storm water through inventory reduction, tarping, or moving of material indoors.

12. Good Housekeeping & Control Measures

12.1 The permittee shall set up a schedule for parking lot sweepings to minimize sediment levels in the storm waters discharged to the treatment units. Sweeping shall occur at a minimum frequency of 1x/week during non-snow covered periods.

12.2 The permittee shall develop and implement a lessee training plan or otherwise inform lessees of preventive measures and good housekeeping for the maintenance of a clean, orderly facility. Where appropriate, specific handling procedures, storage requirements, spill containment and cleanup procedures and how to dispose of clean-up materials shall be identified. Dumpsters shall not be overloaded. To the extent practicable, loading docks shall have overhangs or door skirts that enclose the trailer end.

12.3 The Permittee shall identify the areas at the site that, due to topography, land disturbance (e.g., construction, landscaping, site grading), or other factors, have a potential for soil erosion. For such identified areas, the Permittee shall implement structural, vegetative, and/or stabilization BMPs to prevent or control on-site erosion and sedimentation.

12.4 The Permittee shall draft and implement a preventive maintenance program that includes regular inspecting, testing, maintaining and repairing of all components of the stormwater collection and treatment system.

13. Sampling Protocol

13.1 The Permittee shall collect samples from each stormwater discharge outfall. Each sample shall be analyzed for all parameters specified in the Limits and Monitoring page for that particular sampling point.

13.2 Samples shall be collected from discharges resulting from a major storm and/or snow melt event during Spring (Apr-May-Jun calendar quarter). The permit shall attempt to acquire a grab sample from the pond during the first sixty minutes of discharge, or as soon as practical thereafter but not to exceed 2.25 hours. If collection during this time frame is impracticable (discharge begins after hours and/or the permittee is otherwise unaware of the discharge start time), such conditions shall be so noted on the FMR form. Failure to sample within the first 2.25 hours of the onset of a discharge is not considered a permit violation.

13.3 For storm events samples, the Permittee shall record the date and duration (in hours) of the event, rainfall (or equivalent snow melt) amount or estimates (in inches) of the event, the approximate duration since the end of the last 0.1 inch or greater storm event which generated runoff (if <2 weeks, the permittee may report n/a if >2 weeks). This information shall be included on the sampling record and maintained at the site. This information may also be reported on the DMR form. The permittee shall have the option of maintaining a rain gauge on-site or utilize the nearest National Weather Service rain gauge station. Any gauging station used shall be located within ten miles of the retail shopping complex.

14. Site Inspection & Visual Monitoring

14.1 The permittee shall establish and implement a site inspection schedule for effective management of the treatment systems. The permittee shall conduct quarterly inspections of the treatment units. At least one inspection per year shall be conducted during a major precipitation event [event that is >0.1 inch in magnitude and that has occurred at leasts 72 hours from the last 0.1-inch or greater storm event which has generated runoff] and at least one shall be conducted during a major snowmelt event [snowmelt which generates runoff considered to be equivalent to or greater than a 0.1-inch precipitation event].

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Chapter 5. Stormwater Management

14. Site Inspection & Visual Monitoring

14.2 For each visual inspection conducted, the permittee shall record the following information in the site log: sample date and time, sample location (using the alphanumeric site locations established herein), method of sampling, and individual(s) who performed the sampling or made the observations.

14.3 Visual examinations of stormwater discharges must be performed once per calendar quarter. If no measurable storm or snowmelt event occurs during the calendar quarter, the permittee is excused from visual sampling of effluent quality, however visual observations of the premises and treatement components shall continue.

14.4 During the dry period, the Permittee shall perform visual monitoring for presence of water in all stormwater conveyance and collection systems. If water is present, the Permittee shall identify the source of the water and if other than uncontaminated groundwater inflow, notify the MPCA staff identified on the permit cover page and eliminate the discharge if reasonably possible.

14.5 SAMPLE EXAMINATION.
Visual examination of all grab samples collected must be performed within the first sixty (60) minutes (or as soon thereafter as practicable, but not to exceed 2.25 hours) of when the runoff or snowmelt begins discharging from the facility. Collect the samples and bring them to a well lit indoor area. Pour each sample into a separate 1 L polycarbonate plastic graduated Imhoff cone*. The cone should have graduations that allow volume measurement to the nearest milliliter. Record the total sample volume to the nearest milliliter on the visual monitoring form. Examine the samples for the following criteria according to the instructions provided with the visual monitoring form: Foam, odor, clarity, floating solids, suspended solids, color, oil sheen, settled solids, and any other obvious indicators of stormwater pollution. Read the settled solids 1 hour after pouring the sample into the cone, to assure that all solids are settled out of the water. Settled solids in the bottom of the cone should be measured to the nearest milliliter. It is also recommended that a sample of tap water be collected in the same type of container used to collect the samples and used as a comparison to aid in evaluating the samples for the criteria stated above.
*Note: Clear polycarbonate plastic Imhoff cones are available from several scientific supply companies.

