4.0 Overall Issues, Goals and Policies

This section of the Plan presents the issues, goals, and policies that pertain generally to VBWD, organized in the following nine major topic areas:

Section 4.1	Surface Water Quality
Section 4.2	Groundwater Management
Section 4.3	Public Education and Public Involvement
Section 4.4	Stream Management and Restoration
Section 4.5	Stormwater Runoff Management
Section 4.6	Wetland, Habitat, and Shoreland Management
Section 4.7	Water Level and Floodplain Management
Section 4.8	Erosion Prevention and Sediment Control
Section 4.9	Administration and Funding

Section 4.10 provides a listing of references for Sections 4.1 – 4.9.

Each of the sections 4.1 – 4.9 is organized in a similar manner, starting with a table that summarizes the following (in the order shown):

- Importance of VBWD involvement in the topic area
- General issues associated with the topic area
- Portions of the VBWD mission that relate to the topic area
- Policies the VBWD will implement to accomplish its mission

Following the summary table are subsections covering the following:

- VBWD History and background regarding the topic area
- Identified issues – in almost all of the sections, the issues are organized under multiple subheadings
- Policies, strategies and actions to be implemented to address the identified issues – all of the sections divide this subsection into subheadings

Section 5 of the VBWD Plan (Subwatershed Management Plans) presents detailed issues pertaining to specific waterbodies and specific actions the VBWD will take to address these issues. All of the actions identified in each of Sections 4.1 through 4.9 and Sections 5.1 through 5.38 are included in the table of implementation tasks (Table 6-1).

The VBWD reviews progress towards achieving the goals and performing the actions described in Sections 4.1 through 4.9 as part of its annual reporting process. This process is described in Section 6.1.1.6 of the Plan, and includes the development of an annual activity report, which is submitted to the Board of Water and Soil Resources (BWSR) and posted on the VBWD website.

List of Tables

List of Appendices

4.1 Surface Water Quality

4.1.1 Importance	Water quality is commonly defined by its physical, chemical, biological and aesthetic (e.g., appearance and smell) characteristics, but it is more than a collection of metrics. Water quality may be used to describe a water's suitability for specific and diverse purposes (i.e., drinking water, recreation, aquatic life). Good water quality results in a waterbody fulfilling its collective intended uses in a sustainable manner. The lakes, ponds, streams and wetlands in VBWD are an important asset providing many functions for both human and natural communities. These resources supply recreational and aesthetic benefits, enhance property values, serve as sources or sinks for groundwater exchange, provide nutrient removal, provide wildlife habitat and provide fishery resources. The high quality of the watershed's natural resources, especially its waterbodies, makes the VBWD an attractive place for people to live. Preserving the high quality of the watershed's waterbodies is critical to the existence of a high quality of life among the citizens residing in the watershed and in the larger metropolitan region. If water quality becomes degraded, a water resource and its surrounding ecosystem will lose its function and value. If water quality is not maintained, its ecological function, as well as the commercial and recreational value of our water resources, will diminish and public health may be compromised.
4.1.2 General Issues	Water quality is closely linked to the surrounding environment and land use. The water quality of a lake, pond, wetland, or stream is dependent on how much runoff reaches a waterbody and the path that runoff takes, (i.e., hydrology), how much groundwater reaches a waterbody (i.e., hydrogeology) and what that runoff and groundwater bring with it (i.e., pollutant load), as well as processes occurring within the waterbody and the soil/water interface. Hydrology is dependent on the weather, the topography of the landscape, the soils, the land cover, and other factors. Hydrogeology is dependent upon soil and geologic conditions. Pollutant loading is dependent primarily upon land cover and land use (see Appendix A-4.1). Internal loading processes are dependent on the ecological and physical characteristics of the resource and pollutant load (see Appendix A-4.1). Changes to any of these factors will influence the water quality of a water resource. While some of the factors are difficult to control, changes to land cover can be regulated and/or managed.
4.1.3 Mission	To manage and protect our water resources within the limits of VBWD jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Improving and protecting the quality of surface water and groundwater resources. (*Groundwater quality is addressed in Section 4.2 – Groundwater*)

4.1.4 Policies to Accomplish Mission	
	WQ-A. The VBWD will maintain a classification system for all major waterbodies.
	WQ-B. The VBWD will manage all major waterbodies for non-degradation of water quality, with allowance for natural variability.
	WQ-C. The VBWD will monitor the water quality of all major waterbodies (or coordinate such monitoring performed by others).
	WQ-D. The VBWD will analyze water quality monitoring data to identify changes and track trends.
	WQ-E. The VBWD will report water quality monitoring results.
	WQ-F. The VBWD will maintain action triggers set to assist in determining appropriate water quality management/improvement actions.
	WQ-G. The VBWD will implement appropriate water quality management/improvement actions to improve or protect water quality, with consideration for new technologies/methods.
	WQ-H. The VBWD will continue to operate and maintain, current and future VBWD water quality improvement systems to ensure they provide the designed benefits.
	WQ-I. The VBWD will continue to protect water quality through permit review, community plan review, and education efforts, and the policies and practices described in this Plan (see Section 4.5 – Stormwater Runoff Management).
	WQ-J. The VBWD will collaborate with other entities in their efforts to manage and prevent the spread of aquatic invasive species and support the implementation of best available technology to that end.
	WQ-K. The VBWD will pursue opportunities to cooperate with other entities in water quality protection efforts, including monitoring, capital improvements, and program development, as appropriate.
	Note: The above policies pertain to surface water, with the understanding that quality of surface water has a direct impact on groundwater quality (see Section 4.2 for more information regarding groundwater).

4.1.5 VBWD History Related to Surface Water Quality

Although originally formed to respond to flooding and drainage problems in the watershed, the VBWD has been concerned about water quality since its inception. The first VBWD watershed management plan (*Overall Plan*, 1970) contained a water quality policy stating that it is "…essential that water quality be maintained in a manner consistent with its planned use." In essence, the VBWD has followed this policy throughout its history. The 1970 Plan also contained a policy recognizing the

need for the development and maintenance of recreational facilities beyond those provided in conjunction with flood control facilities.

In its 1976 report *Water Management Plan for the Main Stem of Valley Branch Watershed District*, the VBWD analyzed a number of alternatives to provide flood relief and prevent future flooding problems. As part of the analysis, the VBWD completed a detailed assessment of the environmental impacts of each of the alternatives, including possible impacts to water quality in the major waterbodies located along the proposed system (Appendices, *Water Management Plan for the Main Stem of Valley Branch Watershed District*, 1976).

Since 1971, VBWD and other entities have been monitoring the water quality of lakes in the watershed. The VBWD has monitored streams since 1972. The VBWD summarizes and analyzes this data and determines water quality trends. The second VBWD watershed management plan (*Water Management Plan*, 1987) was the first to include a water quality monitoring plan. Now all VBWD watershed management plan updates include a water quality monitoring plan.

"Preservation of water quality for recreational and aesthetic purposes" was the water quality goal in the 1987 VBWD Plan. Again, the plan called for managing water quality in accordance with the "desired uses" of the VBWD lakes and established water quality goals for major VBWD waterbodies based on the desired uses. A related policy called for the "preservation of wildlife habitat related to water and wetlands."

The major focus of the 1987 VBWD Plan was the construction of a connected system of lake outlets and pipes to alleviate flooding problems in a large portion of the watershed. An important issue addressed in the 1987 Plan was the impact of the proposed outlet system on downstream water quality. Because of concerns regarding the impact of the project on the water quality of Lake Elmo, the VBWD constructed a bypass pipe as part of Project 1007. This bypass pipe was designed to carry 90% of the flows from Eagle Point Lake past Lake Elmo, thus preventing nutrient-rich Eagle Point Lake water from entering Lake Elmo. Project 1007 also prevented lower quality water from flowing into Lake Edith and Valley Creek, which are very high quality waters.

VBWD's concern for water quality is evident in the third VBWD Plan (*Water Management Plan*, 1995), in which the VBWD incorporated water quality management policies and requirements into its permitting process. Between the 1987 and 1995 Plans, the VBWD continued to collect water quality data (including biological data) for the major waterbodies in the watershed.

During preparation of the 1995 VBWD Plan, the VBWD re-evaluated water quality goals for the major waterbodies in the watershed. The VBWD established preliminary goals for major waterbodies based on desired uses and identified a process to identify final water quality goals after evaluating water and phosphorus budgets as well as other factors that may limit goal attainability.

Between 1997 and 2001, the VBWD completed eight hydrologic and phosphorus (loading) budget reports for 15 VBWD lakes and ponds, as well as one subwatershed and lake management plan for a group of nine VBWD lakes and ponds. The subwatershed and lake management plans set forth the

improvements required to achieve or maintain the VBWD's water quality goals. In addition to the proposed water quality improvements described in the subwatershed and lake management plans, numerous other best management practices (BMPs) have been performed since the VBWD implemented its water quality requirements.

With its 2005 Plan (*Watershed Management Plan*, 2005), the VBWD continued its emphasis on maintaining and improving water quality. The VBWD developed a classification system for major lakes, ponds, and wetlands to assist the VBWD in prioritizing water quality improvement actions. Streams were not included in the initial classification system. The 2005 classification system was based on existing water quality and other factors. The classification system was updated as part of this Plan and includes major VBWD streams and the St. Croix River/Lake St. Croix (see Section 4.1.7.1).

The VBWD continues to monitor the water quality of major waterbodies within the watershed, and reports the water quality results annually. Water quality monitoring activities and frequency vary according to waterbody classification and existing water quality (see Section 4.1.7.3).

In addition to regular monitoring at defined intervals, the VBWD has performed water quality diagnostic studies of several waterbodies since development of the 2005 Plan, including a 2007 water quality assessment study for Acorn Lake, Long Lake, and Sunfish Lake. In 2009, the VBWD completed water quality assessments of Eagle Point Lake, Horseshoe Lake, and Lake DeMontreville. Currently, the VBWD is performing diagnostic studies of several lakes and Kelle's Creek as part of a Watershed Restoration and Protection Strategies (WRAPS) study (see Section 4.1.6.1.2).

Since 2005, the VBWD has implemented programs and projects with the express purpose of improving water quality. The VBWD first adopted a buffer rule in 1996 requiring minimum 16.5-foot buffers to protect water resources. The 2013 rule update increased required buffer widths, including a minimum value of 25 feet (see *VBWD Revised Rules and Regulations*, 2013, as amended). The VBWD has begun to implement recommendations resulting from habitat monitoring performed from 2005 to 2009. In 2008, the VBWD performed in-lake alum treatments of Sunfish Lake and Long Lake in response to diagnostic feasibility studies.

4.1.6 Identified Surface Water Quality Issues

The VBWD faces several surface water quality issues, including ongoing issues carried over from the 2005 Plan as well as emerging issues. This section discusses the water quality issues identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Issues identified by the parties listed above were presented and discussed at the October 30, 2013, issue identification and prioritization workshop. The results of that workshop were considered by the VBWD Managers and the following major water quality issues were identified and organized into five topics:

1. Water quality degradation
2. Aquatic invasive species control and management
3. Water quality monitoring and reporting
4. Implementation and maintenance of water quality improvement projects
5. Collaboration with other entities to reduce pollutant loading and improve water quality

Water quality issues that pertain to specific waterbodies are further discussed in Section 5 – Subwatershed Management Plans.

4.1.6.1 Water Quality Degradation

Water quality in lakes, ponds, wetlands and streams is closely linked to watershed conditions and internal waterbody processes (for more information on internal waterbody processes, see Appendix A-4.1). As urbanization continues and other land use changes occur in the VBWD, nutrient and sediment inputs (i.e., loadings) from stormwater runoff can far exceed the natural inputs to a lake, pond, or stream. Stormwater runoff can carry significant amounts of phosphorus from the watershed into a waterbody. Land use changes resulting in increased imperviousness (e.g., urbanization) or land disturbance (e.g., urbanization, construction, or agricultural practices) also result in increased amounts of phosphorus carried in stormwater runoff. The increased runoff from urbanization can also lead to higher stream velocities, resulting in erosion and higher sediment loading to downstream waterbodies (see Section 4.3 – Stream Management and Restoration). In addition to watershed sources, other possibly significant sources of phosphorus include atmospheric deposition, internal loading (e.g., release from anoxic sediments, algae die-off, aquatic plant die-back, and fish-disturbed sediment) and failing subsurface sewage treatment systems (SSTS). The majority of VBWD properties adjacent to major waterbodies are served by SSTS or community sewage treatment systems (see Section 4.2 – Groundwater Management). Should any of these systems fail, they have the potential to add nutrients, bacteria, and other pollutants to VBWD waterbodies.

As phosphorus loadings increase, it is likely that water quality degradation will accelerate, resulting in unpleasant consequences, such as, reduced diversity of rooted aquatic plants, fish kills, and profuse algae growth (algal blooms, which can inter interfere with recreational and aesthetic uses of the waterbody).

While urbanization and its associated nutrient loading may lead to visible deterioration in water quality, other pollutants may also impair a waterbody's suitability for recreation, fish consumption,

or drinking water consumption. Specific activities and/or land uses can contribute to nutrient and other pollutant loading, including bacterial loading from agricultural land use (e.g., animal pastures or feedlots) or chemical loading from industrial land use (e.g., perfluorooctane sulfonate, or PFOS).

4.1.6.1.1 Impaired Waters 303(d) List

The federal Clean Water Act (CWA) requires states to adopt water quality standards to protect the nation's waters. Water quality standards designate beneficial uses for each waterbody and establish criteria that must be met within the waterbody to maintain the water quality necessary to support its designated use(s). In Minnesota, the Minnesota Pollution Control Agency (MPCA) administers the CWA and establishes water quality standards, including numeric and narrative criteria, used to determine if a waterbody is impaired. In compliance with Section 303(d) of the CWA, the MPCA identifies and establishes priority rankings for waters that do not meet the water quality standards. The list of impaired waters, sometimes called the 303(d) list, is updated by the MPCA every 2 years.

The MPCA has established water quality standards for biological indicators in lakes including total phosphorus, chlorophyll-a, and transparency (Secchi disc depth). Standards vary by MPCA ecoregion and whether a lake is classified as "shallow" or "deep." The MPCA defines "shallow" lakes as having a maximum depth of 15 feet or less or having at least 80% of the lake area shallow enough to support aquatic plants. The MPCA's listing of waterbodies on the impaired waters 303(d) list may depend upon their classification of a waterbody as a wetland, shallow lake, or deep. Generally, the MPCA does not list waterbodies classified as wetlands as impaired for biological indicators.

As in lakes, nutrient loading to streams may result in water quality problems, most of which are the result of increased algae and macrophyte production (e.g., decrease in dissolved oxygen due to algal blooms, see Appendix A-4.1). Research from around North America (including Minnesota) identify correlation between phosphorus and in-stream chlorophyll-a. Previous MPCA studies extended this correlation to 5-day biological oxygen demand (BOD_5) and further establish linkages with diel (i.e., daily) DO flux (i.e., the range in dissolved oxygen concentrations observed over a 24 hour period; MPCA's *Minnesota Nutrient Criteria Development for Rivers*, 2013). Based on this research, the MPCA adopted region-based eutrophication-related water quality standards for streams, including a revised total suspended solids (TSS) standard. These standards provide a basis for assessing the condition of Minnesota streams relative to excess nutrients. In turn, this allows for the development of strategies and policies to protect the condition of streams and to minimize, and hopefully reverse, the impact of excess nutrients on stream ecosystems.

Eutrophication-related water quality standards applicable to VBWD waterbodies are presented in Table 4.1-1. Note that the MPCA has established water quality standards for additional parameters; these standards are published in Minnesota Rules 7050 and are applicable to VBWD lakes, ponds, and streams. Standards for several parameters included in Minnesota Rules 7050 vary according to the MPCA-determined designated use of the waterbody (e.g., drinking water, industrial use).

Table 4.1-1 MPCA Water Quality Standards Applicable to VBWD Waterbodies

MPCA Waterbody Category	Water Quality Standards[1, 2]							
	Total Phosphorus (ug/L)	Chlorophyll a (ug/L)	Secchi Disc (m)	Total Suspended Solids (mg/L)	Daily Dissolved Oxygen Flux (mg/L)	Biological Oxygen Demand (5-day) (mg/L)	*Escherichia coli* (#/100mL)[3]	Chloride (mg/L)
Streams	100	18	NA	30	3.5	2.0	126	230
Deep Lakes	40	14	1.4	NA	NA	NA	126	230
Shallow Lakes	60	20	1.0	NA	NA	NA	126	230

1 – Standards are based on Minnesota Rules 7050.
2 – This table is a simplification of Minnesota Rules 7050. Refer to Minnesota Rules 7050 for more detailed information about standards, including calculation of time-average values, temporal applicability of standards, etc.
3 – calculated as a geometric mean of at least 5 samples per month, with no single sample exceeding 1260 organisms per 100 mL.

At the time of development of the 2005 Plan, Lake Elmo was the only VBWD waterbody included on the MPCA's impaired waters 303(d) list. Currently there are six lakes within the VBWD included on the draft 2014 impaired waters 303(d) list (see Table 3-4). Three additional VBWD waters (Bay Lake, Eagle Point Lake, and Kramer Pond) are included in the draft 2014 impaired waters 303(d) list due to nutrients/eutrophication, although the MPCA has classified these waterbodies as wetlands; the VBWD anticipates that the MPCA will remove these waterbodies from the impaired waters 303(d) list based on their classification. Kelle's Creek is also included on the draft 2014 impaired waters 303(d) list as impaired due to *Escherichia coli* (see Table 3-4). Significant impaired waters downstream of the VBWD include the St. Croix River (from Willow River to Kinnickinnic River, impaired for mercury and PCBs in fish tissue), Lake St. Croix (impaired for nutrients and biological indicators) and Lake Pepin (impaired for nutrients and biological indicators).

To address impaired waters and protect designated uses, the MPCA utilizes a total maximum daily load (TMDL) analysis. A TMDL is the amount of a pollutant that a waterbody can receive and still meet water quality standards. A TMDL study identifies the sources of loading, and develops an allocation scheme amongst the various contributors, which may include point sources, non-point sources, and natural background levels. A waste load allocation (WLA) is developed to determine allowable pollutant loadings from individual point sources (including loads from storm sewer networks). A TMDL implementation plan identifies actions to be implemented to achieve the desired waste load allocations and meet its water quality standards and designated uses. A TMDL addressing the mercury impairment for Lake Elmo has been performed (i.e., the statewide mercury TMDL).

TMDL plans addressing mercury in fish tissue in the St. Croix River and addressing nutrients and biological indicators in Lake St. Croix have also been approved by the MPCA (available from the MPCA website). TMDL studies are in progress to address PFOS in Lake Elmo, PCBs in fish tissue in the St. Croix River adjacent to the VBWD, and nutrients/eutrophication in Lake Pepin, located downstream of the VBWD.