14.6 SAMPLE DATA RECORDING.
Record all sample data on the visual monitoring form after examining the sample for all of the criteria listed. The form should include the examination date and time, examination personnel, the nature of the discharge (i.e., rain or snowmelt), identification of outfall sampled, quality of the stormwater discharge (including observations of color, odor, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and any other obvious indicators of stormwater pollution), and probable sources of any observed contamination. In the field notes record the time rainfall began, time of sampling, how the sample was collected, name of the sampler, any unusual circumstances that might affect sampling results, etc. The permittee must sign and certify the documentation in accordance with 40 CFR 122.22(d). All visual examination reports must be maintained on site with the SWPPP.

14.7 During precipitation/snow melt events, the permittee shall include the following as part of the visual monitoring/site inspection:

Observe for any oil sheen, floating material or other foreign material in the discharge;
Describe clarity of discharge;
Check for any noticeable odor or color;
Take a sample of the stormwater in a clear container and note any settling in the sample after a half hour;
Inspect source control best management practices (BMPs);
Note any obvious sources of pollution (e.g., soil erosion);
Note any changes in operations or storage of materials that might impact stormwater.

14.8 The permittee shall make a visual examination of ponds contents twice per calendar year, preferably in the Spring and the Fall. The permittee is excused from visual sampling of the pond contents for the ponds 1-4 sand filters during periods in which all collected storm water has infiltrated, or when the pond is blanketed with snow. However, the permittee shall note the condition of the pond bed and to the extent reasonable, record similar observations for the pond bed as recorded for pond contents.

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Chapter 5. Stormwater Management

14. Site Inspection & Visual Monitoring

14.9 All sampling/observation data should be reported onto a visual monitoring form. In performing the visual monitoring, the permittee shall observe the quality of the pond contents with respect to colour, clarity, floating solids, settled solids, suspended solids, foam, oil sheen, and any other obvious indicators of storm water pollution.

Chapter 6. Total Facility Requirements

1. General Requirements

General Requirements

1.1 Incorporation by Reference. The following applicable federal and state laws are incorporated by reference in this permit, are applicable to the Permittee, and are enforceable parts of this permit: 40 CFR pts. 122.41, 122.42, 136, 403 and 503; Minn. R. pts. 7001, 7041, 7045, 7050, 7052, 7053, 7060, and 7080; and Minn. Stat. Sec. 115 and 116.

1.2 Permittee Responsibility. The Permittee shall perform the actions or conduct the activity authorized by the permit in compliance with the conditions of the permit and, if required, in accordance with the plans and specifications approved by the Agency. (Minn. R. 7001.0150, subp. 3, item E)

1.3 Toxic Discharges Prohibited. Whether or not this permit includes effluent limitations for toxic pollutants, the Permittee shall not discharge a toxic pollutant except according to Code of Federal Regulations, Title 40, sections 400 to 460 and Minnesota Rules 7050, 7052, 7053 and any other applicable MPCA rules. (Minn. R. 7001.1090, subp.1, item A)

1.4 Nuisance Conditions Prohibited. The Permittee's discharge shall not cause any nuisance conditions including, but not limited to: floating solids, scum and visible oil film, acutely toxic conditions to aquatic life, or other adverse impact on the receiving water. (Minn. R. 7050.0210 subp. 2)

1.5 Property Rights. This permit does not convey a property right or an exclusive privilege. (Minn. R. 7001.0150, subp. 3, item C)

1.6 Liability Exemption. In issuing this permit, the state and the MPCA assume no responsibility for damage to persons, property, or the environment caused by the activities of the Permittee in the conduct of its actions, including those activities authorized, directed, or undertaken under this permit. To the extent the state and the MPCA may be liable for the activities of its employees, that liability is explicitly limited to that provided in the Tort Claims Act. (Minn. R. 7001.0150, subp. 3, item O)

1.7 The MPCA's issuance of this permit does not obligate the MPCA to enforce local laws, rules, or plans beyond what is authorized by Minnesota Statutes. (Minn. R. 7001.0150, subp.3, item D)

1.8 Liabilities. The MPCA's issuance of this permit does not release the Permittee from any liability, penalty or duty imposed by Minnesota or federal statutes or rules or local ordinances, except the obligation to obtain the permit. (Minn. R. 7001.0150, subp.3, item A)

1.9 The issuance of this permit does not prevent the future adoption by the MPCA of pollution control rules, standards, or orders more stringent than those now in existence and does not prevent the enforcement of these rules, standards, or orders against the Permittee. (Minn. R. 7001.0150, subp.3, item B)

1.10 Severability. The provisions of this permit are severable and, if any provisions of this permit or the application of any provision of this permit to any circumstance are held invalid, the application of such provision to other circumstances and the remainder of this permit shall not be affected thereby.

1.11 Compliance with Other Rules and Statutes. The Permittee shall comply with all applicable air quality, solid waste, and hazardous waste statutes and rules in the operation and maintenance of the facility.

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Chapter 6. Total Facility Requirements

1. General Requirements

1.12 Inspection and Entry. When authorized by Minn. Stat. Sec. 115.04; 115B.17, subd. 4; and 116.091, and upon presentation of proper credentials, the agency, or an authorized employee or agent of the agency, shall be allowed by the Permittee to enter at reasonable times upon the property of the Permittee to examine and copy books, papers, records, or memoranda pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit; and to conduct surveys and investigations, including sampling or monitoring, pertaining to the construction, modification, or operation of the facility covered by the permit or pertaining to the activity covered by the permit. (Minn. R. 7001.0150, subp.3, item I)

1.13 Control Users. The Permittee shall regulate the users of its wastewater treatment facility so as to prevent the introduction of pollutants or materials that may result in the inhibition or disruption of the conveyance system, treatment facility or processes, or disposal system that would contribute to the violation of the conditions of this permit or any federal, state or local law or regulation.

Sampling

1.14 Representative Sampling. Samples and measurements required by this permit shall be conducted as specified in this permit and shall be representative of the discharge or monitored activity. (40 CFR 122.41 (j)(1))

1.15 Additional Sampling. If the Permittee monitors more frequently than required, the results and the frequency of monitoring shall be reported on the Discharge Monitoring Report (DMR) or another MPCA-approved form for that reporting period. (Minn. R. 7001.1090, subp. 1, item E)

1.16 Certified Laboratory. A laboratory certified by the Minnesota Department of Health shall conduct analyses required by this permit. Analyses of dissolved oxygen, pH, temperature and total residual oxidants (chlorine, bromine) do not need to be completed by a certified laboratory but shall comply with manufacturers specifications for equipment calibration and use. (Minn. Stat. Sec. 144.97 through 144.98 and Minn. R. 4740.2010 and 4740.2050 through 4740.2120) (Minn. R. 4740.2010 and 4740.2050 through 2120)

1.17 Sample Preservation and Procedure. Sample preservation and test procedures for the analysis of pollutants shall conform to 40 CFR Part 136 and Minn. R. 7041.3200.

1.18 Equipment Calibration: Flow meters, pumps, flumes, lift stations or other flow monitoring equipment used for purposes of determining compliance with permit shall be checked and/or calibrated for accuracy at least twice annually. (Minn. R. 7001.0150, subp. 2, items B and C)

1.19 Maintain Records. The Permittee shall keep the records required by this permit for at least three years, including any calculations, original recordings from automatic monitoring instruments, and laboratory sheets. The Permittee shall extend these record retention periods upon request of the MPCA. The Permittee shall maintain records for each sample and measurement. The records shall include the following information (Minn. R. 7001.0150, subp. 2, item C):

a. The exact place, date, and time of the sample or measurement;

b. The date of analysis;

c. The name of the person who performed the sample collection, measurement, analysis, or calculation; and

d. The analytical techniques, procedures and methods used; and

e. The results of the analysis.

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Chapter 6. Total Facility Requirements

1. General Requirements

1.20 Completing Reports. The Permittee shall submit the results of the required sampling and monitoring activities on the forms provided, specified, or approved by the MPCA. The information shall be recorded in the specified areas on those forms and in the units specified. (Minn. R. 7001.1090, subp. 1, item D; Minn. R. 7001.0150, subp. 2, item B)

Required forms may include:

Supplemental Report Form (Supplemental)
Individual values for each sample and measurement must be recorded on the Supplemental which, if required, will be provided by the MPCA. Supplementals shall be submitted with the appropriate DMRs. You may design and use your own Supplemental; however it must be approved by the MPCA. Note: Required Summary information MUST also be recorded on the DMR. Summary information that is submitted ONLY on the Supplemental does not comply with the reporting requirements.

1.21 Submitting Reports. DMRs and Supplementals shall be submitted to:

MPCA
Attn: Discharge Monitoring Reports
520 Lafayette Road North
St. Paul, Minnesota 55155-4194.

DMRs and Supplementals shall be postmarked by the 21st day of the month following the sampling period or as otherwise specified in this permit. A DMR shall be submitted for each required station even if no discharge occurred during the reporting period. (Minn. R. 7001.0150, subps. 2.B and 3.H)

Other reports required by this permit shall be postmarked by the date specified in the permit to:

MPCA
Attn: WQ Submittals Center
520 Lafayette Road North
St. Paul, Minnesota 55155-4194

1.22 Incomplete or Incorrect Reports. The Permittee shall immediately submit an amended report or DMR to the MPCA upon discovery by the Permittee or notification by the MPCA that it has submitted an incomplete or incorrect report or DMR. The amended report or DMR shall contain the missing or corrected data along with a cover letter explaining the circumstances of the incomplete or incorrect report. (Minn. R. 7001.0150 subp. 3, item G)

1.23 Required Signatures. All DMRs, forms, reports, and other documents submitted to the MPCA shall be signed by the Permittee or the duly authorized representative of the Permittee. Minn. R. 7001.0150, subp. 2, item D. The person or persons that sign the DMRs, forms, reports or other documents must certify that he or she understands and complies with the certification requirements of Minn. R. 7001.0070 and 7001.0540, including the penalties for submitting false information. Technical documents, such as design drawings and specifications and engineering studies required to be submitted as part of a permit application or by permit conditions, must be certified by a registered professional engineer. (Minn. R. 7001.0540)