Recently, the MPCA began taking a watershed-wide approach to their efforts to improve water quality. This process, known as the Watershed Restoration and Protection Strategy (WRAPS) begins with a two-year program of intensive watershed monitoring, after which the data is assessed and used to develop restoration and protection strategies and implement them on a watershed basis. TMDL waste load allocations are then calculated for impaired waterbodies within the watershed and an implementation plan is developed. The information from the WRAPS study serves as the basis for a TMDL report published by the MPCA. A WRAPS study within the VBWD performed from 2012 to 2015 includes Kelle's Creek (impaired due to *E. coli*) and several nutrient-impaired lakes (see Section 4.1.6.1.2).

An issue for VBWD is the role of VBWD in performing TMDL and WRAPS studies and integrating the results of TMDL and WRAPS analyses into VBWD management of waterbodies.

4.1.6.1.2 VBWD WRAPS Studies

The MPCA, in cooperation with the VBWD, performed a Watershed Restoration and Protection Strategies (WRAPS) study to address impaired and degraded waters within the watershed. The study began in 2012 and was completed in 2015. The VBWD waterbodies addressed in the study include the following:

Lakes:

- Sunfish Lake
- Eagle Point Lake
- Silver Lake
- Lake Edith
- Horseshoe Lake
- Bay Lake
- Downs Lake
- Goose Lake (South)
- Kramer Pond
- Echo Lake

Streams:

- Kelle's Creek

The early tasks of the WRAPS study focused on data collection, including the organization of existing water quality data and collection and analysis of lake sediment cores. This work included assessments of ponds and wetlands for the development of water quality models, as well as a determination of which waterbodies are classified as shallow lakes versus wetlands. The MPCA's determination of lakes versus wetlands is significant, as the water quality criteria presented in Table 4.1-1 are not applicable to wetlands. Therefore, waterbodies classified as shallow lakes could

potentially be listed as impaired (and require a subsequent WRAPS or TMDL study) while those listed as wetlands are currently not considered for listing as impaired.

The initial phase of the WRAPS study included watershed and in-lake modeling. The MPCA's contractor used watershed pollutant loading models (P8) to estimate the pollutant loading to each of the impaired lakes in the study. Several of the lakes within this study have been evaluated by the VBWD in the past so the MPCA's contractor updated existing P8 watershed pollutant loading models. The MPCA's contractor developed new P8 models, as necessary, for the direct watersheds to Silver Lake, Lake Edith, Eagle Point Lake, Horseshoe Lake, and Sunfish Lake. The MPCA's contractor utilized the Metropolitan Council 2010 and 2030 land use data to model existing and anticipated future land use conditions, respectively. The results of the P8 watershed modeling, along with estimates of loading from other external sources, such as discharges from upstream lakes and failing SSTS, were used as inputs into mass balance models to-evaluate the in-lake response to phosphorus, including estimation of internal loading.

For the impaired lakes in the study, the lake modeling was used to estimate the phosphorus load reductions that would be required from various external and internal sources to meet the applicable water quality standards set for each of the lakes. Once a load capacity is established for the lakes, the waste load allocations (WLA) can be established and a TMDL equation can be developed for each lake. For waterbodies that are not impaired, the lake modeling was used to identify and quantify the sources of pollutant loadings to the lakes and help understand where pollutant loads may be addressed to help improve and/or protect water quality.

For Kelle's Creek, a bacteria source assessment was performed to estimate loading from the sources of bacteria within the watershed. Flow duration and load capacity curve methodology was used to establish the TMDL for the creek and the required reductions in bacteria loading.

Once load reduction targets were established, the VBWD developed management actions that will protect and improve water quality conditions in order to achieve the TMDL allocations for each of the impaired waterbodies, and protect the water quality of the remaining waterbodies. The VBWD assessed the feasibility of the various BMP options and conducted public meetings to educate stakeholders about the strategies.

The VBWD worked with the MPCA to develop the TMDL reports for the impaired waters within the VBWD included in the study. The final TMDL reports included TMDL equations and allocations for excessive nutrient impairment at Sunfish Lake and elevated *E. coli* at Kelle's Creek. The TMDLs are expected to be approved by the US Environmental Protection Agency (EPA) in 2015. The MPCA's contractor generated a separate WRAPS report that will address the waters evaluated in detail as part of the WRAPS study and the remaining high priority waterbodies as identified by the VBWD (e.g., Lake DeMontreville, Lake Olson, Lake Jane, Lake Elmo, and Valley Creek). Management actions, including restoration and protection projects identified in the TMDL study and WRAPS report are included in this Plan in the relevant individual watershed management plans (Section 5) and the VBWD implementation tables (Table 6-1 and Table 6-2).

The current version of the TMDL report for Sunfish Lake and Kelle's Creek is available from the MPCA website.

4.1.6.1.3 Nondegradation and Water Quality Performance Standards

The VBWD seeks to maintain the water quality of waterbodies that have good existing water quality. To prevent degradation of existing water quality, the VBWD requires water quality treatment for development and redevelopment projects. Section 4.5 – Stormwater Runoff Management provides more information about VBWD's water quality management policies.

4.1.6.2 Aquatic Invasive Species Control and Management

Watershed management has historically focused on water quality as a function of land use activities and the resulting increase in loading of nutrients, sediment, and other chemicals (see Section 4.1.6.1 and Appendix A-4.1). Changes in the ecology of aquatic plants, animals, and microorganisms may also result in the degradation of aquatic environments and negatively impact aesthetics, recreation, and environmental quality.

The term "invasive species" describes plants, animals, or microorganisms within lakes and streams that are non-native and that 1) cause or may cause economic or environmental harm or harm to human health, or 2) threaten or may threaten natural resources or the use of natural resources in the state (Minnesota Statutes Chapter 84D.01). Aquatic invasive species (AIS) is a term given to invasive species that inhabit lakes, wetlands, rivers, or streams and overrun or inhibit the growth of native species. Aquatic invasive species pose a threat to natural resources and local economies that depend on them.

Under direction from the Minnesota Legislature, the MDNR established the Invasive Species Program in 1991. The program is designed to implement actions to prevent the spread of invasive species and manage invasive aquatic plants and wild animals (Minnesota Statutes 84D). The goals of the MDNR Invasive Species Program are to:

1. Prevent the introduction of new invasive species into Minnesota;

2. Prevent the spread of invasive species within Minnesota;

3. Reduce the impacts caused by invasive species to Minnesota's ecology, society, and economy.

As part of its Invasive Species Program, the Minnesota Department of Natural Resources (MDNR) maintains a list of waters infested with specific AIS (MDNR Designation of Infested Waters, 2013 as amended). The MDNR list includes several VBWD waterbodies as infested with Eurasian watermilfoil, including:

- Lake DeMontreville
- Lake Elmo

- Lake Jane
- Horseshoe Lake
- Long Lake

The MDNR's list of AIS infested waterbodies does not include all known AIS occurrences within the VBWD. In addition, the VBWD has identified the presence of the following aquatic invasive species in VBWD waterbodies (see Appendix A-4.1):

- Eurasian watermilfoil (*Myriophyllum spicatum*)
- Purple loosestrife (*Lythrum salicaria*)
- Curlyleaf pondweed (*Potamogeton crispus*)
- Yellow iris(*Iris pseudacorus*)
- Narrowleaf cattail (*Typha angustifolia)*
- Hybrid cattail *(Typha glauca)*
- Reed canary grass (*Phalaris arundinacea)*
- Common carp (*Cyprinus carpio*)

The occurrence of these AIS in individual VBWD waterbodies is detailed in Section 5 – Subwatershed Management Plans.

Of these species, curlyleaf pondweed (CLP) is of special concern due to its potential as a source of internal phosphorus loading. CLP grows vigorously during early spring, outcompeting native species for nutrients. After CLP dies out in early to mid-summer, decay of the plant releases nutrients and consumes oxygen, exacerbating internal sediment release of phosphorus. This process may result in algal blooms during the peak of the recreational use season, which further inhibit native macrophytes by reducing water clarity and blocking sunlight necessary for growth. The VBWD limits its management of AIS to instances where the AIS have a demonstrated negative effect on water quality (see Section 4.1.7.7). Planned AIS management actions for the major VBWD waterbodies are described in Section 5 – Subwatershed Management Plans and listed in Table 6-1. Appendix A-4.1– Water Quality Background Information includes additional information regarding AIS and other water quality information.

Invasive aquatic animals present in the VBWD include common carp, which can cause negative water quality effects, especially to shallow lakes and wetlands. Carp feeding techniques disrupt shallow-rooted plants, which can reduce water clarity and possibly release phosphorus bound in sediment, leading to increased algal blooms and decline in native aquatic plants. Common carp are

also present in the St. Croix River. Common carp are typically spread between lakes by the accidental inclusion and later release of live bait, but can also migrate through natural or built channels as adults.

Zebra mussels have been identified in the St. Croix River downstream of the Boomsite Recreational Area at river mile 25.4 (just north of Stillwater). Zebra mussels can cause problems for lakeshore residents and recreationists by clogging water intakes and attaching to motors and possibly clogging cooling water areas. Zebra mussel shells can cause cuts and scrapes if they grow large enough on rocks, swim rafts and ladders. Zebra mussels can also attach to native mussels, killing them. Zebra mussels filter plankton from the surrounding water, which can result in improved water clarity and result in more aquatic vegetation. In large populations, zebra mussel filter feeding could impact the food chain, reducing food for larval native fish. Zebra mussels are typically spread as adult mussels attached to boats or aquatic plants, or as larvae carried in bait buckets, bilges or any other water moved from an infested lake or river.

4.1.6.3 Water Quality Monitoring and Reporting

As urbanization, redevelopment, and land use changes continue in VBWD, more stresses are placed on the water quality of VBWD waterbodies. The VBWD has collected a large amount of water quality data over its history. In addition, other agencies have collected data for VBWD waterbodies, including the MPCA, Metropolitan Council, and others (see Section 3.9). The amount of data currently available varies by waterbody.

Continued water quality data collection is necessary for the VBWD to track water quality improvement or degradation, detect trends, and better understand water quality processes, and ultimately determine if there are water quality problems (e.g., impaired uses). This information is critical for VBWD to identify and prioritize water quality improvement projects, and to determine appropriate methods for preventing water quality degradation (e.g., to inform the ongoing WRAPS project). Detection of trends, specifically improvements, is critical to determining the effectiveness of actions implemented by the VBWD.

The Metropolitan Council enters water quality data collected as part of the Metropolitan Council's Citizen Assisted Monitoring Program (CAMP) into the EQuIS database. Data recorded into EQuIS, is available to be assessed by the MPCA, and could result in the listing of VBWD waterbodies on the MPCA's impaired waters 303(d) list (see Section 4.1.6.1.1). Water quality data collected by the VBWD is reported in the VBWD's annual report submitted to the Board of Water and Soil Resources (BWSR) and MDNR and posted on the VBWD website; however, the data area not currently within MPCA databases.

4.1.6.4 Implementation and Maintenance of Water Quality Improvement Projects

The VBWD and other cities, townships, and property owners have implemented several stormwater runoff management projects and water quality improvement projects. After implementation of the projects, it is essential that these projects be operated and maintained so that they continually provide

their designed benefits. For example, water quality treatment ponds must be regularly inspected and accumulated material removed (see Section 4.5 – Stormwater Runoff Management). For water quality improvement projects constructed by VBWD, the maintenance responsibility lies with VBWD unless otherwise documented; in some cases agreements are made with cities (e.g., Woodbury, Oakdale) or the Minnesota Department of Transportation (MnDOT) to maintain the projects. Maintenance responsibilities for other projects within the VBWD, but not constructed by the VBWD, may be less clear.

In addition, hundreds of water quality improvement projects have been constructed in VBWD as part of VBWD-permitted projects. Historically, a large number of these projects (typically ponds) have not been adequately maintained. As a result, the designed amount of stormwater runoff treatment may no longer be achieved. The VBWD performed a study to identify ponds not adequately maintained and assumed responsibility for maintaining these ponds as part of the 2007 VBWD rule revision. The VBWD's role and level of responsibility for maintaining and repairing water quality treatment projects is discussed in greater detail in Section 4.5 – Stormwater Runoff Management.

The MPCA promotes runoff retention as a water quality treatment option, as demonstrated in its Minimal Impact Design Standards (MIDS) guidance, which the VBWD recently adopted in its 2013 rule revision. The benefits of infiltration as a best management practice include volume reduction, complete removal of most pollutants from the infiltrated water (with respect to downstream loading to surface waters), and recharge of groundwater (see Section 4.2 – Groundwater). Infiltration can be implemented at small scales in the form of rainwater gardens, and VBWD residents have expressed interest in constructing rainwater gardens. Residential rainwater gardens may provide opportunities for on-site water quality treatment with smaller construction and operating costs than centralized water quality treatment facilities. Maintenance responsibilities for rainwater gardens and similar best management practices typically fall to property owners. Inconsistent maintenance either due to lack of effort or lack of understanding (e.g., maintenance responsibility not communicated during a property sale) can impact the long-term effectiveness of such practices (see Section 4.5 – Stormwater Runoff Management).

4.1.6.5 Collaboration with Other Entities to Reduce Pollutant Loading and Improve Water Quality

The VBWD is one of several units of government that are directly or indirectly responsible for managing water resources – both water quality and water quantity. Other entities with a role in water quality protection include, but are not limited to:

- VBWD cities and townships
- Washington Conservation District and Ramsey Conservation District
- Washington County and Ramsey County
- Minnesota Department of Natural Resources

- Minnesota Pollution Control Agency
- Minnesota Board of Water and Soil Resources (BWSR)
- Minnesota Department of Health
- Minnesota Department of Agriculture

Nearly all water quality issues arising within or downstream of the VBWD fall under the jurisdiction of regulatory entities in addition to the VBWD. By their nature, issues of large physical scale (e.g., nutrient loading to Lake St. Croix or Lake Pepin) will affect many jurisdictions. As such, there are opportunities for the VBWD to collaborate with other units of government to achieve common goals with an efficient use of resources. Examples include the ongoing WRAPS study directed by the MPCA, but executed in collaboration with the VBWD (see Section 4.1.6.1.2). Future opportunities may include cooperative monitoring efforts.

Overlapping permitting and stormwater management responsibilities also create the potential for redundancy or potentially conflicting goals (e.g., infiltration and groundwater quality protection). Communication between the VBWD and other units of government, especially its cities and townships, is necessary to avoid inefficiencies. The regulatory roles of select governmental units with respect to water quality are summarized in Table 4.1-2.

Table 4.1-2 Summary of Other Agencies with Water Quality Jurisdiction in the VBWD

Agency/Entity	Jurisdiction	Roles Related to Water Quality	Permit Authority / Certification
Washington Conservation District (WCD)	Washington County	• Stream monitoring program (in cooperation with VBWD) • Volunteer stream monitoring program (in partnership with the Metropolitan Council) • Lake water quality monitoring, sediment surveys, and macrophyte (aquatic plant) surveys (in cooperation with VBWD) • Infiltration monitoring (in cooperation with VBWD)	
Minnesota Department of Natural Resources (MDNR)	Statewide	• Management of public water lakes, streams, and wetlands (MN Statutes 103G) • Identification of Special Waters, including trout streams (Valley Creek) and Outstanding Resource Value Waters (ORVW, St. Croix River) (see Section 4.4) • Administer invasive species program, addressing aquatic invasive species (MN Statutes 84D)	• Public Waters Work Permit • Aquatic Plant Control Permits • Fisheries permits • Lake service provider certificate
Minnesota Pollution Control Agency (MPCA)	Statewide	• Develop state water quality standards (MN Rules 7050) • Update impaired waters 303(d) list and perform TMDL studies for impaired waters • Regulate water quality impacts through administration of the State Discharge System (SDS) and National Pollutant Discharge Elimination System (NPDES) permit programs • Provides stormwater management guidance through Minimal Impact Design Standards (MIDS) (see Section 4.5) • Regulation of subsurface sewage treatment systems (SSTS) (MN Rules 7080) • Provide guidance for the management of stormwater sediment • Selective administration of the Clean Water Act Section 401 addressing water quality impacts to navigable waterways	• NPDES Phase I and Phase II (MS4) permits • NPDES Industrial Stormwater Permit • NPDES Construction Stormwater Permit • Clean Water Act Section 401 Certification
Minnesota Board of Water and Soil Resources (BWSR)	Statewide	• Oversight of watershed management organizations (WMOs) and soil and water conservation districts (SWCDs) • Reviews, provides comments, and approves WMO watershed management plans	• Approval of watershed management plans

Table 4.1-2 Summary of Other Agencies with Water Quality Jurisdiction in the VBWD

Agency/Entity	Jurisdiction	Roles Related to Water Quality	Permit Authority / Certification
Minnesota Department of Health (MDH)	Statewide	• Protection of drinking water quality through administration of the Well Management Program (MN Rules 4725), Wellhead Protection Program (MN Rules 4720), and Safe Drinking Water Act • Review and approval of Wellhead Protection Plans (WHPPs) • Monitor groundwater quality (see Section 4.2)	• Well Construction Permit (see Section 4.2)
Minnesota Department of Agriculture	Statewide	• Regulate application of fertilizer and pesticides on agricultural land • Administer the Agricultural Water Quality Certification Program: a voluntary program to accelerate adoption of on-farm conservation practices; certified producers will be considered compliant with water quality standards for a period of 10 years and will receive priority for technical assistance	• Chemigation Permit Program • Agricultural Water Quality Certification
Metropolitan Council	7 County Metropolitan Area	• Designated areawide waste treatment management agency under Section 208 of federal Clean Water Act (U.S. Code 1288), which includes responsibility for ensuring management policies, programs, and facilities are implemented in the metro area to provide urban stormwater management to protect water quality • Partner to fill gaps in monitoring and assessment water quality of area lakes, rivers, and streams • Review local comprehensive water management plans, as specified by the Metropolitan Surface Water Management Act	
Ramsey County Public Works	Ramsey County	• Monitor and analyze surface water quality	•

4.1.7 Policy Details, Strategies, and Actions Related to Surface Water Quality

This section provides the details for policies WQ-A through WQ-K (as listed in Section 4.1.4), along with the resulting strategies and actions.

4.1.7.1 WQ-A. Classification

As part of the 2005 Plan, the VBWD classified all major waterbodies in the VBWD according to a waterbody classification system. That classification system is updated for the current Plan and is described in this section. The major waterbodies and their resulting designated VBWD classifications are listed in Table 4.1-3. The VBWD classification system contains the following four classifications that will be used by the VBWD and local units of government to classify waterbodies: High Priority, Medium Priority, Low Priority, or Stormwater Pond. The waterbody classifications will assist VBWD in identifying and prioritizing water quality improvement actions. In their local water management plans, the local units of government will need to classify waterbodies into one of the four VBWD management classifications.

Waterbody classifications are based on the assessment of five attributes:

1. Water quality
2. MPCA waterbody classification (deep, shallow, wetland, stream)
3. MDNR classification as a trout stream or outstanding resource value water (ORVW), or direct drainage to an outstanding resource value water (i.e., St. Croix River) or a trout stream (Valley Creek),
4. Public access to the waterbody
5. Construction or modification to perform as a stormwater pond

For the purposes of classification, the water quality of a waterbody is characterized as one of the following categories:

- **Impaired** – the waterbody is included on an Impaired Waters 303(d) list or does not meet applicable VBWD or MPCA water quality standards.