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Chapter 6. Total Facility Requirements

1. General Requirements

1.24 Detection Level. The Permittee shall report monitoring results below the reporting limit (RL) of a particular instrument as "<" the value of the RL. For example, if an instrument has a RL of 0.1 mg/L and a parameter is not detected at a value of 0.1 mg/L or greater, the concentration shall be reported as "<0.1 mg/L." "Non-detected," "undetected," "below detection limit," and "zero" are unacceptable reporting results, and are permit reporting violations. (Minn. R. 7001.0150, subp. 2, item B)

Where sample values are less than the level of detection and the permit requires reporting of an average, the Permittee shall calculate the average as follows:

a. If one or more values are greater than the level of detection, substitute zero for all nondetectable values to use in the average calculation.

b. If all values are below the level of detection, report the averages as "<" the corresponding level of detection.

c. Where one or more sample values are less than the level of detection, and the permit requires reporting of a mass, usually expressed as kg/day, the Permittee shall substitute zero for all nondetectable values. (Minn. R. 7001.0150, subp. 2, item B)

1.25 Records. The Permittee shall, when requested by the Agency, submit within a reasonable time the information and reports that are relevant to the control of pollution regarding the construction, modification, or operation of the facility covered by the permit or regarding the conduct of the activity covered by the permit. (Minn. R. 7001.0150, subp. 3, item H)

1.26 Confidential Information. Except for data determined to be confidential according to Minn. Stat. Sec. 116.075, subd. 2, all reports required by this permit shall be available for public inspection. Effluent data shall not be considered confidential. To request the Agency maintain data as confidential, the Permittee must follow Minn. R. 7000.1300.

Noncompliance and Enforcement

1.27 Subject to Enforcement Action and Penalties. Noncompliance with a term or condition of this permit subjects the Permittee to penalties provided by federal and state law set forth in section 309 of the Clean Water Act; United States Code, title 33, section 1319, as amended; and in Minn. Stat. Sec. 115.071 and 116.072, including monetary penalties, imprisonment, or both. (Minn. R. 7001.1090, subp. 1, item B)

1.28 Criminal Activity. The Permittee may not knowingly make a false statement, representation, or certification in a record or other document submitted to the Agency. A person who falsifies a report or document submitted to the Agency, or tampers with, or knowingly renders inaccurate a monitoring device or method required to be maintained under this permit is subject to criminal and civil penalties provided by federal and state law. (Minn. R. 7001.0150, subp.3, item G., 7001.1090, subps. 1, items G and H and Minn. Stat. Sec. 609.671)

1.29 Noncompliance Defense. It shall not be a defense for the Permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit. (40 CFR 122.41(c))

1.30 Effluent Violations. If sampling by the Permittee indicates a violation of any discharge limitation specified in this permit, the Permittee shall immediately make every effort to verify the violation by collecting additional samples, if appropriate, investigate the cause of the violation, and take action to prevent future violations. Violations that are determined to pose a threat to human health or a drinking water supply, or represent a significant risk to the environment shall be immediately reported to the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 (toll free) or (651)649-5451 (metro area). In addition, you may also contact the MPCA during business hours. Otherwise the violations and the results of any additional sampling shall be recorded on the next appropriate DMR or report.

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Chapter 6. Total Facility Requirements

1. General Requirements

1.31 Unauthorized Releases of Wastewater Prohibited. Except for conditions specifically described in Minn. R. 7001.1090, subp. 1, items J and K, all unauthorized bypasses, overflows, discharges, spills, or other releases of wastewater or materials to the environment, whether intentional or not, are prohibited. However, the MPCA will consider the Permittee's compliance with permit requirements, frequency of release, quantity, type, location, and other relevant factors when determining appropriate action. (40 CFR 122.41 and Minn. Stat. Sec 115.061)

1.32 Discovery of a release. Upon discovery of a release, the Permittee shall:

a. Take all reasonable steps to immediately end the release.

b. Notify the Minnesota Department of Public Safety Duty Officer at 1(800)422-0798 (toll free) or (651)649-5451 (metro area) immediately upon discovery of the release. In addition, you may also contact the MPCA during business hours at 1(800) 657-3864.

c. Recover as rapidly and as thoroughly as possible all substances and materials released or immediately take other action as may be reasonably possible to minimize or abate pollution to waters of the state or potential impacts to human health caused thereby. If the released materials or substances cannot be immediately or completely recovered, the Permittee shall contact the MPCA. If directed by the MPCA, the Permittee shall consult with other local, state or federal agencies (such as the Minnesota Department of Natural Resources and/or the Wetland Conservation Act authority) for implementation of additional clean-up or remediation activities in wetland or other sensitive areas.

d. Collect representative samples of the release. The Permittee shall sample the release for parameters of concern immediately following discovery of the release. The Permittee may contact the MPCA during business hours to discuss the sampling parameters and protocol. In addition, Fecal Coliform Bacteria samples shall be collected where it is determined by the Permittee that the release contains or may contain sewage. If the release cannot be immediately stopped, the Permittee shall consult with MPCA regarding additional sampling requirements. Samples shall be collected at least, but not limited to, two times per week for as long as the release continues.

e. Submit the sampling results as directed by the MPCA. At a minimum, the results shall be submitted to the MPCA with the next DMR.