- **Degraded** – the waterbody is not included on an Impaired Waters 303(d) list, but shows a statistically significant degrading trend in water quality.

- **Acceptable –** the waterbody currently meets water quality standards based on applicable criteria presented in Table 4.1-1. These criteria are derived from the MPCA's *Guidance for Assessing the Quality of Minnesota Surface Waters for the Determination of Impairment 305(b) Report and 303(d) List* (2014) and Minnesota Rules 7050 (including proposed revisions).

The four management classifications pertaining to VBWD lakes, ponds, streams, and wetlands and are defined as follows:

High Priority. High priority waterbodies have

(1) "Impaired" or "Degraded" water quality

or

(2) MPCA "deep lake" classification

or

(3) MDNR classification as a trout stream or ORVW

Medium Priority. Medium priority waterbodies have

(1) MPCA "shallow lake" classification

or

(2) some form of public access (i.e., official public access or surrounding land is public),

or

(3) are directly upstream of an outstanding resource value water (St. Croix River) or a trout stream (Valley Creek).

Low Priority. Low priority waterbodies are those that do not meet the criteria for High Priority or Medium Priority, and are not specifically categorized as stormwater ponds.

Stormwater Ponds. Basins constructed or modified to function as stormwater ponds are classified in a separate category. This includes the West Lakeland Storage Site, Rest Area Pond, and the numerous stormwater ponds constructed as part of development projects.

Table 4.1-4 shows the parameters used to determine the classifications. VBWD considers any Minnesota Department of Natural Resources (MDNR) public waters not listed in Table 4.1-3 and other non-listed waterbodies to be Low Priority. Additional classifications and considerations applicable to wetlands are described in Section 4.6 – Wetlands, Habitat, and Shoreland Management. The waterbody classification system in this Plan is different than the classification system used in the 1995 and 2005 VBWD Plans. The MPCA has not determined the classification of all waterbodies in the District; the VBWD classifications shown in Table 4.1-3 and Table 4.1-4 are preliminary, with the MPCA to determine an appropriate classification for each waterbody. The VBWD currently classifies Raleigh Creek as a Medium Priority waterbody.

Table 4.1-3 VBWD Waterbody Classifications

High Priority Waterbodies	Medium Priority Waterbodies	Low Priority Waterbodies	Stormwater Ponds
Lake Edith[1]	Acorn (Mud) Lake[2]	Bay Lake[3]	West Lakeland Storage Site[3]
Lake Jane[1]	Cloverdale Lake[2]	Beutel Pond[3]	Rest Area Pond[3]
Lake Elmo[1]	Clear Lake[2]	Capaul's Pond[3]	
Long Lake[1]	Goetschel Pond[2]	Fahlstrom Pond[3]	
Lake DeMontreville[2]	Horseshoe Lake[2]	Friedrich's Pond[3]	
Downs Lake[2]	McDonald Lake[2]	Goose Lake North[3]	
Echo Lake[2]	Lake Olson[2]	Klawitter Pond[3]	
Goose Lake South[2]	Sunnybrook Lake[2]	Kramer Pond[3]	
Silver Lake[2]	Eagle Point Lake[3]	Legion Pond[3]	
Sunfish Lake[2]	Raleigh Creek[4]	Mergens Pond[3]	
Kelle's Creek[4]		Rose Lake[3]	
Valley Creek[4]		Weber Pond[3]	
St. Croix River/Lake St.Croix[4]			

Note: Colors and footnotes (1-4) refer to MPCA water body classification as deep lake (dark blue, footnote 1), shallow lake (light blue, footnote 2), wetland (green, footnote 3), or stream (orange, footnote 4). Barton Pit is not included in this table since it does not normally hold water.

The classifications listed in Table 4.1-3 are provided as guidance. The VBWD Board of Managers may revise individual waterbody classifications at its discretion with consideration of changes to public access, future impairments, and the results of future water quality and habitat monitoring. The VBWD will consider revising the classification of a waterbody if its MPCA classification changes. The VBWD Board of Managers will discuss any proposed revisions to waterbody classifications at a VBWD Board of Managers meeting prior to making such changes.

Table 4.1-4 Waterbody (non-Stormwater Ponds) Classification Determination

Water Body Name	Water Quality Criteria	MPCA Category[2]	Official Public Access or Public has Access via Surrounding Public Land[1]	Drains to, or is, Trout stream or ORVW	Water Quality Trend as of 2013 (95% Confidence)	Priority for Water Quality Management
Kelle's Creek	Impaired	--	--	Drains to	n/a	High
Raleigh Creek	--	--	--	No	n/a	Medium
Valley Creek	--	--	--	Trout Stream	n/a	High
St. Croix River/Lake St. Croix	Impaired	--	--	ORVW	n/a	High

Table 4.1-4 Waterbody (non-Stormwater Ponds) Classification Determination

Water Body Name	Water Quality Criteria	MPCA Category[2]	Official Public Access or Public has Access via Surrounding Public Land[1]	Drains to, or is, Trout stream or ORVW	Water Quality Trend as of 2013 (95% Confidence)	Priority for Water Quality Management
Acorn (Mud) Lake	Acceptable	Shallow	Yes	No	n/a	Medium
Bay Lake	Acceptable	Wetland	No	No	None	Low
Beutel Pond	--	Wetland	No	No	n/a	Low
Capaul's Pond	Acceptable	Wetland	No	No	n/a	Low
Clear Lake	Acceptable	Shallow	No	No	n/a	Medium
Cloverdale Lake	Acceptable	Shallow	No	No	n/a	Medium
L. DeMontreville	Acceptable	Shallow[3]	Yes	No	None	High
Downs Lake	Impaired	Shallow	No	No	n/a	High
Eagle Point Lake	Acceptable	Wetland	Yes	No	None	Medium
Echo Lake	Impaired	Shallow	No	Yes	Improving	High
Lake Edith	Acceptable	Deep	No	Drains to	None	High
Lake Elmo	Impaired	Deep	Yes	No	None	High
Fahlstrom Pond	Acceptable	Wetland	No	No	n/a	Low
Friedrich's Pond	Acceptable	Wetland	No	No	n/a	Low
Goetschel Pond	Degraded	Shallow	No	No	n/a	Medium
Goose Lake North	Acceptable	Wetland	No	No	n/a	Low
Goose Lake South	Impaired	Shallow	No	No	n/a	High
Horseshoe Lake	Acceptable	Shallow	No	No	None	Medium
Lake Jane	Impaired	Deep	Yes	No	n/a	High
Klawitter Pond	Acceptable	Wetland	No	No	None	Low
Kramer Pond	Acceptable	Wetland	No	No	n/a	Low
Legion Pond	Acceptable	Wetland	No	No	n/a	Low
Long Lake	Acceptable	Deep	No	No	None	High
McDonald Lake	Acceptable	Shallow	No	No	None	Medium
Mergens Pond	Acceptable	Wetland	No	No	n/a	Low
Lake Olson	Acceptable	Shallow	Yes	No	None	Medium
Rose Lake	Acceptable	Wetland	No	No	n/a	Low
Silver Lake	Degraded	Shallow	Yes	No	Declining	High
Sunfish Lake	Impaired	Shallow	Yes	No	None	High
Sunnybrook Lake	Acceptable	Shallow	No	No	n/a	Medium
Weber Pond	Acceptable	Wetland	No	No	n/a	Low

[1] – Yes or No, Adjacent roads not considered surrounding public land
[2] – MPCA classifications are not determined for all VBWD waterbodies and will need to be confirmed with the MPCA
[3] – Lake DeMontreville is classified as high priority due to its potential to be categorized as a deep lake (see Section 5.7)

4.1.7.2 WQ-B Management

The VBWD will manage the waterbodies within its jurisdiction according to their classification.

All waterbodies will be managed to maintain or improve their existing water quality (non-degradation), with allowance for natural variability. In waterbodies where statistically significant water quality degradation has occurred (as identified by trend analyses), the VBWD will manage those waterbodies with the goal of restoring the water quality to prior conditions. Management actions will vary according to VBWD waterbody classification. Proposed development and other projects should be designed to preserve or improve existing water quality. To support this policy,

implementation of best management practices will be required during development and other types of construction. The VBWD defines "non-degradation" relative to an "existing condition" based on long-term water quality trends (at least five years of data). The VBWD definition differs from the MPCA's proposed "antidegradation" rule, which defines the existing condition as the water quality at the time the rule was promulgated.

Impaired waterbodies located in the VBWD (see Section 4.1.6.1.1) will be managed with the ultimate goal of achieving the intended use(s) of the waterbody, and removing the waterbody from the impaired waters 303(d) list. Select water quality standards applicable to deep lakes, shallow lakes, and streams in the VBWD are presented in Table 4.1-1 (note that Minnesota Rules 7050 includes additional standards applicable to VBWD waterbodies).

All waterbodies will also be managed to preserve and promote biodiversity and improve aesthetics.

Long-term management of the well-being of waterbodies requires a structured approach to monitoring the waterbody classification attributes (primarily water quality), and requires a process for determining the appropriate level of monitoring based on changing conditions. The VBWD will review waterbody classifications (see Section 4.1.7.1) and water quality relative to action triggers (see Section 4.1.7.5) annually to determine if additional management actions are necessary in response to these changes (see Section 4.1.7.6).

Approximately five years following the completion of the WRAPS study (2020-2021), the VBWD will cooperate with the MPCA and other entities to evaluate progress made towards implementing strategies identified in the WRAPS study. This will include assessment of available monitoring data to determine progress towards protecting or improving the water quality of the affected waterbodies. The strategies developed from the WRAPS study are included in Table 6-1 of this Plan and the respective individual watershed management plans (Section 5).

4.1.7.3 WQ-C Monitoring

The VBWD regularly monitors the major waterbodies in the District. The objective of the monitoring is to detect changes or trends in the water quality or habitat over time, thereby determining the impact of changing land use patterns in the watershed (i.e., pollutant loading), internal loading, and the effectiveness of the VBWD's efforts to protect or improve water quality. The type of water chemistry monitoring recommended for each waterbody varies according to its classification, as shown in Table 4.1-5 (Table 4.1-3 lists the major VBWD bodies and their VBWD classification).

Table 4.1-5 Water Quality Monitoring Guidelines for Major VBWD Waterbodies

Water Quality Management Classification	Type of Monitoring		
	Survey Level/ CAMP[1]/ Stream Water Quality	Supplemental	Intensive
High Priority[2]	Every Year	Every 3 Years & If Triggered	If Triggered[3]
Medium Priority	Every Year	If Triggered[3]	If Triggered[3]
Low Priority	Every 3 Years	None	None

[1] Metropolitan Council's Citizen-Assisted Monitoring Program (CAMP) or equivalent

[2] While the St. Croix River/Lake St. Croix are classified as High Priority by the VBWD, the VBWD does not intend to monitor the water body because other entities do.

[3] See Table 4.1-6. In general, Intensive monitoring will be triggered as part of a diagnostic-feasibility study, and Supplemental monitoring will be triggered when historic monitoring indicates a possible problem.

Stream Physical Condition, Biological Indicator, and Flow Monitoring is described in Section 4.4 – Stream Management and Restoration.

The recommendations presented in Table 4.1-5 represent a baseline monitoring program. The VBWD may perform more frequent or intensive monitoring, on a case-by-case basis, based on the results of the regular monitoring, inclusion of a waterbody on the impaired waters 303(d) list, or other drivers. Table 4.1-3 provides a guideline monitoring program for the VBWD major waterbodies for years 2015 – 2025. The VBWD will review the recommended monitoring program as part of its annual implementation plan review, and may alter the program as necessary with consideration for past monitoring results, changes in land use (or planned changes in land use), and available budget. The VBWD performed habitat monitoring from 2005 to 2009; the VBWD will consider updating and reestablishing its habitat monitoring program.

This section describes waterbody monitoring programs currently utilized by the VBWD:

Survey Level/CAMP Water Quality Monitoring—This monitoring is performed by the Metropolitan Council as part of its Citizen Assisted Monitoring Program (CAMP). CAMP uses volunteers to measure lake surface water temperature and Secchi disc depth (transparency), and to collect lake surface water samples on a biweekly basis from mid-April to mid-October (approximately 14 sampling events). The water samples are analyzed for total phosphorus, total Kjeldahl nitrogen, chlorophyll *a*, and chloride. The VBWD will recruit volunteers to collect the water quality samples for this monitoring program. If no volunteers can be found, the VBWD will hire a contractor to collect the water quality samples six times per year. The laboratory work will be performed by the Metropolitan Council. If the Metropolitan Council discontinues CAMP, the VBWD will contract with another laboratory.

Supplemental Water Quality Monitoring—This monitoring program is supplemental to the Survey Level/CAMP Water Quality Monitoring Program, and involves collecting additional samples and data from lakes approximately six times between mid-April to mid-October (typically once in April, June, July, and September and twice in August). In addition to the sample collection and analysis performed as part of the Survey Level/CAMP Water Quality Monitoring Program, the supplemental monitoring involves analyzing total phosphorus concentrations at depths throughout the water column, analyzing surface water samples for ortho-phosphorus and total nitrogen, and collecting dissolved oxygen, specific conductance, turbidity, and pH data. This type of monitoring is needed to assess problems (e.g., degrading water quality trends) and is also appropriate for regular monitoring of regionally important waterbodies, such as the High Priority waterbodies. This sampling and laboratory work will be performed by the Metropolitan Council or a contractor for the VBWD.

Intensive Water Quality Monitoring—This monitoring program involves more sample collection dates and analyzing additional parameters at depth, including total phosphorus. If a waterbody's water quality degrades, intensive monitoring is triggered. The VBWD will develop an intensive monitoring plan specifically for the waterbody and the goals to be achieved, usually as part of a diagnostic-feasibility study. This monitoring program will be conducted by a contractor for the VBWD.

Macrophyte (Aquatic Plant) Monitoring—This program monitors the presence and abundance of aquatic plants in VBWD waterbodies. For high priority waterbodies whole lake aquatic plant surveys will be performed (typically twice a year in June and August). For select high priority waterbodies, point-intercept surveys are performed to more accurately determine plant density. The VBWD will perform additional aquatic plant surveys as necessary in support of aquatic plant management actions performed on VBWD waterbodies.

Phytoplankton and Zooplankton Monitoring—This program monitors phytoplankton and zooplankton communities within VBWD high priority and medium priority waterbodies. The phytoplankton and zooplankton monitoring program typically includes monthly data collection from May through September, performed by water resource professionals. Other entities monitoring phytoplankton and zooplankton in VBWD waterbodies include WCD (monitoring Sunfish Lake) and Ramsey County Public Works (monitoring Silver Lake). Samples are analyzed to track the relative distribution of phytoplankton and zooplankton species throughout the summer and tested for the presence of phytotoxins.

Stream Water Quality Monitoring—This program monitors chemical water quality, biological indicators, flow, and physical conditions of Kelle's Creek, Raleigh Creek, and Valley Creek. Chemical water quality monitoring includes the collection of grab samples and continuous water quality data at locations on the South Fork of Valley Creek, the North Fork of Valley Creek, and Kelle's Creek. Monitoring is performed in partnership with the Metropolitan Council's Watershed Outlet Monitoring Program (WOMP), the St. Croix Watershed Research Center, and the Washington Conservation District. Measured parameters include turbidity (total suspended

solids), temperature, dissolved oxygen, nutrients, and bacteria (*E. coli*). Biological indicator, physical condition, and flow monitoring of VBWD streams is described in Section 4.4 – Stream Management and Restoration.

VBWD will coordinate its water quality monitoring program with the programs of other units of government. VBWD will obtain water quality monitoring data collected by other units of government as necessary to assess trends. VBWD will review the MPCA's biannual draft list of impaired waters 303(d) list, and comment on the list, if necessary.

4.1.7.4 WQ-D & WQ-E Analyzing Data and Reporting Results & Trends

The VBWD will continue to compile a report every year summarizing the water quality, macrophyte, phytoplanklton/zooplankton, and stream monitoring results for all waterbodies monitored. All of the water quality monitoring results for that year will be consolidated into a single report that will include data analysis, a narrative data summary, and calculation of water quality trends. The VBWD will follow the trend analysis procedures described in Appendix A-4.1. The VBWD will use the annual monitoring report, and historic data, to determine needed monitoring and other water quality management actions for the next year. The VBWD will post the report on the VBWD website.

The VBWD will share water quality data via public databases (e.g., EQuIS, MPCA's Environmental Data Access) to the extent possible within the constraints of funding. The VBWD recognizes the benefits of data sharing for multi-jurisdictional water quality studies (e.g., WRAPS and TMDLs), and will pursue options that are not cost-prohibitive.

4.1.7.5 WQ-F Action Triggers

The VBWD will maintain water quality "action triggers" for waterbodies in the District. These action triggers will be used to assist in determining waterbodies that require water quality management actions based on monitoring data. After each year of sampling, the VBWD will review available water quality data, assess trends for each waterbody, and determine if an action trigger is met. Any action triggers that are met for a specific water body will be reported in the water quality monitoring report discussed in Policy WQ-D & WQ-E. Action triggers for lakes, ponds, streams and wetlands will be set as follows:

- Inclusion on the MPCA's impaired waters 303(d) list.
- For waterbodies with at least five years of data, a statistically significant degrading trend in the summer average of any of the following water quality parameters:

For lakes, ponds, and wetlands:	**For streams**
• Total phosphorus (TP) • Chlorophyll a (Chl a) • Secchi disc transparency (SD)	• Total phosphorus (TP) • Chlorophyll a (Chl a) • Total suspended solids (TSS) • Biological oxygen demand (BOD)

- For waterbodies with less than five years of water quality data, the VBWD action triggers are set at the applicable MPCA water quality standards for the following water quality parameters (see Table 4.1-1):

For lakes, ponds, and wetlands:	For streams
• Total phosphorus (TP) • Chlorophyll a (Chl a) • Secchi disc transparency (SD)	• Total phosphorus (TP) • Chlorophyll a (Chl a) • Total suspended solids (TSS) • Biological oxygen demand (BOD)

4.1.7.6 WQ-G, WQ-H & WQ-I Water Quality Management Actions

Each year, after analyzing the collected water quality data for each waterbody, as discussed in Policy WQ-D & WQ-E, the VBWD will compare the results to the action triggers. If any action trigger is met (see Section 4.1.7.5), water quality management actions will be taken. Table 4.1-6 lists the recommended water quality management actions to be implemented by VBWD for High and Medium Priority lakes, ponds, streams, and wetlands.

Table 4.1-6 recommends implementation of the following water quality management actions to be implemented if one or more action triggers is met:

- Diagnostic-feasibility study for the waterbody/watershed
- Supplemental or intensive water quality monitoring
- Runoff water quality monitoring (if needed)

The actions listed in Table 4.1-6 are guidelines; VBWD will determine the appropriate actions to implement on a case-by-case basis.

For Low Priority waterbodies with degrading trends in water quality, the VBWD Managers will determine the appropriate management actions on a case-by-case basis.