1.33 Upset Defense. In the event of temporary noncompliance by the Permittee with an applicable effluent limitation resulting from an upset at the Permittee's facility due to factors beyond the control of the Permittee, the Permittee has an affirmative defense to an enforcement action brought by the Agency as a result of the noncompliance if the Permittee demonstrates by a preponderance of competent evidence:

a. The specific cause of the upset;

b. That the upset was unintentional;

c. That the upset resulted from factors beyond the reasonable control of the Permittee and did not result from operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or increases in production which are beyond the design capability of the treatment facilities;

d. That at the time of the upset the facility was being properly operated;

e. That the Permittee properly notified the Commissioner of the upset in accordance with Minn. R. 7001.1090, subp. 1, item I; and

f. That the Permittee implemented the remedial measures required by Minn. R. 7001.0150, subp. 3, item J.

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Chapter 6. Total Facility Requirements

1. General Requirements

1.34 The Permittee shall at all times properly operate and maintain the facilities and systems of treatment and control, and the appurtenances related to them which are installed or used by the Permittee to achieve compliance with the conditions of the permit. Proper operation and maintenance includes effective performance, adequate funding, adequate operator staffing and training, and adequate laboratory and process controls, including appropriate quality assurance procedures. The Permittee shall install and maintain appropriate backup or auxiliary facilities if they are necessary to achieve compliance with the conditions of the permit and, for all permits other than hazardous waste facility permits, if these backup or auxiliary facilities are technically and economically feasible Minn. R. 7001.0150. subp. 3, item F.

1.35 In the event of a reduction or loss of effective treatment of wastewater at the facility, the Permittee shall control production or curtail its discharges to the extent necessary to maintain compliance with the terms and conditions of this permit. The Permittee shall continue this control or curtailment until the wastewater treatment facility has been restored or until an alternative method of treatment is provided. (Minn. R. 7001.1090, subp. 1, item C)

1.36 Solids Management. The Permittee shall properly store, transport, and dispose of biosolids, septage, sediments, residual solids, filter backwash, screenings, oil, grease, and other substances so that pollutants do not enter surface waters or ground waters of the state. Solids should be disposed of in accordance with local, state and federal requirements. (40 CFR 503 and Minn. R. 7041 and applicable federal and state solid waste rules)

1.37 Scheduled Maintenance. The Permittee shall schedule maintenance of the treatment works during non-critical water quality periods to prevent degradation of water quality, except where emergency maintenance is required to prevent a condition that would be detrimental to water quality or human health. (Minn. R. 7001.0150. subp. 3, item F and Minn. R. 7001.0150. subp. 2, item B)

1.38 Control Tests. In-plant control tests shall be conducted at a frequency adequate to ensure compliance with the conditions of this permit. (Minn. R. 7001.0150. subp. 3, item F and Minn. R. 7001.0150. subp. 2, item B)

Changes to the Facility or Permit

1.39 Permit Modifications. No person required by statute or rule to obtain a permit may construct, install, modify, or operate the facility to be permitted, nor shall a person commence an activity for which a permit is required by statute or rule until the Agency has issued a written permit for the facility or activity. (Minn. R. 7001.0030)

Permittees that propose to make a change to the facility or discharge that requires a permit modification must follow Minn. R. 7001.0190. If the Permittee cannot determine whether a permit modification is needed, the Permittee must contact the MPCA prior to any action. It is recommended that the application for permit modification be submitted to the MPCA at least 180 days prior to the planned change.

1.40 Construction. No construction shall begin until the Permittee receives written approval of plans and specifications from the MPCA (Minn. Stat. Sec. 115.03(f)).

Plans, specifications and MPCA approval are not necessary when maintenance dictates the need for installation of new equipment, provided the equipment is the same design size and has the same design intent. For instance, a broken pipe, lift station pump, aerator, or blower can be replaced with the same design-sized equipment without MPCA approval.

If the proposed construction is not expressly authorized by this permit, it may require a permit modification. If the construction project requires an Environmental Assessment Worksheet under Minn. R. 4410, no construction shall begin until a negative declaration is issued and all approvals are received or implemented.

1.41 Report Changes. The Permittee shall give advance notice as soon as possible to the MPCA of any substantial changes in operational procedures, activities that may alter the nature or frequency of the discharge, and/or material factors that may affect compliance with the conditions of this permit. (Minn. R. 7001.0150, subp. 3, item M)

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Chapter 6. Total Facility Requirements

1. General Requirements

1.42 Chemical Additives. The Permittee shall receive prior written approval from the MPCA before increasing the use of a chemical additive authorized by this permit, or using a chemical additive not authorized by this permit, in quantities or concentrations that have the potential to change the characteristics, nature and/or quality of the discharge.