When selected as the appropriate management action, VBWD will complete a diagnostic-feasibility study to determine the options for water quality improvement projects and estimated project costs. To the extent possible, such analyses will be performed as part of existing or ongoing studies, such as WRAPs or TMDL studies. As part of these diagnostic-feasibility studies, VBWD will evaluate the impact of watershed runoff pollution and subsurface sewage treatment systems (SSTS) on water quality, and will evaluate the impact of water quality treatment technologies (including new/emergent technologies) on water quality. The VBWD will not seek to regulate SSTS, as SSTS are already regulated by the MPCA, the counties, and the communities. The VBWD will cooperate with other units of government to address specific concerns or issues related to the impact of SSTS on water quality (see Section 4.2 – Groundwater Management).

The VBWD will consider possible water quality treatment strategies for the VBWD waterbodies on a case-by-case basis as determined from diagnostic-feasibility studies, and as proposed in the subwatershed management plans (see Section 5). These actions are summarized in the subwatershed management plans included in Section 5 and in Table 6-1. The specific measures called for in Section 5 of the Plan are recommendations from previous VBWD diagnostic-feasibility studies. The Managers recognize that new technology, methods, and data may impact the recommendations water quality treatment options for waterbodies and will evaluate new information as they consider implementing water quality improvement projects.

The VBWD will implement the improvement options discussed in the subwatershed management plans of Section 5 and summarized in Table 6-1. All of these projects were recommended by the VBWD's watershed and lake management plans and/or hydrologic and nutrient budgets reports to attain or maintain the District's water quality goals.

For waterbodies on the impaired waters 303(d) list, the VBWD will work with the MPCA to determine the appropriate roles for conducting TMDL or WRAPS studies, which will result in recommended management actions intended to achieve the TMDL allocations for impaired waterbodies and/or protect the water quality of the remaining waterbodies. The VBWD will serve in a lead role for implementing TMDLs and WRAPSs studies in the watershed. Management actions outlined in future TMDL and WRAPS reports will be incorporated into this Plan and considered for implementation by the VBWD, as appropriate.

Table 4.1-6 Recommended Water Quality Management Actions for High and Medium Priority Waterbodies[1]

Comparison of Most Recent Summer Average Water Quality to MPCA Standards[2]	95% Confidence Water Quality Trend	Type(s) of Management Action Needed		
		Watershed Management	Water Quality Monitoring	Runoff Water Quality Monitoring or Equivalent
Better Than all Applicable Standards	**No Trend Analysis Available, No Trend or Improving Trend**	No Action	Continue existing water quality monitoring program	None
	Degrading Trend	No Action	Perform Supplemental monitoring next year	Watershed land use review[3]
At or Worse Than One or More Applicable Standards	**No Trend Analysis Available, No Trend or Improving Trend**	No Action	Perform Supplemental monitoring next year	None
	Degrading Trend	Comprehensive lake/stream/ watershed diagnostic-feasibility study	Intensive monitoring (as part of diagnostic-feasibility study)	Detailed runoff water quality monitoring, if needed, as part of diagnostic-feasibility study

1. For Low Priority lakes and wetlands, the VBWD Managers will review data and implement appropriate actions, on a case-by-case basis.

2. Applicable standards are included in Table 4.1-1 and include total phosphorus and chlorophyll a for all waterbodies, as well as Secchi disc transparency for lakes, and biological oxygen demand and total suspended solids for streams (see Section 4.1.7.5).

3. Watershed land use review: Review changes in watershed land use since last trend analysis and review weather/climate conditions.

4.1.7.6.1 Treatment Options to Improve Water Quality

There are many management actions (sometimes referred to as best management practices, or BMPs) available to the VBWD to improve the water quality of lakes, streams, and wetlands. Several of these actions are summarized in this section. This section is not all-inclusive, and the VBWD will seek to incorporate innovate management practices and technology as they develop.

Stormwater Runoff Treatment

One of the most of effective means of improving water quality in lakes, pond, streams and wetlands is to prevent nutrients and other pollutants from reaching these waterbodies through treatment of stormwater runoff. Stormwater runoff treatment practices may include the use of:

- Rainwater gardens
- Vegetative buffers
- Settling ponds (wet stormwater ponds)
- Porous pavement
- Filtration basins

Stormwater runoff management techniques that infiltrate runoff effectively remove all pollutants from runoff (although not all runoff may be treated; some infiltration devices only capture a portion of the runoff from larger storm events). Filtration of stormwater through natural areas (e.g., vegetated buffers) or constructed facilities (e.g., filtration basins) can significantly reduce the amount of pollutants carried in stormwater in situations where infiltration is not feasible. More information about stormwater treatment is included in Section 4.5 – Stormwater Runoff Management.

In-Lake Alum Treatment

The VBWD will consider in-lake alum treatments among possible water quality treatment options only after reasonable water quality improvements in the tributary watershed are implemented. The 2005 Plan considered in-lake alum treatments for Silver Lake, Echo Lake, Lake DeMontreville, and Lake Olson. These projects have been abandoned or postponed pending further study.

Previous VBWD water quality improvement studies found alum treatment to be the most effective measure to control internal phosphorus loading. However, alum does not control the biological component of this internal loading. In addition, alum treatments may only provide temporary improvement, unless pollutant loading from the watershed is also addressed. If best management practices are not implemented in the upstream watershed, phosphorus in lake sediment may continue to increase, resulting in future internal loading issues. Alum treatments are best applied to deep lakes (average depth greater than about 15 feet). When alum is applied to shallow lakes, the improved water clarity usually results in abundant (and often undesired) aquatic plant growth. This can become an even bigger issue if non-native and/or invasive plant species take over.

When evaluating in-lake alum treatment to improve water quality, the VBWD will consider detailed information regarding the internal loading component of the lake's nutrient budget resulting from

diagnostic-feasibility studies. The VBWD will share this information with MDNR staff and jointly determine the appropriateness of alum treatment to improve water quality.

Biomanipulation

The VBWD will collaborate with the MDNR to evaluate the possibility of manipulating the biological food chain (i.e., biomanipulation) in VBWD lakes as a means to improve water quality. These biomanipulation methods could include "reclamation," whereby rotenone or another chemical (e.g., those that target a particular size of fish) would be applied to the lake (most likely by the MDNR) to eliminate undesirable fish species, and predator fish would be stocked in the lake (also most likely by the MDNR). Shallow lakes managed in this manner may be aerated to prevent winterkill.

The VBWD will consider pursuing biomanipulation only in situations where detailed information regarding the internal loading component of the lake's nutrient budget, including the biological portion of the budget (e.g., plants, fisheries), identifies fish as a contributor to internal loading. The VBWD will share this information with MDNR staff and jointly determine the appropriateness of biomanipulation methods in improving water quality. If biomanipulation appears to be an appropriate method to improve water quality, the VBWD will explore possible partnerships with the MDNR on such projects and tailor biomanipulation methods to the composition of the lake's fishery and water quality condition. VBWD will cooperate with the MDNR and other groups to address other non-water quality related fisheries issues (see Section 4.6 – Wetland and Habitat Management).

Habitat Management

The VBWD may consider habitat management actions in response to monitoring results for High, Medium and Low Priority waterbodies. The VBWD will work with other units of government and non-profit organizations to determine the appropriate lead agency and/or group for implementing each action, which may be VBWD, depending on the action. If the designated unit of government or non-profit group does not undertake a recommended action, then the VBWD will consider implementing the action. Management actions may include increased monitoring, education efforts, or projects (e.g., construction of fish barriers to prevent carp migration or carp removal). The VBWD's role in the management of fish and aquatic plants is described in Section 4.6 – Wetlands and Habitat.

4.1.7.6.2 Project Prioritization and Implementation

Projects will be implemented based on feasibility, prioritization, and available funding, following the process described in Section 6.2. Prioritization will consider the VBWD management classification (High, Medium, Low, Stormwater Pond). The VBWD will place the highest implementation priority on water quality improvement projects that target High Priority waterbodies. However, VBWD will also take into account the order in which projects need to be undertaken in the tributary watershed, because water quality of upstream waterbodies may significantly impact downstream water quality.

The VBWD will also give higher priority to water quality improvement projects that are the most effective at achieving water quality goals. Section 4.9 – Administration and Funding, describes the general funding policies of the VBWD.

4.1.7.6.3 Operations and Maintenance

VBWD is responsible for operating and maintaining all District water quality improvement systems to ensure they provide the designed benefits. This means VBWD will inspect its systems and perform (or contract for the performance of) any needed maintenance, modifications, and/or repairs.

4.1.7.6.4 Stormwater Management Rules (to Address Water Quality)

As part of the VBWD permitting process, the VBWD will continue to implement development standards targeted at preserving and improving water quality (see *VBWD Revised Rules and Regulations*, 2013, as amended). The types of projects subject to these development standards are included in the VBWD Rules and Regulations document, included as Appendix A-4.5 of this Plan.

The VBWD stormwater management rules (Section 2 of the VBWD Rules and Regulations) contains policies and standards specifically addressing water quality. These policies include:

A. All stormwater runoff will be treated at the time of development.

B. Developers are encouraged to try new and innovative stormwater management techniques.

C. The VBWD will work with local government units to adopt/revise ordinances to allow for runoff pollution prevention methods (e.g., narrower streets, smaller parking lots).

D. Projects and development plans will be reviewed to evaluate compliance with VBWD standards.

E. Other public agencies will be required to conform to VBWD stormwater quality requirements.

F. Local watershed management plans will be reviewed for compliance with the VBWD Plan.

The VBWD standards for water quality are based on the MPCA's Minimal Impact Design Standards (MIDS) guidance. This standard is essentially a volume retention standard, and indirectly benefits water quality by providing 100 percent pollutant removal of infiltrated stormwater volume. The VBWD requirements vary according to project type, including:

- New, non-linear development
- Reconstruction/redevelopment projects
- Linear projects (e.g., roadways, sidewalks, trails)

Some project sites have restrictions where infiltration is not feasible or advised, such as karst topography, very fast or very slow infiltrating soils, shallow bedrock, a shallow confining layer/rough terrain, shallow groundwater, Drinking Water Management Supply Areas, and/or potential stormwater hotspots. In these situations, project applicants must follow these flexible treatment options, as summarized in the design sequence flow chart in Appendix C of the VBWD Rules and Regulations. The flexible treatment options include requiring a smaller amount of volume retention, phosphorus reduction without volume retention, or off-site mitigation (in order of decreasing preference).

Additionally, projects must comply with the standards (including water quality) contained in the MPCA's NPDES Construction Stormwater Permit. The Construction Stormwater Permit contains additional standards specifically addressing projects that drain to trout streams or ORVWs. The VBWD stormwater management standards also include restrictions on infiltration to limit the potential for negative impacts on groundwater quality (see Section 4.2 – Groundwater Management).

Vegetated buffers act as a filter for stormwater runoff, removing pollutants, limiting erosion, and having a beneficial impact on water quality. The VBWD requires vegetated buffers of varying widths around streams, lakes, wetlands and stormwater ponds. Specific criteria for buffers are described in Section 4.6 – Wetlands and Habitat. In addition, the VBWD prohibits the placement of SSTS within drainage easements, which effectively prevents the construction of SSTS within the 100-year floodplain of VBWD waters.

4.1.7.7 WQ-J Aquatic Invasive Species

The VBWD has identified the presence of several aquatic invasive species in VBWD waterbodies (see Section 4.1.6.2). The occurrence of these AIS in individual VBWD waterbodies is detailed in Section 5 – Subwatershed Management Plans. Curlyleaf pondweed is of special concern due to its potential as a source of internal phosphorus loading (see Section 4.1.6.2). Appendix A-4.1–Water Quality Background Information provides more information regarding AIS impacts.

The VBWD will collaborate with other governmental units to manage and prevent the spread of AIS, and encourage lake associations, homeowner associations, and land owners to lead AIS management efforts. The VBWD will continue to perform macrophyte (aquatic plant) surveys of high priority waters (see Section 4.1.7.3) to identify the extent of AIS presence. The VBWD will continue to provide technical assistance to lake associations and other groups in their efforts to manage aquatic plants. This may include point-intercept surveys of aquatic vegetation, preparation of lake vegetation management plans (LVMP), completion of Invasive Aquatic Plant Management (IAPM) Permit applications, design of herbicide treatment programs, participation in meetings with MDNR staff, and other technical analysis. LVMPs developed for individual VBWD lakes will consider the presence and management of native and invasive species and will identify levels prompting management actions on a lake-by-lake basis.

The VBWD will initiate AIS management projects only in cases where a diagnostic study has demonstrated a negative water quality effects from AIS (e.g., phosphorus loading from curlyleaf

pondweed). Such projects will include a monitoring plan to document the impact to AIS as well as long-term water quality (e.g., nutrient concentrations). In situations where other entities have obtained the required permits and performed the desired treatment, the VBWD will provide follow-up monitoring and required reporting to the MDNR. The VBWD will communicate with the MDNR to maintain consistent records of aquatic invasive species locations and extents. The VBWD will continue to meet with lake associations, cities and townships, and other parties, as necessary, to discuss options for management of aquatic invasive species, and may update its policies regarding management of aquatic invasive species accordingly.

Regardless of the entity implementing the project, the VBWD recommends that aquatic plant management actions be implemented beginning at the upstream end of the tributary watershed and working downstream, or be implemented at the same time throughout the tributary watershed. This will prevent managed areas from receiving undesirable plant materials from upstream.

Management options for aquatic invasive plants include physical treatment (i.e., removal), chemical (herbicide) treatment, or drawdowns of shallow lakes. Herbicide treatment design is critical to treatment success; herbicide treatment design includes determination of the areas to be treated, AIS to be treated, herbicide type, herbicide dosage, and timing of application. Timing of the herbicide application is important, as the herbicide needs to be applied before the native plants start growing to avoid impacting desired native plants. Control of curlyleaf pondweed with herbicide requires longer treatment than other AIS; current practice is annual herbicide treatments for multiple years. This multi-year treatment is necessary because the turions (the part of the plant from which new plants grow) remain viable for multiple years.

In many cases, it may not be feasible to eradicate AIS from infested waterbodies. However, an effective multi-year treatment can reduce invasive species to low levels and allow native species to recolonize the areas vacated by invasive species. In data collected from 2000 to 2011, the MDNR did not observe a consistent trend of increased water clarity in eutrophic lakes following lake-wide herbicide treatment of curlyleaf pondweed (MDNR AIS Annual Report, 2013). There are, however, many individual cases of improved water transparency following curlyleaf pondweed reduction. Improvement in water clarity following curlyleaf pondweed reduction may also be limited by other sources of phosphorus loading, such as internal loading from lake sediment or watershed loading.

The MDNR is moving from lake-wide treatments to partial lake treatments, which may be less expensive and less time consuming than lake-wide treatments. This move is consistent with results of recent research that has improved understanding of lake mixing and herbicide dosing. In general, application of a higher dose of herbicide in the areas of the lake infested by AIS (i.e., partial lake treatment) is as effective, or possibly more effective, than applying a lower herbicide dose over the entire lake.

Treatment of invasive animal species may include construction of fish barriers to prevent migration of common carp or physical removal of carp. Although zebra mussels have not been identified in

VBWD waters, education regarding watercraft decontamination and other best management practices are critical to preventing further the spread of invasive species.

4.1.7.8 WQ-K Cooperative Efforts to Address Water Quality

The VBWD will identify additional opportunities to cooperate with other entities in water quality protection efforts, as they arise, and pursue relationships that the VBWD considers to be beneficial. Cooperative efforts may include water quality monitoring, or the development and implementation of educational programs targeting water quality (see also Section 4.3 – Education and Public Involvement). An ongoing example of this is the VBWD's coordination with the MDNR and lake associations to address aquatic plant management (see Section 4.1.7.7). The VBWD will periodically review its collaborative efforts to identify those practices that are most successful and those which may be improved.

Possible future opportunities include collaboration with the Minnesota Department of Agriculture to address nutrient and chemical loading from agricultural land uses, and cooperation with the MDNR to address regional groundwater quality (see also Section 4.2 – Groundwater Management).

Appendix A-4.1 Water Quality Background Information

Water Quality Background Information

A.1 General Concepts in Water Quality

There are a number of concepts and terminology that are used to describe and evaluate a waterbodies water quality. This section briefly discusses those concepts, divided into the following topics:

- Eutrophication
- Trophic states
- Limiting nutrients and stressors
- Stratification
- Nutrient recycling and internal loading

To learn more about these five topics, one can refer to any text on limnology (the science of lakes and streams).

A.1.1 Eutrophication

The water quality problems in a waterbody caused by sediment and nutrients from the watershed are described by the word "eutrophication." Nutrients are essential to aquatic ecosystems, but excessive amounts can have negative effects on lakes, wetlands, and streams. The term "eutrophication" refers to the accumulation of sediments and nutrients in a waterbody. Eutrophication can be a natural process, especially in lakes, ponds, and other basins, that causes a waterbody to become more fertile, resulting in increased algae and aquatic plant growth. The increasing biological production and sediment inflow from the watershed eventually fill the basin or stream channel. The natural eutrophication process results from normal environmental forces . Human activities can accelerate the aging process – this is called cultural eutrophication.

Nutrient and sediment inputs (i.e., loadings) from wastewater treatment plants, septic tanks, and stormwater runoff can far exceed the natural inputs to a lake, wetland, or stream. The accelerated rate of water quality degradation caused by these pollutants can alter the aquatic ecosystem and results in profuse and unsightly growths of algae (algal blooms), reduced diversity of rooted aquatic plants (macrophytes), and fish kills.

The impact of nutrients on aquatic ecosystems and biota through food web alterations depend on a number of factors. For example, turbidity, shading, and water body depth can decrease the impact of nutrients on algal growth (although turbidity can negatively affect other species). The type of habitat (e.g., large versus small) and location within the habitat (e.g., bottom versus suspended in the water) has an impact on how nutrients influence water quality and biological condition. For example, three

important factors that can limit or promote algal growth are nutrient availability, temperature, and light. In large streams and lakes, turbidity may have more influence on light availability, whereas shading may be a significant factor in smaller ponds or streams. A conceptual model of the factors driving eutrophication in lakes and streams is shown in Figure A-4.1-1.

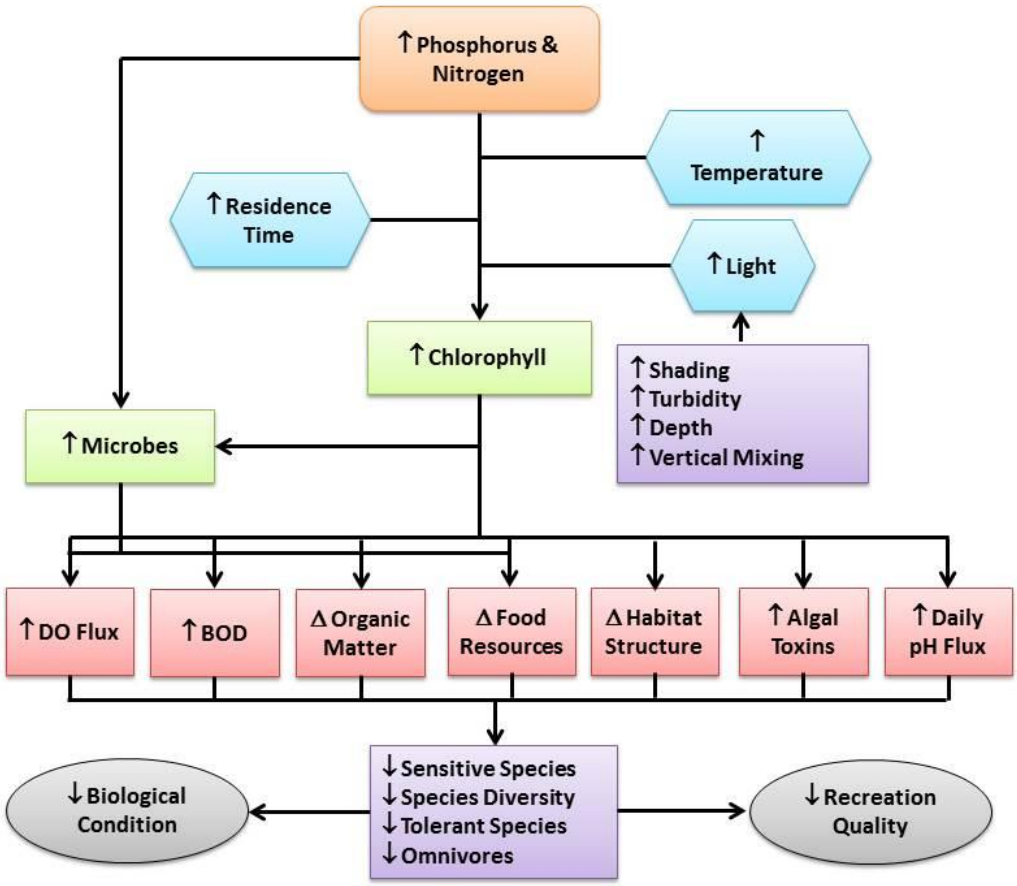


Figure A-4.1-1 Conceptual model of the impact of nutrient loading on biological conditions and recreational quality in lakes, streams, and wetlands (adapted from *MPCA's River Nutrient Criteria SONAR, 2010*).

A.1.2 Trophic States

Not all waterbodies are at the same stage of eutrophication; therefore, criteria have been established to evaluate the nutrient status of lakes (trophic level criteria have yet to be established for streams). Trophic state indices (TSIs) are calculated for lakes on the basis of total phosphorus (TP), chlorophyll *a* (Chl-a) concentrations, and Secchi disc (SD) transparencies. TSI values range upward from 0, describing the condition of the lake in terms of its trophic status (i.e., its degree of fertility), with higher numbers representing greater eutrophication. All three of the parameters can be used to determine a TSI. However, water transparency is typically used to develop the TSI_{SD} (trophic state

index based on Secchi disc transparency) because public perception of water clarity is often directly related to recreational-use impairment. Water quality trophic status categories include:

- Oligotrophic (i.e., excellent water quality),
- Mesotrophic (i.e., good water quality),
- Eutrophic (i.e., poor water quality), and
- Hypereutrophic (i.e., very poor water quality).

For example, for a lake with medium fertility, the TSI rating system results in the placement of the lake in the mesotrophic trophic status category. Water quality characteristics of lakes in the various trophic status categories are listed in Table A-4.1-1. Determining the trophic status of a lake is an important step in diagnosing water quality problems. Trophic status indicates the severity of a lake's algal growth problems and the degree of change needed to meet its water quality goals. Additional information is needed to determine the cause of algal growth and the means to reduce it.

Table A-4.1-1 Nutrient Criteria to Determine Lake Trophic State

Trophic State	TSI_{SD}	Chlorophyll a (ug/L)	Total Phosphorus (ug/L)	Secchi Disc Transparency (m)
Oligotrophic	< 38	< 2	< 10	> 4.6
Mesotrophic	38 – 50	2 – 8	10 – 25	2.0 – 4.6
Eutrophic	50 – 62	8 – 26	25 – 57	0.85 – 2.0
Hypereutrophic	> 62	> 26	> 57	< 0.85

A.1.3 Limiting Nutrients

The quantity or biomass of algae in a waterbody is usually limited by the water's concentration of an essential element or nutrient – the "limiting nutrient." (For most rooted aquatic plants, the nutrients are derived from the sediments.) The limiting nutrient concept is a widely applied principle in ecology and in the study of eutrophication. It is based on the idea that algae require many nutrients to grow, but the nutrient with the lowest availability, relative to the amount needed by the algae, will limit algal growth. It follows then, that identifying the limiting nutrient will point the way to controlling algal growth.

Nitrogen (N) and phosphorus (P) are generally the two growth-limiting nutrients for algae in most natural waters. Analysis of the nutrient content of lake water and algae provides ratios of nitrogen to phosphorus (N:P). By comparing the ratio in water to the ratio in the algae, one can estimate whether a particular nutrient may be limiting. Algal growth is generally phosphorus-limited in lakes with N:P ratios greater than 12 (research addressing limiting N:P ratios is streams is limited). Laboratory

experiments (bioassays), fertilization of in-situ enclosures, and whole-lake experiments have repeatedly demonstrated that phosphorus is usually the nutrient that limits algal growth in freshwaters. Reducing phosphorus in a lake, therefore, is required to reduce algal abundance and improve water transparency. Failure to reduce phosphorus concentrations will allow the process of eutrophication to continue at an accelerated rate. Research presented in the MPCA's River Nutrient Criteria SONAR (2010) identifies phosphorus as more limiting to algal growth in Minnesota streams than nitrogen, although nutrients may not be the limiting factor for algal blooms in streams.

A.1.4 Stratification and Mixing

Thermal stratification profoundly influences the chemistry and biology of deep waterbodies. The density of water decreases as it warms, which means warmer water tends to rise to the surface. As a result, lakes and ponds in temperate regions tend to form temperature layers, or "stratify," when they are exposed to the heat of the sun. When the ice melts in the spring, the water temperature in a lake is usually around 4˚C (39˚F) from top to bottom. At this temperature, water is most dense (heaviest). During the spring and summer months, the sun warms the surface layer of the lake causing it to become warmer and less dense (lighter). In shallow portions of a lake, the sun's rays are often able to reach the lake's bottom in most places. During the summer, the water temperature in these portions of the lake (which are usually near the shore or in the "littoral zone") may be warm throughout. Stratification can also occur in streams or rivers with adequate depth or slow-moving water. Stratification in streams or shallow lakes may be more abbreviated than deep lakes, as they are more susceptible to mixing from wind action (or higher velocity flow in the case of streams).

The deeper portions of lakes typically remain cooler and denser than shallow regions during the summer because sunlight does not reach the bottom of the deeper portions of the lake. The warmer, lighter water stays near the surface. The cooler, deeper water layer of the lake is called the hypolimnion, and the warm surface layer is known as the epilimnion. Between the warm epilimnion and the cool hypolimnion is a transitional layer of water known as the metalimnion. This layer of the lake is characterized by a rapidly-declining temperature with depth.

Because of the density differences between the lighter warm water in the epilimnion and the heavier cold water in the hypolimnion, stratification in a lake can become very resistant to mixing. Shallow waterbodies may circulate many times during the summer as a result of wind mixing. Lakes possessing these wind mixing characteristics are referred to as polymictic lakes. In contrast, deeper lakes generally become well-mixed only twice each year. This usually occurs in the spring and fall. Lakes possessing these mixing characteristics are referred to as dimictic lakes. During spring and fall, the lack of strong temperature/density differences allows wind-driven circulation to mix the water column throughout.

Thermal stratification in deeper waterbodies is significant because the density change in the metalimnion (middle transitional water temperature stratum) provides a physical barrier to mixing between the epilimnion and the hypolimnion. This separation can impact water quality by limiting

nutrient movement between the epilimnion and hypolimnion, limiting biotic activity in the waterbody (see Section A.1.5).

A.1.5 Nutrient Recycling and Internal Loading

Phosphorus enters a lake, stream, or wetland from the watershed (either as runoff or groundwater inflow), precipitation, or direct atmospheric deposition (see Figure A-4.1-2). Phosphorus in a lake may be decreased by reducing these external loads. All waterbodies, however, accumulate phosphorus (and other nutrients) in the sediments from the settling of particles and dead organisms. Under specific conditions, this reservoir of phosphorus can be reintroduced in the water and become available again for plant uptake. This resuspension or dissolution of nutrients from the sediments to the lake water is known as "internal loading." As long as a waterbody's sediment surface remains sufficiently oxidized (i.e., dissolved oxygen remains present in the water above the sediment), its phosphorus will remain bound to sediment particles as ferric hydroxy phosphate. When dissolved oxygen levels become extremely low at the water-sediment interface (as a result of microbial activity using the oxygen), the chemical reduction of ferric iron to its ferrous form causes the release of dissolved phosphorus, which is readily available for algal growth, into the water column.

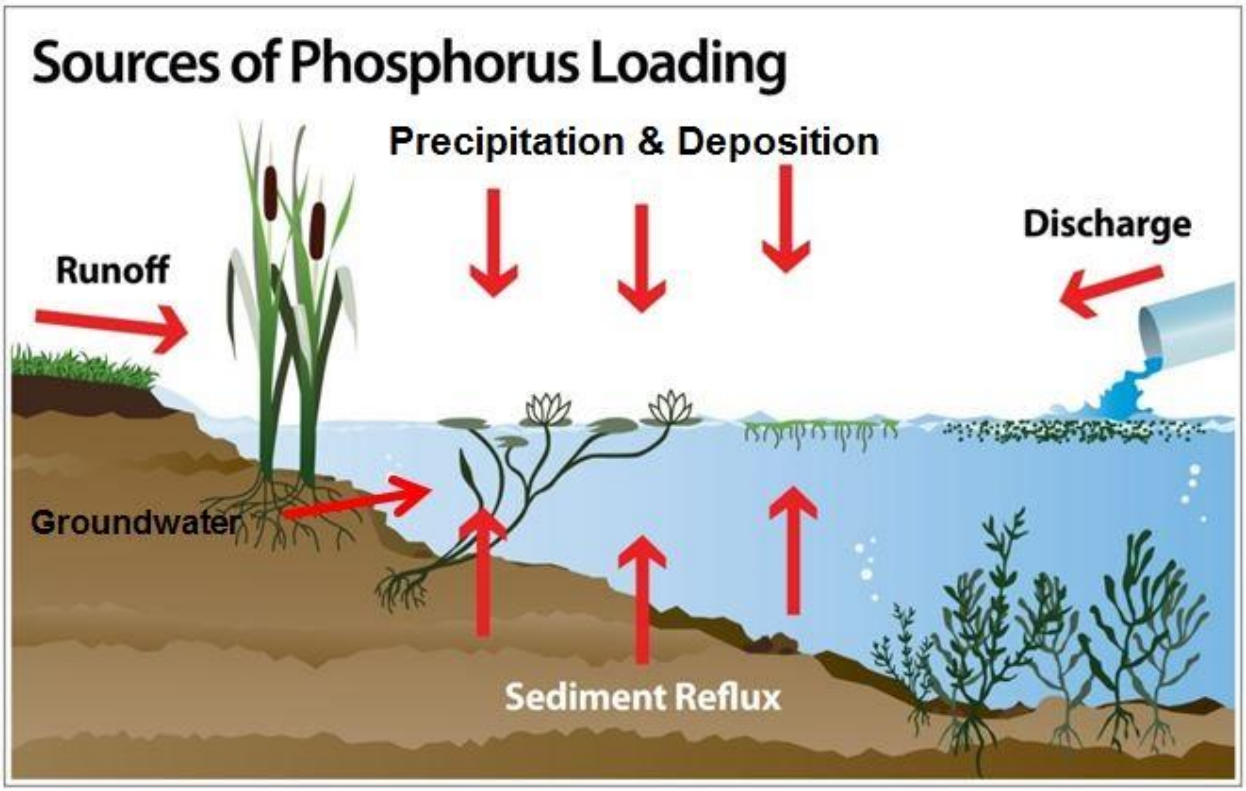


Figure A-4.1-2 Sources of Phosphorus Loading to Lakes, Streams, and Wetlands (figure adapted from www.solitudelakemanagement.com)

The amount of phosphorus released from internal loading can be estimated from depth profiles (measurements from surface to bottom) of dissolved oxygen and phosphorus concentrations. Even if

the water samples indicate the water column is well oxidized, the oxygen consumption by the sediment during decomposition can restrict the thickness of the oxic sediment layer to only a few millimeters. Therefore, the sediment cannot retain the phosphorus released from decomposition or deeper sediments, which results in an internal phosphorus release to the water column. Low-oxygen conditions at the sediments, with resulting phosphorus release, are to be expected in eutrophic lakes where relatively large quantities of organic material (decaying algae and macrophytes) are deposited on the lake bottom.

The pH of the water column can also play a vital role in affecting the phosphorus release rate under oxic conditions. Photosynthesis by macrophytes and algae during the day tends to raise the pH in the water column, which can enhance the phosphorus release rate from the oxic sediment. Enhancement of the phosphorus release at elevated pH (pH > 7.5) is thought to occur through replacement of the phosphate ion (PO_4^{-3}) with the excess hydroxyl ion (OH^-) on the oxidized iron compound (James, et al., 2001).

Another potential source of internal phosphorus loading is the die-off of curlyleaf pondweed, an invasive aquatic plant present in many VBWD lakes. Curlyleaf pondweed grows vigorously during early spring, crowding out native species. It releases a small reproductive pod (turion) that resembles a small pinecone during early summer. After curlyleaf pondweed dies out in mid-summer, it may sink to the lake-bottom and decay, causing oxygen depletion and exacerbating internal sediment release of phosphorus. This potential increase in phosphorus concentration during mid-summer likely could result in an algal bloom during the peak of the recreational use season.

Waterbody stratification can affect internal nutrient loading within a waterbody. Wave action on the surface of the waterbody introduces dissolved oxygen at the air-water interface. In stratified waterbodies, the water in the epilimnion may circulate as a result of wind action, while hypolimnetic waters at the bottom generally remain isolated. Consequently, very little transfer of oxygen occurs from the atmosphere to the hypolimnion during the summer. When this occurs, generally in mid-summer, oxygen from the air cannot reach the bottom of the waterbody and, if the sediments have sufficient organic matter, biological activity can deplete the remaining oxygen in the hypolimnion, resulting in the anoxic conditions that drive internal phosphorus loading.

During mixing events, oxygen may be transported to the deeper portions of the waterbody, while dissolved phosphorus is brought up to the surface, where it becomes available for plant and algal growth (phosphorus in the hypolimnion is generally not available for plant and algal growth due to insufficient light penetration). As the summer progresses, phosphorus concentrations in the hypolimnion can continue to rise between mixing events until oxygen is again introduced (recycled). Similarly, phosphorus in the epilimnion will be depleted by algal growth between mixing events. It is the destratification, brought about by wind-induced mixing of the water column, which re-introduces phosphorus to the upper portion of the lake (the epilimnion). This process is common in lakes and wide, deep portions of rivers, but is rare in smaller streams, where shallow depths and high velocities result in well-mixed conditions that limit the possibility of anoxic conditions.

A.2 Criteria for Water Quality Evaluation

A.2.1 Water Chemistry

Several different organizations have monitored the water quality of VBWD waterbodies since 1961. These organizations include the VBWD, Metropolitan Council (using its own staff and via the Citizen Assisted Monitoring Program, or CAMP), Ramsey County, the Minnesota Pollution Control Agency (MPCA), the Minnesota Department of Natural Resources (MDNR), Washington Conservation District (WCD), lake association volunteers, and others. For lakes, readings are taken either in the deepest location of a bay or in the main basin of each water body. For streams, measurements are taken at the stream centerline (or as close to the centerline as can be safely accessed). This historical data is examined to determine if any degradation or improvement in the waterbody's water quality has occurred. Limnological data such as temperature, dissolved oxygen, Secchi disc transparency (water clarity), total phosphorus concentration (limiting nutrient), and chlorophyll *a* concentration, and total suspended solids are reviewed. The following paragraphs describe the importance of selected parameters collected and analyzed to determine the water quality of lakes, streams, and wetlands.

Phosphorus

Phosphorus is the nutrient that most often limits the growth of algae. Phosphorus-rich lake water indicates a lake has the potential for abundant algal growth, which can lead to lower water transparency and a decline in hypolimnetic oxygen levels in a lake.

Water samples are collected from the lake and sent to a laboratory for analysis. Water is typically collected from the surface of the lake (0 – 2 meters) and sometimes from lower depths.

Chlorophyll *a*

Chlorophyll *a* is a measure of algal abundance within a lake. High chlorophyll *a* concentrations indicate excessive algal abundance (i.e., algal blooms), which can lead to recreational use impairment.

Water samples are collected from the lake and filtered in the field. The filters and collected material are sent to a laboratory for analysis. Samples are typically collected from the surface of the lake (0 – 2 meters) and sometimes from lower depths.

Transparency (Secchi Disc and Transparency Tubes)

Public perceptions and expectations of stream and lake water quality are generally correlated with water clarity. Secchi disc transparency is a measure of water clarity in lakes. The MPCA reports that as Secchi disc transparency decreases from about 1.7 meters (5.6 feet) to 0.8 meters (2.6 feet), the frequency of algae blooms increases from about five percent of the summer to about 70 percent of the summer. This frequency of nuisance algal blooms means the lake is perceived as "impaired swimming" for about 26 percent to 50 percent of the summer (MPCA, 2014). Similarly, a Metropolitan Council survey (Osgood, 1989) revealed a positive relationship between a lake's

suitability for recreational and Secchi disc transparencies (i.e., higher Secchi disc transparency = more suitable for recreation).

Water transparency in lakes is measured using a tool called a Secchi disc, an 8-inch diameter, circular, all-white (or black and white) metal plate attached to a calibrated rope. The disc is lowered into the water until it is no longer visible, lowered a little further, and then raised back up until it reappears. The depth at which the disc disappears/reappears is the Secchi disc transparency depth.

Water transparency in streams is measured using a tool called a transparency tube. The tube is 2 feet long 1.5 inches wide, made of clear plastic, and has a release valve at the bottom. A stopper inserted at one end of the tube is painted black and white similar to a Secchi disc. The tube is filled with water collected from a stream or river; the user releases the water from the bottom of the tube until the black and white symbol is visible. The depth of the water when the symbol becomes visible is recorded in centimeters, If the symbol is visible when the tube is full, the transparency reading is ">60 centimeters." As with the Secchi disc in lakes, greater transparency reading in centimeters reflects higher water clarity.

Dissolved Oxygen

Dissolved oxygen is a key indicator of water quality. The survival of aquatic life, such as fish, depends on a sufficient level of dissolved oxygen. Generally, warmer water holds less oxygen than cooler water. Oxygen may be consumed by microbial activity in water (see Section A.1.5). When the dissolved oxygen levels drop, aquatic species (e.g., fish) may be stressed. Severe low dissolved oxygen can result in fish kills.

An electrode and meter are used to measure dissolved oxygen in the field. Measurements can be taken at various depths to monitor the dissolved oxygen levels throughout the lake or waterbody. Dissolved oxygen is expressed as a concentration.

Diel oxygen flux is the difference between the maximum daily dissolved oxygen concentration and the minimum daily dissolved oxygen concentration. The diel oxygen flux serves as a representation of how variable the dissolved oxygen can be for a water body.