The Permittee shall request approval for an increased or new use of a chemical additive at least 60 days, or as soon as possible, before the proposed increased or new use.

This written request shall include at least the following information for the proposed additive:

a. The process for which the additive will be used;
b. Material Safety Data Sheet (MSDS) which shall include aquatic toxicity, human health, and environmental fate information for the proposed additive;
c. A complete product use and instruction label;
d. The commercial and chemical names and Chemical Abstract Survey (CAS) number for all ingredients in the additive (If the MSDS does not include information on chemical composition, including percentages for each ingredient totaling to 100%, the Permittee shall contact the supplier to have this information provided); and
e. The proposed method of application, application frequency, concentration, and daily average and maximum rates of use.

Upon review of the information submitted regarding the proposed chemical additive, the MPCA may require additional information be submitted for consideration. This permit may be modified to restrict the use or discharge of a chemical additive and include additional influent and effluent monitoring requirements.

Approval for the use of an additive shall not justify the exceedance of any effluent limitation nor shall it be used as a defense against pollutant levels in the discharge causing or contributing to the violation of a water quality standard. (Minn. R. 7001.0170)

1.43 MPCA Initiated Permit Modification, Suspension, or Revocation. The MPCA may modify or revoke and reissue this permit pursuant to Minn. R. 7001.0170. The MPCA may revoke without reissuance this permit pursuant to Minn. R. 7001.0180.

1.44 TMDL Impacts. Facilities that discharge to an impaired surface water, or to a watershed or drainage basin that contains impaired waters, may be required, at some future date, to comply with additional permits, or permit requirements, including additional restriction or relaxation of limits and monitoring as authorized by the CWA 303(d)(4)(A)) and 40 CFR 122.44.l.2.i, based on the conclusions of any applicable US EPA approved Total Maximum Daily Load (TMDL) studies, their associated implementation plans or additional sampling or monitoring.

1.45 Permit Transfer. The permit is not transferable to any person without the express written approval of the Agency after compliance with the requirements of Minn. R. 7001.0190. A person to whom the permit has been transferred shall comply with the conditions of the permit. (Minn. R., 7001.0150, subp. 3, item N)

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Chapter 6. Total Facility Requirements

1. General Requirements

1.46 Facility Closure. The Permittee is responsible for closure and post-closure care of the facility. The Permittee shall notify the MPCA of a significant reduction or cessation of the activities described in this permit at least 180 days before the reduction or cessation. The MPCA may require the Permittee to provide to the MPCA a facility Closure Plan for approval.

Facility closure that could result in a potential long-term water quality concern, such as the ongoing discharge of wastewater to surface or ground water, may require a permit modification or reissuance.

The MPCA may require the Permittee to establish and maintain financial assurance to ensure performance of certain obligations under this permit, including closure, post-closure care and remedial action at the facility. If financial assurance is required, the amount and type of financial assurance, and proposed modifications to previously MPCA-approved financial assurance, shall be approved by the MPCA. (Minn. Stat. Sec. 116.07, subd. 4)

1.47 Permit Reissuance. If the Permittee desires to continue permit coverage beyond the date of permit expiration, the Permittee shall submit an application for reissuance at least 180 days before permit expiration. If the Permittee does not intend to continue the activities authorized by this permit after the expiration date of this permit, the Permittee shall notify the MPCA in writing at least 180 days before permit expiration.

If the Permittee has submitted a timely application for permit reissuance, the Permittee may continue to conduct the activities authorized by this permit, in compliance with the requirements of this permit, until the MPCA takes final action on the application, unless the MPCA determines any of the following (Minn. R. 7001.0040 and 7001.0160):

a. The Permittee is not in substantial compliance with the requirements of this permit, or with a stipulation agreement or compliance schedule designed to bring the Permittee into compliance with this permit;

b. The MPCA, as a result of an action or failure to act by the Permittee, has been unable to take final action on the application on or before the expiration date of the permit;

c. The Permittee has submitted an application with major deficiencies or has failed to properly supplement the application in a timely manner after being informed of deficiencies.

Appendix D

Design Workshop Summary and Dot-mocracy Exercise Results

A two half-day workshop was jointly hosted by the South St. Louis Soil & Water Conservation District (SSLSWCD), Simon Property Group (SPG), and Barr Engineering Co. The purpose of the design workshop was to solicit stakeholder feedback on green infrastructure design features, educational goals, artistic elements, and potential partnering opportunities. A formal electronic invitation was sent out to relevant personnel within each hosting organization, the Regional Stormwater Protection Team (RSPT), and other key decision-makers at a variety of organizations/agencies. RSPT is an information networking task force of agencies and jurisdictions within the Duluth-Superior (Twin Ports) area that is comprised of approximately 85 individuals. Table 1 provides a list of workshop participants.