Biochemical oxygen demand (BOD) is a calculation of the amount of dissolved oxygen that will be consumed by aquatic organisms to break down organic matter present in the water. High BOD values indicate a higher potential for reduced dissolved oxygen levels due to microbial activity. Water samples are collected from the waterbody and sent to a laboratory for analysis to calculate BOD.

Temperature

Water temperature is an important water quality parameter because of its relationship with dissolved oxygen, water density, and its influence on living organisms. As the water gets warmer, an aquatic organism's metabolism speeds up, increasing its need for oxygen. However, capacity for water to hold oxygen in dissolved form decreases as water temperature increases. Aquatic organisms are adapted to a variety of water temperatures, but each species has its own optimum for growth and

reproduction. The preferred temperature for trout is generally considered to be below 64 degrees Fahrenheit, and sustained temperatures above 75 degrees Fahrenheit are considered lethal.

Temperature also affects water density. Above 4 degrees Celsius (39 degrees Fahrenheit), water density decreases with increased temperature. In deep lakes during the summer, this relationship results in thermal stratification, with the warmer water near the surface of the lake in a well-mixed layer called the epilimnion. Colder water is trapped below in the hypolimnion. The transition between the epilimnion and hypolimnion is a narrow band with a steep temperature gradient called the thermocline. Thermal stratification can affect water quality, as sustained warmer temperatures near the surface (where light is available) are favorable conditions for algal blooms, if nutrients are available. In shallow lakes, mixing due to wind can limit thermal stratification. Thermal stratification typically does not occur in streams due to the mixing of the flowing water.

Water temperature is typically measured in the field using a digital thermometer. In lakes, temperature is often measured in the epilimnion and as a depth profile at specific intervals. In streams, a single temperature is typically measured.

Total Suspended Solids (streams only)

Total suspended solids (TSS) is a measure of all particles suspended in water which will not pass through a filter. High TSS concentrations can negatively impact water quality in several ways. Suspended solids absorb heat from the sun, thereby increasing the water temperature and decreasing the dissolved oxygen concentration. Suspended solids also reduce the amount of light reaching aquatic plants. This results in a reduction in the amount of oxygen produced by these plants through photosynthesis. Suspended solids can also settle to the bottom of the water body, negatively impacting fish and aquatic insect (macroinvertebrate) habitat.

Water samples are collected from the stream and are left unfiltered. Samples can be taken from any depth of the lake. The samples are sent to a laboratory for analysis.

A.2.2 Water Quality Goal Attainability

After completion of the 2005 VBWD Plan, the MPCA developed eutrophication water quality standards for deep and shallow lakes. The MPCA recently developed draft nutrient water quality standards for streams. Most of the MPCA's eutrophication standards are based on summer average concentrations, calculated from June through September. The VBWD adopted these water quality standards as the water quality goals for each lake, pond or stream. These goals are compared to current water quality (and trends in historic water quality) to assess whether the waterbodies require protection or restoration to maintain or achieve their goals. The VBWD continues to monitor the major VBWD waterbodies.

Trend Analyses

Trend analyses of lake water quality data are completed to determine if a lake has experienced significant degradation or improvement during all (or a portion) of the years for which water quality data are available. Water quality data from the "summer" growing season (June-September) are

compiled from previous investigations for each analysis. The summer averages of the water quality data are used to determine water quality trends. Long term trends are typically determined using standard statistical methods (i.e., linear regression and analysis of variance). For this Plan, VBWD used the Mann-Kendall/Sen's Slope Trend Test to determine water quality trends and their significance. To complete the trend test, the calculated summer average must be based on at least four measured values during the sampling season, and at least five years of data are required.

VBWD considers a lake's water quality to have significantly improved or declined if the Mann-Kendall/Sen's Slope Trend Test is statistically significant at the 95 percent confidence level.

A.2.3 Biological Data

Several types of biological data can also be compiled and evaluated (in addition to the physical and chemical parameters) for waterbodies. Macrophyte (large aquatic plant), phytoplankton (small aquatic plants), zooplankton (small aquatic animals), macroinvertebrate (i.e., insects), and fisheries data provide insight into the health of the aquatic ecosystem of each water body. Aquatic communities interact with each other and influence both short- and long-term variations in observed water quality.

Aquatic plants (i.e., macrophytes and phytoplankton) are a natural part of most waterbody communities and provide many benefits to fish, wildlife, and people. They are the primary producers in the aquatic food chain, converting the basic chemical nutrients in water and soil into plant matter through photosynthesis, which provides food for other aquatic life.

Macrophytes are the large aquatic plants growing in the shallow (littoral) area of the waterbody. Table A-4.1-2 lists the common name and the scientific name, and includes photographs of macrophytes found in VBWD lakes. Macrophytes provide critical fish and wildlife habitat, but can negatively impact the recreational use of a waterbody. Invasive macrophytes, such as curlyleaf pondweed, Eurasian watermilfoil, and purple loosestrife can be especially problematic in lakes. Invasive species are undesirable because their natural control mechanisms are not introduced with the species. Consequently, invasive species frequently exhibit rapid unchecked growth patterns. All invasive macrophytes in the VBWD are non-native, although not all non-native species are invasive.

Curlyleaf pondweed is an invasive, perennial, rooted, submersed aquatic vascular plant, which was first noted in Minnesota about 1910 (Moyle and Hotchkiss, 1945). Native to Eurasia, Africa, and Australia, this species has been found in most of the United States since 1950, and is currently found in most parts of the world (Catling and Dobson, 1985).

Curly-leaf pondweed is detrimental to lakes for three reasons:

- It tends to crowd out native aquatic macrophyte species.
- Dense colonies of the weed may interfere with recreational activities on the lake.

- After curlyleaf pondweed dies out in mid-summer, it sinks to the lake bottom and decays. When dense colonies of the weed decay, oxygen depletion and release of phosphorus may occur.

Eurasian watermilfoil is another exotic invasive aquatic plant. It is considered a noxious plant because it has few natural enemies or controls, and it has the ability to regrow from small fragments, allowing it to out-compete native aquatic plant species and spread rapidly. Dense growths of Eurasian watermilfoil may result in habitat degradation, pose a hazard to navigation, and are an aesthetic nuisance.

Similarly, purple loosestrife is a noxious invasive aquatic plant that chokes out all other vegetation and is not usable by most wetland mammals. The entire plant, including roots, must be physically removed, or commercial herbicides must be used to eradicate the plant.

Phytoplankton (algae) species form the base of the lake's food web and directly influence the waterbody's fish production and recreational use. Phytoplankton derive energy from sunlight and from dissolved nutrients found in the water column. Phytoplankton provide food for several types of animals, including zooplankton, which in turn are eaten by fish. A phytoplankton population in balance with the waterbody's zooplankton population is ideal for fish production. An inadequate phytoplankton population reduces the waterbody's zooplankton population and adversely impacts the waterbody's fishery. However, excess phytoplankton, especially blue-green algae (cyanobacteria), can interfere with recreational usage of a waterbody and is considered problematic.

Some blue-green algae produce toxins that, when ingested or inhaled, can cause short- and long-term health effects. These effects range from tingling, burning, numbness, drowsiness, and dermatitis to liver or respiratory failure—possibly leading to death. Not all blue-green algae produce toxins, but the presence of blue-green algae is a marker for a potential hazard. The World Health Organization (WHO) developed guidelines to determine risks from blue-green algae. No adverse health effects are expected when fewer than 20,000 blue-green algae per milliliter are observed. Low adverse health effects, such as skin irritations and/or gastrointestinal illness may occur when numbers are between 20,000 and 100,000 per milliliter. When blue-green algae numbers exceed 100,000 per milliliter, moderately adverse health effects, including the potential for long-term illness, may occur (WHO 2003).

Chlorophyll a is a measure of total phytoplankton biomass. Identifying the phytoplankton species and their abundance provides additional information on the health of the aquatic ecosystem, as well as an explanation for some of the changes that occur in the chlorophyll a levels over time. Smaller algae that can be eaten by zooplankton are considered desirable over the larger algal species that cannot be easily consumed. The larger species that cannot be consumed by the zooplankton also have the ability to form "blooms"—very high concentrations of algae—which can impair recreational use and aesthetics, and deplete oxygen needed by fish and macroinvertebrates.

Zooplankton—microscopic crustaceans—are vital to the health of a lake ecosystem because they feed upon the phytoplankton and are food themselves for many fish species. Protection of the waterbody's

zooplankton community through proper water quality management practices protects the waterbody's fishery. Zooplankton are also important to lake water quality. The zooplankton community is generally comprised of three groups: cladocera, copepods, and rotifers. If present in abundance, large cladocera (e.g., daphnia) can decrease the number of algae and improve water transparency within a lake. Small-bodied zooplankton are an important food source for a waterbody's panfish community, but are too small to control the algae community.

Benthic (i.e., bottom-dwelling) macroinvertebrates can provide a long-term assessment of water quality. They live on the bottom and in the vegetation of a stream as long as water quality conditions permit. As attached organisms, benthic aquatic invertebrates are exposed to all the temporal variations in stream quality and "integrate" the quality of passing water. Each type of benthic invertebrate has a different tolerance for pollution; studying the numbers and types of benthic invertebrates can indicate pollution in a stream. When sufficient pollutants enter the stream to prevent their survival, they are eliminated. Monitoring the presence or absence of biological indicator organisms provides indirect evidence of the effects of transitory changes in stream water quality. A numeric "biotic index" is typically used to quantify the results of macroinvertebrate monitoring.

Fisheries form the top level of the food chain within the aquatic environment. Smaller fish feed upon the zooplankton and are food themselves for many larger fish species. The populations and species of fish can have an effect on water quality. Depending on the size and population, certain species of fish can adversely affect the zooplankton community, which will, in turn, increase the number of algae and diminish water transparency within a lake. Certain fish species, such as carp and bullheads, can stir up sediments at the bottom of the waterbody, which can bring nutrients back into the water column and cause algal blooms. Similar to macroinvertebrates, fisheries data can provide an assessment of overall water quality, and can be incorporated into biotic indices to quantify monitoring results and track trends.

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

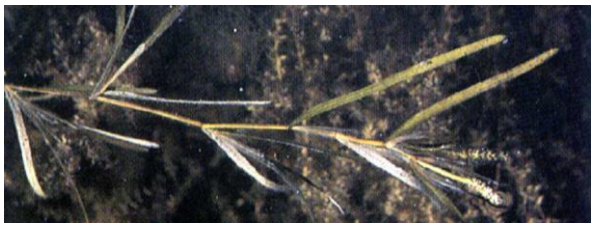
Common Name	Scientific Name	Picture
Submerged Aquatics		
Variable pondweed	*Potamogeton gramineus*	
Large-leaf pondweed	*P. amplifolius*	
Curlyleaf pondweed *(invasive)*	*P. crispus*	
Flatstem pondweed	*P. zosteriformis*	
Sago pondweed	*P. pectinatus*	
Leafy pondweed	*P. foliosus*	

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

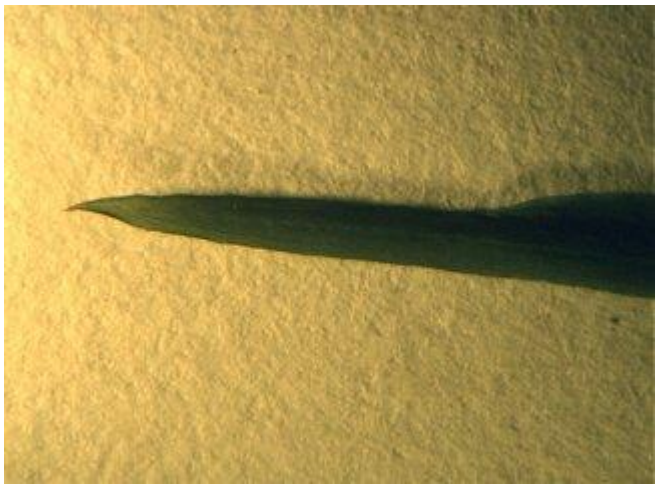
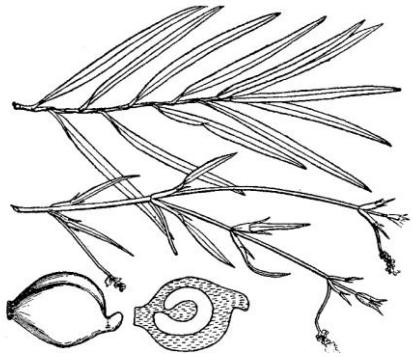
Common Name	Scientific Name	Picture
Narrowleaf pondweed	*P. strictifolius*	
Robbins' pondweed	*P. robbinsii*	
Illinois pondweed	*P. illinoensis*	
Floating leaf pondweed	*P. natans*	

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

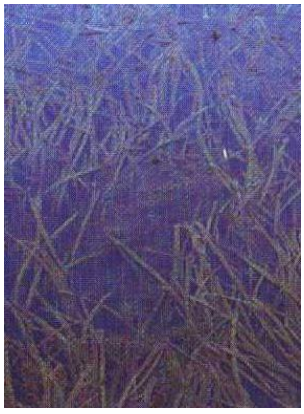
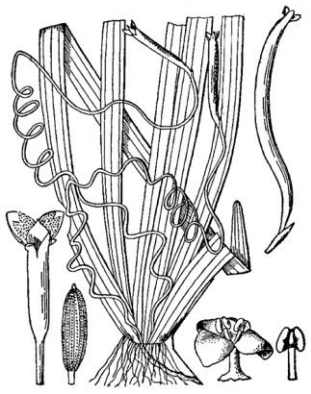
Common Name	Scientific Name	Picture
Clasping-leaf pondweed	*P. richardsonii*	
Northern water milfoil	*Myriophyllum sibericum*	
Eurasian watermilfoil *(invasive)*	*M. spicatum*	
Wild celery	*Vallisneria Americana*	 

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

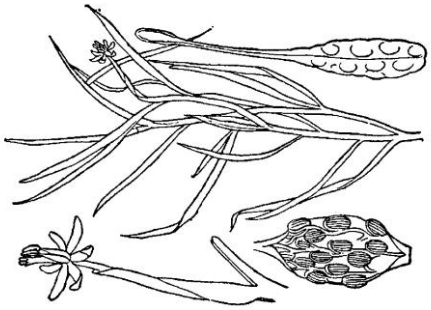
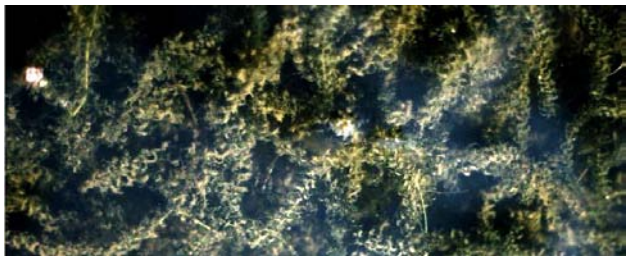
Common Name	Scientific Name	Picture
Water stargrass	*Zosterella dubia*	
Coontail	*Ceratophyllum demersum*	
White water buttercup	*Ranunculus aquatilis (shown)*	
Buttercup	*Ranunculus spp.*	
Elodea	*Elodea canadensis*	

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

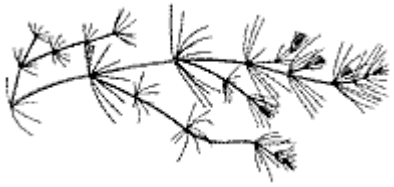
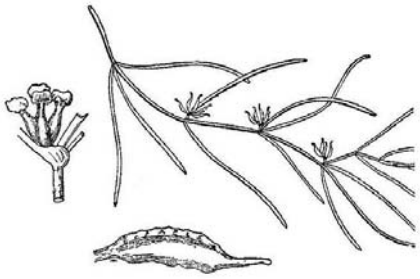
Common Name	Scientific Name	Picture
Pipewort	*Eriocaulon spp.*	
Bushy pondweed (a.k.a. water-nymph, naiad)	*Najas spp* *(Shown: N. flexilis, slender naiad)*	
Muskgrass	*Chara spp.*	
Horned pondweed	*Zannichellia palustris*	

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

Common Name	Scientific Name	Picture
Floating Leaf Plants		
White waterlily	*Nymphaea odorata*	
Little yellow waterlily	*Nuphar* *(Nuphar) microphyllum*	
Spatterdock, bullhead pond lily	*Nuphar variegata*	
Emergent Plants		
Bulrush	*Scirpus spp.*	  
Cattail	*Typha spp.* *Left: T. latifolia, broadleaf (native).* *Right: T. angustifolia, narrow-leaf (non-native)*	 

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

Common Name	Scientific Name	Picture
Water smartweed	*Polygonum amphibian*	
Arrowhead	*Sagittaria latifolia*	
Purple loosestrife *(invasive)*	*Lythrum salicaria*	
Common bur reed	*Sparganium eurycarpum*	

Table A-4.1-2 Macrophytes found in VBWD Lakes, Streams, and Wetlands

Common Name	Scientific Name	Picture
Blue flag iris	*Iris versicolor*	
Yellow iris *(invasive)*	*Iris pseudacorus*	

List of Tables

4.2 Groundwater Management

4.2.1 Importance	All VBWD residents obtain their drinking water from groundwater. This makes it especially important to ensure that these aquifers are uncontaminated, protected from future contamination, and provide adequate supplies. Overuse and contamination of groundwater can negatively impact other highly valued resources including trout streams, wetlands, groundwater-connected lakes, and the fish, wildlife, and plant communities that rely on them. Several VBWD waterbodies are groundwater-dependent and need an adequate supply of clean groundwater.
4.2.2 General Issues	Groundwater quality and quantity is closely linked to the aboveground environment. Groundwater quality and quantity are dependent on the infiltration of surface water/rainfall through the soil, which is a function of soil type, land cover, weather, and other factors. Changes to any of these factors will influence groundwater recharge, and ultimately groundwater supply. While some of the factors are difficult to control, some activities and changes to land cover can be regulated and/or managed. Groundwater is a finite resource with inputs and outputs. The input is generally rainwater and snowmelt that seeps into the ground. The outputs can be groundwater that is pumped out for human use and groundwater that naturally discharges to lakes, wetlands, and streams. The sustainability of groundwater supply is a growing concern, as development results in groundwater withdrawals that may outpace inputs. Maintaining clean, safe groundwater supplies is critical to human and environmental health and to the economic and social vitality of our communities. Groundwater can be contaminated by commercial and industrial waste disposal, landfills, leaking underground storage tanks, non-compliant subsurface sewage treatment systems (SSTS), mining operations, accidental spills, feedlots, and fertilizer/pesticide applications. In the VBWD, groundwater contaminants have been found in many areas. In these areas, there are added financial and social costs required to manage the affected water supply.
4.2.3 Mission	To manage and protect our water resources within the limits of VBWD jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Improving and protecting the quality of surface water and groundwater resources. Understanding and responding to the effects of community growth and related activities on groundwater and surface water resources.
4.2.4 Policies to Accomplish Mission	GM-A. The VBWD will continue to collect groundwater level data to assist in managing the water levels and floodplains of the VBWD's water resources. GM-B. The VBWD will report groundwater level data. GM-C. 1. The VBWD will cooperate with Washington County to address

	groundwater quality issues (e.g., failing subsurface sewage treatment systems). 2. The VBWD encourages the cities and other public water suppliers to adopt wellhead protection programs. These programs will include the identification and sealing of abandoned wells. The wellhead protection plans must be submitted to VBWD for review. 3. The VBWD will cooperate with the cities and other public water suppliers to educate the general public concerning the use of best management practices to prevent contamination of groundwater supplies and the importance of these measures in protecting groundwater supplies. GM-D The VBWD will collaborate with local and state agencies in the development of the North and East Metro Groundwater Management Area Plan and/or other regional planning efforts. The role of the VBWD may include: • Collaborate with appropriate entities to identify data gaps and attempt to fill those gaps through monitoring. • Coordinate with appropriate entities to develop a groundwater budget for the watershed. • Coordinate with appropriate entities to develop and utilize tools to assess surface water impacts and groundwater impacts of groundwater use GM-E. The VBWD seeks to prevent negative impacts (e.g., reduced flow to surface waterbodies, lowering lake or wetland levels, well interference) to groundwater-dependent resources through permit review, community plan review, and education efforts. GM-F. The VBWD seeks to prevent negative impacts (e.g., flooding) to surface waters due to groundwater quality mitigation efforts (e.g., pump-out systems) through permit review, community plan review, and education efforts.

4.2.5 Background and History Related to Groundwater Management

General information regarding the hydrogeology of the VBWD and a discussion of the different aquifers and groundwater processes within the VBWD is given in Section 3.7. Groundwater issues are regulated by a number of local and state entities; their roles are summarized in the Table 4.2- 1.

Table 4.2- 1 Groundwater Management Roles of Selected Entities

City/Agency	Role / Responsibility	Associated Regulation / Documentation
• Washington County (see Section 4.2.6.4.1)	• Implement County Groundwater Plan • Regulate SSTS	• Washington County 2014-2024 Groundwater Plan
• Ramsey County (see Section 4.2.6.4.2)	• Implement County Groundwater Plan	• Ramsey County Groundwater Protection Plan (2009-2019)
• City of Lake Elmo • City of Mahtomedi • City of North St. Paul • City of Oakdale • City of Oak Park Heights • City of White Bear Lake • City of Woodbury • Cimarron Park • Oak-Land Junior High	• Install, operate, and maintain municipal groundwater wells • Implement Wellhead Protection Plans (WHPPs)	• City Comprehensive Plans • WHPPs
• Minnesota Department of Health (MDH – see 4.2.5.1)	• Administer Public Water Supply Program (monitoring, training, source water assessments) • Administer Well Management Program (well installation and abandonment) • Administer Wellhead Protection Program, requiring wellhead protection plans (WHPPs) for public suppliers, and providing guidance for infiltration projects in wellhead protection areas	• Safe Drinking Water Act • Minnesota Rules 4725 • Minnesota Rules 4720
• Minnesota Department of Natural Resources (MDNR – see Section 4.2.5.2)	• Regulate groundwater appropriations greater than 1 million gallons per year or 10,000 gallons per day • Implement state-wide groundwater management program, including mapping of sensitive areas, investigations, and monitoring	• Minnesota Groundwater Protection Act (1989) • Minnesota Statute 103G.287
• Minnesota Pollution Control Agency (MPCA)	• Groundwater quality monitoring • Administer SSTS design and maintenance standards • Regulate use, registration, and cleanup of underground storage tanks (UST)	• Minnesota Rules 7800 • Minnesota Rules 7150
• Minnesota Department of Agriculture (MDA)	• Regulate application of fertilizer and pesticides on agricultural land	• Minnesota Groundwater Protection Act (1989)

Table 4.2- 1 Groundwater Management Roles of Selected Entities

City/Agency	Role / Responsibility	Associated Regulation / Documentation
(see Section 4.1.6)	• Implement Agricultural Water Quality Certification Program	
• Minnesota Geological Survey (MGS)	• Perform mapping (e.g., County geologic atlases) and investigations • Maintain database of county wells	
• Metropolitan Council	• Developing regional Master Water Supply Plan • Maintaining a regional database of technical information related to water supply issues and concerns • Provide assistance to communities in the development of their local water supply plans • Identify approaches for emerging water supply issues	• Minnesota Statutes 473.1565 • Met Council's 2040 Water Resources Policy Plan

4.2.5.1 Minnesota Department of Health (MDH)

Minnesota Department of Health (MDH) – The MDH is responsible for preventing pollution of water supplies to ensure safe drinking water sources and limit public exposure to contaminants. Through implementation of the federal Safe Drinking Water Act, the MDH administers the Public Water Supply Program, which allows the MDH to monitor groundwater quality and train water supply system operators. The 1996 amendments to the federal Safe Drinking Water Act require the MDH to prepare source water assessments for all of Minnesota's public water systems and to make these assessments available to the public. Source water assessments summarize information regarding the water sources used by a public water system, including a description of the drinking water sources, the susceptibility of these sources to contamination, and identification of contaminants of concern. These source water assessments are available at the following MDH website: http://www.health.state.mn.us/divs/eh/water/swp/swa/index.htm.

Through its Well Management Program, the MDH administers and enforces the Minnesota Water Well Code, which regulates activities such as well abandonment and installation of new wells.

The MDH also administers the Wellhead Protection Program, which is aimed at preventing contaminants from entering the recharge zones of public well supplies. In 1997, the Wellhead Protection Program rules (Minnesota Rules 4720.5100 to 4720.5590) went into effect. These rules require all public water suppliers that obtain their water from wells to prepare, enact, and enforce wellhead protection plans (WHPPs). The MDH prepared a prioritized ranking of all such suppliers in Minnesota. Regardless of the ranking, Minnesota Rules 4720 requires all public water suppliers to

initiate wellhead protection measures for the inner wellhead management zone. If a city with an existing WHPP drills a new well and connects it to the distribution system, the WHPP must be amended. If a city does not have a WHPP, construction of a new well may trigger the immediate development of a WHPP. The MDH also provides guidance for evaluating infiltration projects in areas with vulnerable groundwater supplies; the guidance considers the presence of wellhead protection areas, aquifer characteristics, land use, and other factors. This guidance is available from the MDH website: http://www.health.state.mn.us/divs/eh/water/swp/stormwater.pdf

All cities within the VBWD that operate municipal water supply wells have completed (both Part I and Part II) and are implementing their approved wellhead protection plans. Within the VBWD, the Cimarron Park community and Oak-Land Junior High School have also completed WHPPs. Wellhead protection plans include: delineation of groundwater "capture" areas (wellhead protection areas), delineation of drinking water supply management areas (DWSMAs), assessment of the water supply's susceptibility to contamination from activities on the land surface, and management programs, such as identification and sealing of abandoned wells, and education/public awareness programs. Minnesota Rules 4720 require that wellhead protection plans be submitted to watershed management organizations for review.

4.2.5.2 Minnesota Department of Natural Resources (MDNR)

The Minnesota Department of Natural Resources (MDNR) has the statutory responsibility to assure that groundwater can continue to meet current and future needs without harming natural ecosystems or causing other problems. This is achieved in part by the MDNR's groundwater appropriation permit program, which requires suppliers of domestic water to more than 25 people or groundwater appropriations that exceed 10,000 gallons per day or 1,000,000 gallons per year to obtain a water appropriation permit from the MDNR. Section 3.10 contains more information about MDNR water appropriations permits, which apply to withdrawals from both surface water and groundwater. The MDNR is also responsible for mapping sensitive groundwater areas, conducting groundwater investigations, addressing well interference problems, and maintaining the observation well network.

In 2013, the MDNR published a draft strategic plan identifying strategies and actions intended to achieve sustainable use of groundwater resources (MDNR, 2013). The management objectives outlined in that plan focus on ensuring that permitted groundwater appropriations employ conservation practices, maintain aquifer levels within sustainability thresholds, and do not negatively impact water quality, groundwater-dependent surface water features (e.g., trout streams, calcareous fens) or groundwater-dependent biological communities.

In 2012, the Minnesota legislature created groundwater management areas (GWMAs) as a tool for the MDNR to address difficult groundwater-related resource challenges (Minnesota Statutes 103G.287). In 2013, the MDNR began developing three pilot groundwater management areas, one of which is the North and East Metro GWMA, which includes the VBWD. Groundwater management areas provide a means for the MDNR to address the long-term sustainability of groundwater

resources. The purpose of the three pilot planning projects is to learn how to effectively create and establish GWMAs in locations facing groundwater management challenges.

Establishment of the GWMA does not replace existing data collection, study, or evaluation efforts performed by local and state agencies. Rather the GWMA will provide a vehicle for focusing resources to improve resource management (e.g., developing a better understanding of surface water-groundwater interaction, integration of available data, etc.). As part of the GWMA program, the MDNR aims to develop a process for assessing appropriations permits and applications for new permits that is applicable statewide, but also considers the possible need for different appropriation limits within different GWMAs.

The MDNR has established a project advisory team for the North and East Metro GWMA. The project advisory team includes members from Washington County, Ramsey County, the Metropolitan Council, MDNR, MDA, MDH, US Geological Survey, city staff, and private companies. The MDNR held meetings in early 2014 to obtain input from the project advisory team, with the initial discussions focusing on the GWMA boundary and appropriations permits. With cooperation from the project advisory team, the MDNR seeks to develop a GWMA plan that includes a comprehensive approach to working across the jurisdictional lines of cities and counties, keeping groundwater use management at the local level with agency oversight when needed.

4.2.5.3 Role of the VBWD

Under Minnesota Statutes (M.S. 103D.201 Subd. 2(14)), the VBWD has the authority to regulate groundwater, although its specific role in groundwater management is somewhat ambiguous. Historically, the VBWD has not been very active in groundwater management. However, early in its history, the VBWD recognized the significance of groundwater and its possible role in water levels of lakes and wetlands. In 1974, the VBWD began constructing its groundwater level monitoring network. All of the wells are located in the water table aquifer (i.e., the surficial aquifer, see Section 3.7). Eleven wells were constructed. Four more wells were constructed in 1975. In 1978, three more wells were constructed and added to the monitoring network. Over the years, additional wells have been added and some have been destroyed. There are currently 15 active monitoring wells. Figure 3-12 shows the locations of all the current and past VBWD groundwater monitoring wells. The VBWD read the water elevations at the groundwater monitoring wells approximately monthly until 1986. After 1986, the groundwater levels were read approximately quarterly for a few years. From 1991 through 2010, the groundwater levels were read approximately every other month. Since 2010, groundwater levels have been read twice annually (approximately May 1 and November 1). Time series of water levels at each groundwater well are shown in Figure 3.13.

The VBWD has used the groundwater level data to gain a better understanding of the groundwater flow patterns and the groundwater influence on lakes within the VBWD. In general, groundwater in the water table and upper aquifers flows east within the VBWD toward the St. Croix River. North of Highway 36, it flows northeast, between Highway 36 and Interstate 94, it generally flows southeast, and south of Interstate 94, it generally flows straight east.

Other activities the VBWD has performed in regards to groundwater management include:

1) Reviewing and commenting (as necessary) upon all MDNR appropriation permits.

2) Working with the MPCA in its efforts to discharge treated contaminated groundwater from the Washington County (Lake Jane) Landfill into the VBWD's Project 1007 system.

3) Contributing to the development of the Washington County Groundwater Plan 2003-2013 by actively participating on the Groundwater Advisory Committee.

4) Supporting Washington County in completing the Northern Washington County Groundwater-Surface Water Interaction Study, October 2003. This study included investigating the feasibility of using areas around Sunnybrook Lake for seepage of floodwaters and the resulting impact on groundwater levels.

5) Contributing and cooperating with Washington County, the Cities of Woodbury and Afton, and several other agencies and communities on the 2003 Legislative Commission on Minnesota Resources (LCMR) grant for determining the long-term sustainability of the groundwater in the Woodbury/Afton area.

6) Providing technical review to the 2004-2005 Southern Washington County Groundwater-Surface Water Interaction Study.

7) Contributing to the development of the Washington County Groundwater Plan 2014-2024 by providing technical review.

4.2.6 Identified Groundwater Management Issues

The VBWD faces several issues related to groundwater management, including existing issues carried over from the 2005 Plan as well as emerging issues. This section discusses the groundwater management issues identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

These issues were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. The VBWD Managers considered the results of that workshop and the following major issues were identified and organized into five topics:

1. Surface water-groundwater interaction

2. Groundwater quality

3. Groundwater quantity

4. Participation in local/regional groundwater management planning

The VBWD is most concerned about the groundwater/surface water interface, i.e., VBWD surface water that becomes groundwater (groundwater recharge), groundwater that becomes surface water in VBWD (groundwater discharge/springs), or water that is extracted from groundwater in VBWD. Groundwater issues that pertain to particular waterbodies are discussed in Section 5 – Individual Plans.

4.2.6.1 Surface Water-Groundwater Interaction

Surface water resources and groundwater resources are interdependent. Precipitation and snowmelt that infiltrates the ground surface may ultimately discharge to streams, lakes, and wetlands. Groundwater levels that are higher than the water level of adjacent surface waters create a gradient (or head differential) driving groundwater flow toward the surface water. When groundwater levels are lower than adjacent surface water elevations, the gradient is reversed and surface water recharges groundwater. The rate of inflow and outflow from surface waters to groundwater is a function of the difference in water level as well as soil and bedrock characteristics. The temporal and spatial variability of each of these factors make it extremely difficult to quantify the exchange of water between surface waters and the groundwater.

Although difficult to estimate, the interdependence of groundwater and surface water can be identified in VBWD water level data. Following the 1996 construction of a pond outlet from Olson Lake Estates (see Section 5.8), the average groundwater level in nearby VBWD observation well 4 (see Figure 3.13.4) decreased from above 950 feet to approximately 945 feet. In several VBWD observation wells (e.g., wells 1, 2, 3, and 8), groundwater levels decreased following the completion of Project 1007 (see Figure 3.13), although variability in the long-term record makes it difficult to determine to what degree Project 1007 affected groundwater levels in these wells.

The interaction of groundwater and surface water can have negative consequences on either resource. Contaminated groundwater discharged to surface waters may have a direct impact on surface water quality and/or habitat (surface water quality issues are described in greater detail in Section 4.1). Declines in groundwater levels (see Section 4.2.6.2) may result in decreased baseflow to streams, which can in turn result in decreased water quality and ecosystem function. Decreased baseflow is especially problematic for streams supporting fish populations (e.g., trout streams), as decreased baseflow may result in higher stream temperatures. Lower water levels in lakes may limit recreational use, reduce habitat areas, and result in increased growth of aquatic invasive species (via an increased littoral zone).

4.2.6.2 Groundwater Quantity

Groundwater is a finite resource with inputs and outputs. The input is generally rainwater and snowmelt that seeps into the ground (recharge). The outputs can be groundwater that is pumped out for human use and groundwater that naturally discharges to lakes, wetlands, and streams. The inputs and outputs need to be managed to ensure a sustainable groundwater supply. While rainfall and snowmelt are variable factors outside of VBWD control, the amount of rainfall or snowmelt that becomes recharge is affected by land use. Development generally results in larger impervious areas and more compacted soils, thus decreasing opportunities for infiltration and recharge. In addition, population increases may result in additional appropriations to meet municipal demands.

Long-term well data collected by the MDNR, USGS, and others identifies declines in groundwater levels across the state. In response to mounting concern about groundwater supply, the MDNR published a draft strategic plan identifying strategies and actions intended to achieve sustainable use of groundwater resources (MDNR, 2013) and established the state's first Groundwater Management Area (GWMA) in the north and east metro (see Section 4.2.5.2), which includes the VBWD.

The VBWD has measured groundwater levels at varying sites dating back to 1974. The VBWD has reduced the frequency of groundwater level monitoring in recent years; emerging technology may make it more feasible to increase monitoring frequency. The available data (see Section 4.2.5.3 and Figure 3.14) generally indicate declining average groundwater levels, although there is much variability between wells (as well as within the record of each well). Groundwater drawdown (i.e., change in groundwater level) is a limited measure of water availability because it may not consider the connection between groundwater and surface water or the time lags involved in moving water from shallow aquifers to deep aquifers. Despite the data limitations, identification of trends in groundwater levels can provide an indication of the potential for impacts to either groundwater capacity and/or surface water features.

The impact of increasing groundwater appropriation on sustainability of groundwater resources within the VBWD remains an issue, as does the potential impact on surface water features (see Section 4.2.6.1). A specific example of a groundwater quantity issue is the possible impact to Valley Creek and existing wells resulting from high-capacity municipal groundwater wells installed in Woodbury. Another example is the possible impact of future increased pumping from the City of Lake Elmo's municipal wells on Lake Elmo water levels (see Section 5.13 – Lake Elmo Watershed Plan – for more information).

4.2.6.3 Groundwater Quality

Maintaining clean, safe groundwater supplies is critical to human and environmental health and to the economic and social vitality of our communities. Groundwater can be contaminated by:

- commercial and industrial operations
- waste disposal and landfills,

- leaking underground storage tanks,
- non-compliant SSTS,
- road salt/chemical application,
- feedlots and fertilizer/pesticide applications (e.g., nitrates), and
- accidental spills.

Public water suppliers (e.g., cities) may not have jurisdiction (or complete jurisdiction) to control land uses within their Drinking Water Supply Management Areas (DWSMA). Public water suppliers need cooperative partners in this instance. Surface water management infrastructure and land use decisions could impact susceptible/vulnerable water supplies.

In the VBWD, groundwater quality is good over the majority of the area. However, soil conditions and shallow bedrock create a moderate to high potential for groundwater contamination introduced from the surface environment (see the 2014 Washington County Groundwater Plan for more information). Factors affecting the sensitivity of groundwater to surface pollutants may include surface geology, bedrock geology, and land use.

In addition to affecting drinking water, contaminated groundwater may impact ecosystem health, depending upon the degree of surface water-groundwater interaction (see Section 4.2.6.1).

Prevention of groundwater contamination through best management practices is critical to protecting the health of the public and the natural environment. Once contaminated, groundwater may remain contaminated for long periods of time. Groundwater clean-up is expensive and technically complex, even when feasible. Increased public awareness of the importance of drinking water protection on the public's general health and well-being is critical to promote practices that protect the quality of groundwater.

There are some locations in the VBWD where groundwater contamination has been found. In these areas, there are added financial and social costs to manage the affected water supply. The following paragraphs discuss Special Well and Boring Construction Areas in VBWD. Special Well and Boring Construction Areas (SWBCAs) are areas designated by the MDH where groundwater contamination is known to exist. In SWBCAs, well construction, repair, and sealing practices are more stringent than the minimum requirements specified in Minnesota Rules 4725.

Special Well and Boring Construction Areas /Groundwater Contamination Sites

Maps showing the location of SWBCAs in Washington County are available from the MDH website (http://www.health.state.mn.us/divs/eh/wells/swca/#washington). There are currently three MDH-designated Special Well and Boring Construction Areas (formerly known as "well advisory areas") located within the VBWD. These three areas are:

1. Lakeland/Lakeland Shores Special Well and Boring Construction Area (SWBCA)

   In VBWD, this area covers small portions of Afton, near Stagecoach Trail (CSAH 21) and West Lakeland Township, south of Interstate 94 (it also includes portions of Lakeland and Lakeland Shores, which are not within VBWD).