Table 1. Design workshop participants

Name	Organization
Katie Altrichter	Simon Property Group/Miller Hill Mall
Dave Danielson	Simon Property Group/Miller Hill Mall
Machelle Kendrick	Simon Property Group/Miller Hill Mall
Colin Bates	Simon Property Group/Miller Hill Mall
Kate Kubiak	South St. Louis Soil and Water Conservation District
Alice Yonke	South St. Louis Soil and Water Conservation District
Jeff Lee	Barr Engineering Company
Erin Anderson Wenz	Barr Engineering Company
Heather Wright Wendel	Barr Engineering Company
Fred Rozumalski	Barr Engineering Company
Kurt Leuthold	Barr Engineering Company
Matt Kumka	Barr Engineering Company
Brendan Dougherty	Barr Engineering Company
Tom Johnson	City of Duluth
Adam Fulton	City of Hermantown
Jesse Schomberg	Minnesota Sea Grant
Andrew Slade	Minnesota Environmental Partnership
Andrea Crouse	Natural Resources Research Institute (NRRI)
Rich Axler	Natural Resources Research Institute (NRRI)
Tiffany Sprague	UMD (MS candidate)/NRRI/AMI
Glenn Merrick	Lake Superior College

The goals of the workshop were to 1) generate excitement and interest about implementing green infrastructure at Miller Hill Mall, 2) obtain stakeholder feedback about partnerships for funding project implementation, 3) assess the types of features that are of most interest to stakeholders (both temperature reducing best management practices (BMPs) and educational features), and 4) disseminate information about the Mall site as well as the opportunities and constraints that will affect the ultimate design.

Day 1 (June 3, 2015) of the workshop was held from 1:00 pm until 4:30 pm at the Miller Hill Mall property. The three host organizations gave brief presentations as follows:

1. SPG/Miller Hill Mall – Katie Altrichter (Mall manager) provided an overview of her organization, their environmental goals/priorities, and key insights/constraints into the operation and interests of the Mall for participating in this project

2. SSLSWCD – Kate Kubiak (Conservation Specialist) provided background information on the temperature Total Maximum Daily Load (TMDL) study and findings for Miller Creek, information on project funding, and her organizations role in the project
3. Barr – Erin Anderson Wenz (Senior Water Resources Engineer) provided an description of the Mall site and existing stormwater features, an overview of the temperature modeling, and information on green infrastructure and its role in reducing stormwater temperature

Following the presentations, participants were engaged to provide their observations/knowledge of the Mall or commercial region, the TMDL study, and/or Miller Creek/brook trout. The discussion also included questions by participants, which was followed by a break that allowed for informal interactions and side-discussions of key items that were brought up during the presentation.

A site walk was organized to visit each of the existing stormwater features as well as provide an opportunity for participants to view the creek as well as the general parking lot area. During the site walk specific functions of each stormwater feature were discussed as well as their potential impact on stormwater runoff (in terms of temperature as well as other water quality considerations).

An optional happy hour was hosted by Barr at a restaurant within the Mall that was attended by an assortment of workshop participants.

Day 2 (June 4, 2015) was hosted at Barr's Duluth office from 9:00 am until 12:30 pm. To kick off the workshop activities, participants were first asked to identify their goals for the project based on of their perspective as a professional or citizen in the region. Specific ideas were identified and written on a flipchart and three pages of ideas were posted on the wall. Each participant was then given three dots to place next to their most important goals (via a "Dot-mocracy" exercise).

Prior to splitting into three smaller groups, each participant was given a notecard as asked to imagine that their ideal vision for this project at Miller Hill Mall was made a reality. Then, based on their vision, write down ideas on the notecard of what specifically the Mall would look like.

In the small groups (see Table 2), each participant was asked to read out loud or describe the vision they wrote on their notecard. Each group then moved into a "brainsprinting" exercise where participants each were given a sheet of paper with a table that provided a space for their name followed by three blank spaces. Participants were asked to think about what they would like people to learn or experience when they come to Miller Hill Mall and write down three concise ideas in one minute or less. After each minute, participants passed their sheets to their neighbor, reviewed the previous ideas, and added three additional ideas that built off of the other listed ideas.

Table 2. Small brainstorming groups (with Barr facilitators in bold)

Erin	**Fred**	**Heather**
Brendan	Kurt	Matt
Dave	Kate	Jesse
Rich	Katie	Andrew
Glenn	Adam	Alice
Machelle	Tom	Jeff
	Andrea	

Following the brainsprinting exercise, each group discussed and recorded ideas of a variety of features related to green infrastructure, education, art, transportation infrastructure, community access, etc. on a site plan. During a working lunch, each group had a speaker who presented their ideas for a discussion amongst the larger group.

The workshop was concluded by a group discussion of funding ideas and potential project partners (including individuals or agencies/organizations) that were not present.

Dot-mocracy Exercise

Top 5 goals of stormwater management plan/features:

1. Aesthetics
2. Education
3. Reduce runoff (temperature)
4. Connection to Miller Creek
5. Public art

Dot Voting

- **#3 Reduce runoff (temperature) – 7 (9 total)**
  - Serve as demonstration project **– 1**
  - Delist Miller Creek **– 1**
- Reduce sediment
- Reduce chlorides and E. coli
- Increase cold water assemblage
- Increase positive customer experience
  - Aesthetic
  - Community involvement **– 1**
- **#1 Aesthetic – 5 (12 total)**
  - Well-manicured **– 1**
  - Balanced
  - Maintainable
  - Trees appropriately placed (many) **– 4**
  - Sense of arrival **– 2**
- **#4 Connection to Miller Creek – 8**
  - Make invisible visible
  - Public access
- Safety – lost children
- Outdoor public green space away from Lake Superior **– 1**
- Walkability **– 2**
  - Within parking lot
  - Miller Hill Corridor
  - Decrease pedestrian-car conflicts
- Farmer's Market **– 2**
  - Get people inside
  - An experience
  - New tenants (unclear whether this was written for Farmer's Market or New Clientele)
- New clientele
- ~~Dark side~~
- Decrease speed on exterior ring road
- Drop-offs at each entry
- Rainwater harvesting and use – toilets, car wash
- **#2 Education – 7 (10 total)**
  - Fountain area could be an education site
  - Live stream video of the creek **– 1**
  - Bus waiting areas
  - Plants + hardscape + landscape associated with the north shore ecology **– 2**
- **#5 Public art – 4**
- Monitor the effectiveness of the Mall's water practices
- Proactive communication/PR
- Green roof pilot project **– 2**

Appendix E

Typical Maintenance Activities for Green Infrastructure BMPs Recommended for Miller Hill Mall

Typical Maintenance Activities for Rain Gardens

- Yearly inspections each spring, monitoring for signs of erosion, plant loss, disease, other damage
- Removal of accumulated sediment and trash from sump manholes, splashblock inlets and other structures
- Pest control as necessary
- Plant replacement as necessary
- Weeding as needed, monthly during first growing season to allow plants to establish
- Replacing mulch as needed to maintain a 3-inch depth across the rain garden (to hold moisture and inhibit weed growth)
- Winter pruning of trees

Typical Maintenance Activities for Tree Trenches

- Yearly inspections each spring, monitoring for signs of erosion, tree loss, disease, other damage
- Removal of accumulated sediment and trash from sump manholes, splashblock inlets and other structures
- Pest control as necessary
- Tree replacement as necessary
- Weeding as needed, monthly during first growing season to allow plants to establish
- Regular tree watering (via gator bags) for the first 2 years of growth
- Fertilizing trees in spring and late summer for the first 2 years of growth
- Winter pruning of trees

Typical Maintenance Activities for Porous Pavers

- Yearly inspections, looking for sinking pavers, loose pavers, broken or missing pavers- replace as necessary
- Vacuum sweeping in spring (after snowmelt) and fall (after leaves have fallen)
- Once pavers become clogged (likely after several years), pavers may need to be completely picked up, sediment removed, pavers replaced and new joint aggregate laid down to re-establish drainage

Appendix F

Example Plant Lists for use in Proposed Miller Hill Mall BMPs

Appendix F

Potential Plant Lists for Miller Hill Mall Green Infrastructure BMPs
Duluth, MN
3/4/2016

HERBACEOUS PLANTS	
Botanic Name	**Common Name**
Monarda	Beebalm
Aster macrophylus	Bigleaf aster
Geranium macrrhizum	Bigroot geranium
Anemone canadensis	Canada anemone
Carex crinita	Catapillar sedge
Juncus effusus	Common rush
Baptisia	False Indigo
Calamogrostis acutiflora 'Karl Foerster'	Feather reedgrass 'Karl Foerster'
Eupatorium 'Gateway'	Joe Pye weed 'Gateway'
Schizachyrium scoparium MinnBlueA	Little bluestem 'Blue Heaven'
Liatris ligulistylus	Meadow blazingstar
Physostegia virginiana	Obedient plant
Chelone lyonii	Pink turtlehead
Sporobolis heterolepis	Prairie Dropseed
Echinacea purpurea	Purple coneflower
Panicum virgatum	Switchgrass
Deschampsia caespitosa	Tufted hairgrass
Carex stricta	Tussock sedge
Solidago flexicaulis	Zig Zag Goldenrod
SHRUBS	
Aronia melanocarpa	Black Chokeberry
Cornus serecia	Red-Osier Dogwood
Diervilla Ionicera	Low Bush Honeysuckle
Cornus racemosa 'Muszam'	Grey Dogwood 'Muzam'
Rhus aromatica 'Gro-Low'	Fragrant Sumac 'Gro-Low'
Juniperus sabina 'Calgery Carpet'	Juniper 'Calgery Carpet'
TREES	
Ulmus 'Acolade'	Elm 'Acolade'
Celtis occidentalis	Hackberry
Betula papyrifera 'Prairie Dream'	Paper Birch 'Prairie Dream'
Malus 'Prairie Fire'	Prairie Fire Flowering Crab
Larix laricina	Tamarack
Picea glauca	White Spruce