   Groundwater in the Lakeland/Lakeland Shores SWBCA contains petroleum products, solvents, and volatile organic carbons (VOCs) at concentrations that exceed drinking water standards. There appear to be two plumes, a northerly plume containing fluorocarbons (Freon) and petroleum products, and a southerly plume containing solvents. In 1987, the MDH issued a Well Advisory (now SWBCA) for portions of Lakeland, Lakeland Shores, Afton and West Lakeland Township. The advisory prohibits the deepening of existing wells into lower bedrock formations or the drilling of new wells into lower bedrock formations. The advisory requires plan approval before the construction of new water supply wells in drift or shallow bedrock aquifers.

   Residents of homes where contaminant levels exceeded drinking water standards were initially provided with bottled water, but are now connected to a municipal water system. No other remedial actions were taken.

2. Baytown/West Lakeland Township Groundwater Contamination Site/SWBCA

   This area begins west of the Lake Elmo Airport and extends eastward to the City of Bayport and the St. Croix River. Within the VBWD, it includes portions of the City of Lake Elmo, Baytown Township, and West Lakeland Township.

   The entire area of contamination in the Baytown Township Groundwater Contamination Site is approximately six square miles. Volatile organic compounds (VOCs) were first found in the groundwater in 1987. Additional well sampling showed VOC contamination across a wide area. In 1988 the MDH issued a well-drilling advisory (now SWBCA) for portions of West Lakeland Township, Baytown Township, and the City of Bayport. This advisory puts limits on the construction of new wells, and requires additional water testing of new wells. The SWBCA remains in effect today. It has recently been expanded to reflect the spreading of the contaminants.

   The main contaminant found is trichloroethylene (TCE). TCE was commonly used for metal cleaning and degreasing, and as a dry cleaning solvent. Another contaminant, carbon tetrachloride, has also been found at very low concentrations in a limited number of wells. Carbon tetrachloride was used in the past as a grain pesticide to kill insects.

   In 1987, investigators began seeking the source of the contamination and determining its extent and direction of travel. Monitoring wells have been installed in and around the Lake Elmo Airport to keep track of the contaminants. In addition, water samples have been collected periodically from several hundred private wells in the area to check for contaminants. Currently, the plume of TCE contamination is approximately 5 miles long and

2 miles wide, extending from northeast Lake Elmo to the St. Croix River. Groundwater movement is generally to the east, toward the St. Croix River, but is complicated due to the fracture flow in the Prairie du Chien aquifer, and other hydrogeologic conditions. TCE has been detected in glacial sediments in northeast Lake Elmo, at the Lake Elmo Airport, and in Bayport.

Activity at this site increased dramatically in February of 2002 when the MDH recommended an interim exposure limit of 5 micrograms per liter based on new information on the toxicity of TCE. The TCE Health Risk Level (HRL) established by MDH is currently set at 5 µg/L. In May of 2013, MDH issued a new Health Based Value (HBV) for TCE at 0.4 µg/L. An HBV level is not regulatory in nature (it must go through a longer rulemaking process at the state level to become an HRL), but can be used as a good indication of the health risk associated with a chemical and is what the state will use moving forward regarding all decisions to protect public health.

Since 2002, the MPCA and the MDH have sampled hundreds of wells in Baytown Township, West Lakeland Township, and Lake Elmo and detected TCE in approximately 400 private wells. Approximately 130 wells exhibit TCE concentrations above the current HBV, but below the previous HRL. Maps showing the concentrations of TCE in the Prairie du Chien and the Jordan aquifers (plume maps) are available on the MDH website (http://www.health.state.mn.us/divs/eh/hazardous/sites/washington/baytown). Not all of the wells within the SWBCA have TCE contamination. Groundwater movement in the area is generally west to east. Most of the existing private residential wells are within the Prairie du Chien aquifer. Bayport's municipal water supply and a few residential developments in eastern Baytown Township have wells drilled into the Franconia aquifer. In 2003, TCE was detected for the first time in private wells drawing from the Franconia aquifer. Also in 2003, TCE was found for the first time in one of Bayport's municipal (Franconia) wells.

Since 2002, the MPCA has provided bottled water and/or whole-house granular activated carbon (GAC) filters to every residence where TCE concentrations were at or above the HRL of 5 µg/L. Baytown Township and West Lakeland Township passed ordinances that provide for governmental supervision of GAC filters installed by individual homeowners. The Minnesota state legislature also passed a law in 2003 that requires homeowners within the Baytown SWBCA who have private wells to notify buyers at the time of sale that the property is within an SWBCA.

In 2007, the MPCA selected a remedial action which includes three components:

- Continued monitoring of private wells and installation, change out, and maintenance of granular activated carbon (GAC) filter systems as previously designated.

- Installation of an air stripping treatment system at Bayport Municipal Well #2. The city of Bayport is responsible for ongoing operation and maintenance of this air stripper.

- Containment of TCE in groundwater at the primary source zone — a former metal fabricating shop located in Lake Elmo identified as the primary TCE source in 2004.

In early 2008, the MPCA completed a hydraulic barrier to contain the TCE plume and prevent migration of contaminated groundwater off the property. The barrier includes four extraction wells to collect and capture the contamination before it migrates off of the property. The extracted water is then treated by air stripping to remove the TCE from the water at a building location on the south side of 11325 Stillwater Boulevard North in Lake Elmo. The water is then discharged back to the soil using horizontal wells approximately 25 feet underground at a Lake Elmo ball field south of the air stripping building.

In 2013 and 2014, the MPCA continued to sample a large number of private wells to identify those that exceed the current HBV. The MDH will review the data and issue advisories as necessary. State and local governments continue to consider solutions available for providing a clean water supply to the Baytown-West Lakeland Township area.

More detailed information about this site can be obtained from the MDH and the MPCA.

3. Lake Elmo/Oakdale (Washington County Landfill) SWBCA

The Lake Elmo/Oakdale SWBCA was established due to VOC and perfluorochemical (PFC) contamination at the Washington County Landfill and a disposal site in Oakdale. The landfill is located in VBWD, one-quarter mile south of Lake Jane, in the City of Lake Elmo. Washington County owns the landfill and operated the landfill under a solid waste permit authorized in 1969. The Oakdale disposal site (which includes three sites - Abresch, Brockman, and Eberle) was used in the 1940s through 1960s for disposal of commercial, industrial, and residential wastes.

In early 1981, the MPCA received a hotline tip that hazardous wastes were placed in the landfill. Subsequent sampling in 1981 and 1982 detected VOCs including trichloroethylene and tetrachloroethylene in private drinking water wells.

In 1982, the MDH issued a well advisory. The advisory alerted well contractors and local officials to the problems of groundwater contamination in the area of the landfill and instructed that the MDH be contacted before any well construction is undertaken within one mile of the area. The boundaries were revised in 1983 based upon findings of a technical investigation. The landfill is located in an abandoned gravel pit and is hydraulically connected to the Prairie du Chien-Jordan aquifer. The natural groundwater flow direction is generally to the southwest.

A remedial system, consisting of gradient control wells and spray irrigation of effluent began operating in late 1983. The system effectively removed organic compounds from the water and reversed the spread of contamination. A program was also initiated to seal the wells once the homes were connected to the public water supply. In May of 1986, Lake Elmo received a grant to construct a public water supply to serve the homes adversely affected by the landfill.

Additionally, municipal water service provided by the Oakdale municipal system was extended into the SWBCA in 1986. In 1996, the site entered the MPCA administered Closed Landfill Program and the MPCA has taken additional steps to improve the landfill cover and the groundwater remediation system. In 2003 PFC contamination was found at the landfill and the Oakdale disposal sites and in 2004 they were detected in Oakdale's municipal water supply. The Lake Elmo/Oakdale SWBCA was revised in 2007 to include PFCs. Oakdale's municipal water supply is treated by granular activated carbon (GAC) filters and residents on private wells in the SWBCA also use GAC filters. The City of Lake Elmo has constructed water mains to supply city water to residents with contaminated private wells.

4.2.6.4 Participation in Local/Regional Groundwater Planning

Multiple governmental units have jurisdiction over groundwater resources (see Section 4.2.5), in part due to the large physical extent of the resource. Thus, cooperation between the state, counties, cities, and others is necessary to avoid duplication of efforts as well as to prevent groundwater issues from falling through the cracks between jurisdictions/roles.

4.2.6.4.1 Washington County Groundwater Plan

Washington County, per Minnesota Statutes 103B.255, is responsible for developing and implementing a county groundwater management plan. The *Washington County Groundwater Plan 2014-2024* (2014 Washington County Groundwater Plan) presents information, issues, policies, and suggested implementation activities for groundwater management. The county's plan identifies watershed districts (WD) and joint powers watershed management organizations (WMO) as essential contributors to effective groundwater management. The 2014 Washington County Groundwater Plan identifies several strategies requiring collaboration with WDs and WMOs (collectively referred to as WMOs in the 2014 Washington County Groundwater Plan), including:

- Work with WMOs to strengthen education efforts.
- Develop, through the Washington County Water Consortium, a county-wide groundwater monitoring plan and a data tracking and mapping system in coordination with WMOs.
- Collaborate with local government units (LGUs) and WMOs to identify and preserve regional recharge areas. Encourage WMOs and LGUs to incorporate protection of recharge areas into plan updates.
- Collaborate with MDH and Metropolitan Council to develop guidelines on placement of infiltration BMPs in wellhead and source water protection areas and work with LGUs and WMOs to develop a map showing areas where it is not recommended to infiltrate.
- Investigate if and how communities in the county govern animal waste management, and work with LGUs and WMOs using this information, to develop recommendations for other communities on effective rules and methods for animal waste management.

- Work with WMOs to identify available partnerships and funding opportunities to address agricultural nutrient management.

The development and implementation of current and future Washington County groundwater plans provides opportunities for the VBWD and Washington County to collaborate on groundwater issues.

4.2.6.4.2 Ramsey County Groundwater Plan

Ramsey County published its draft county groundwater protection plan, which is required per Minnesota Statutes 103B.255, in 2009 (note that as of the writing of this Plan, the Ramsey County Board has not approved the draft county groundwater plan). The draft 2009 Ramsey County Groundwater Plan serves as a centralized policy and strategy document that requires the implementation of programs and activities to protect groundwater. It presents specific initiatives, policies, and programs to be implemented by the Ramsey Conservation District (RCD) in cooperation with other local governmental units, state agencies, and watershed districts. Selected initiatives included in the draft 2009 Ramsey County Groundwater Plan applicable to the VBWD and/or its cities include:

- Establish a central source ("data deli") for groundwater quality data collected in Ramsey County, to be maintained by the RCD.
- Collect annual ambient groundwater quality data from selected observation wells.
- Implement an automated, continuous groundwater elevation data collection program.
- Fund a program for the sealing of unused water wells.
- Encourage water organizations to emphasize stormwater reuse.
- Assist LGUs with developing land use management practices to protect DWSMAs.
- Support open space as a land use that protects groundwater as well as providing other benefits to the public.
- Assemble a geospatial information systems (GIS) database of stormwater infiltration structures that pose threats to groundwater in emergency response spill situations.

Some of these initiatives may benefit the VBWD, or may benefit from VBWD participation. The implementation of the draft 2009 Ramsey County Groundwater Plan and the development of future groundwater plans provide opportunities for the VBWD and Ramsey County to collaborate on groundwater issues.

4.2.6.4.3 Groundwater Management Areas

In 2012, the Minnesota legislature created groundwater management areas (GWMAs) as a tool for the MDNR to address difficult groundwater-related resource challenges. In 2013, the MDNR established the North and East Metro GWMA, which includes the VBWD (see Section 4.2.5.2). The North and East Metro GWMA includes a project advisory team including members from Washington County, Ramsey County, the Metropolitan Council, MDNR, MDA, MDH, US Geological Survey, city staff, and private companies.

The development of a groundwater management area containing the VBWD provides an opportunity for the VBWD and other governmental units to integrate data and management strategies to most effectively address groundwater issues.

4.2.7 Policy Details, Strategies, and Actions Related to Groundwater Management Issues

4.2.7.1 GM-A & GM-B Data Collection and Reporting

The VBWD will continue to collect groundwater level data to assist in managing the water levels and floodplains of the VBWD's water resources. This data will be reported. The VBWD will periodically review its groundwater monitoring program and consider opportunities to incorporate new technologies, where feasible.

To protect the quality and quantity of groundwater, it must first be adequately characterized. The Southern Washington County Groundwater-Surface Water Interaction Study and the Woodbury-Afton LCMR study, along with the VBWD's continued groundwater level readings, and future studies by the VBWD and others will help the VBWD to better understand groundwater and its relationship to surface water and land cover. The VBWD will use the information available from these sources to categorize surface waters as:

1. Groundwater discharge waterbodies
2. Groundwater recharge waterbodies
3. Flow-through waterbodies

Groundwater level readings collected by the VBWD will continue to be published in the VBWD's annual reports, which are also posted to the VBWD's website. The VBWD will analyze collected groundwater level data to identify significant trends in the data.

4.2.7.2 GM-C & GM-D Interagency Cooperation and Participation in Regional Groundwater Planning

The VBWD will cooperate with Washington County, the MDH, and others to address groundwater quality issues (e.g., non-compliant SSTS). The VBWD will cooperate with the MPCA and MDH to

address impaired waters demonstrating surface water-groundwater interaction (e.g., impairment of Kelle's Creek due to *E. coli*, see Section 4.1 – Water Quality).

Because the County and other entities have adequate SSTS permitting and maintenance programs, the VBWD does not plan to adopt any rules regarding SSTS. The VBWD continues to support Washington County's requirement prohibiting the placement of SSTS within drainage easements, which effectively prohibits SSTS installation in the VBWD floodplain.

The VBWD will continue to work with Washington County and other entities to protect natural resources. The VBWD will work with Washington County to implement those strategies included in the 2014 Washington County Groundwater Plan that may benefit from VBWD participation (see Section 4.2.6.4.1).

The VBWD encourages the cities and other public water suppliers to adopt wellhead protection programs. These programs will include the identification and sealing of abandoned wells. In accordance with Minnesota Rules 4720, the wellhead protection plans must be submitted to VBWD for review.

The VBWD will cooperate with the cities and other public water suppliers to educate the general public concerning the use of best management practices to prevent contamination of groundwater supplies and the importance of these measures in protecting groundwater supplies.

The VBWD will seek opportunities to participate in regional groundwater planning efforts, including the North and East Metro Groundwater Management Area (GWMA) and the development of the GWMA Plan. The VBWD will consider opportunities for possible data sharing and model development as part of the GWMA, and providing comment or review on the GWMA Plan.

4.2.7.3 GM-E & GM-F Prevention of Negative Impacts

VBWD will prevent negative quality and quantity impacts (e.g., reduced flow to surface waterbodies, lowering lake or wetland levels, well interference) to groundwater and groundwater-dependent resources through permit review, community plan review, and education efforts.

In 2013, the VBWD adopted rules and regulations to protect the quality and quantity of groundwater. The VBWD involved local units of government and other agencies in the rule-making process. These rules are based on the MPCA's Minimal Impact Design Standards (MIDS) and include a volume control requirement that promotes infiltration where possible. Infiltration of stormwater mitigates the increase of impervious area in the watershed and contributes to groundwater recharge. The VBWD rules and regulations contain specific design considerations (and associated treatment flow chart) that prohibit infiltration in areas where groundwater contamination or other limitations exist (see Rule 2 of the VBWD Rules and Regulations, 2013, as amended).

The 2013 VBWD rules and regulations do not include a groundwater appropriations permitting program. Washington County Water Consortium developed a report titled *Incorporating*

Groundwater Protection into Watershed District Rules. That report recommended that watershed districts use their authority to regulate groundwater use for wells that pump between 1,000 to 10,000 gallons per day or between 100,000 to 1,000,000 gallons per year (wells not regulated by the MDNR). This recommendation is referenced in 2014 Washington County Groundwater Plan. Currently none of the watershed districts in the county use the authority to regulate groundwater that is granted to them under state statute. . The VBWD will continue to consider the benefits of implementing such a permit program. If implemented, the intent of the VBWD permit program would be to minimize groundwater depletion by wells, well interference, and reduced flows to groundwater-dependent resources.

The VBWD prohibits the installation of open-loop geothermal systems due to the potential for impacts to groundwater quality.

The VBWD will continue to provide comments to communities when reviewing their local water management plans, wellhead protection plans, and/or comprehensive plans. The VBWD will provide the public with more specific groundwater information as additional data is collected and/or studies are performed. This information will be useful in the VBWD's education program (see Section 4.3).

VBWD will prevent negative impacts (e.g., flooding) to surface waters due to groundwater quality mitigation efforts (e.g., pump-out systems) through permit review, community plan review, and education efforts.

As discussed previously within this Section, some contamination areas currently exist within the VBWD. It is unclear what, if any, additional remedial measures will be proposed. Some remedial measures could impact surface waters. For example, if groundwater is pumped and discharged to the surface in order to contain the Baytown/West Lakeland Township Groundwater Contamination Site, the discharged water could flow into Bay Lake or Downs Lake. Bay Lake is landlocked and Downs Lake has experienced high water problems in the past. Increasing the volumes of water entering either of these lakes could cause or exacerbate flooding problems.

4.3 Public Education and Public Involvement

4.3.1 Importance	Public education and public involvement are critical to the VBWD accomplishing its mission to protect and manage its water resources. It is through education and involvement efforts that the VBWD increases the public's understanding of water resource management and issues in the watershed, and fosters long-term public commitment to protecting these resources through individual or group actions.
4.3.2 General Issues	The VBWD needs to educate and involve the public to meet the challenges of managing VBWD's water resources. The VBWD needs public input to identify needs and balance interests. Public support is needed to effectively continue its mission to protect and manage its water resources. The collective behavior of an informed, engaged, and environmentally conscientious public will contribute to the protection of the watershed and its natural resources.
4.3.3 Mission	To manage and protect our water resources within the limits of VBWD jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Promoting communication and collaboration with our residents, communities, and pertinent governmental units. Understanding and responding to the effects of community growth and related activities on groundwater and surface water resources. Educating and inspiring our residents, communities, and government units to participate in the protection and improvement of water resources.
4.3.4 Policies to Accomplish Mission	PE-A. The VBWD will continue communication and advertising efforts that seek to increase public awareness of the VBWD's presence, its role in managing water resources, and the impacts of its efforts, utilizing new forms of media, as appropriate. PE-B. The VBWD will continue to implement its cooperative education efforts, maintain advisory committees, recruit volunteers, and engage its residents, local units of government, and other agencies to increase interest in, and support of, the VBWD. PE-C. 1. The VBWD will disseminate educational materials to targeted groups, or pursue other avenues (e.g., workshops), to raise awareness of the impacts that individuals and businesses can have on the watershed and its water resources. 2. The VBWD will collaborate with other groups, agencies and others to promote and encourage behaviors of individuals, businesses, and communities that have a positive impact on the water resources. 3. The VBWD will continue to implement an incentive program

	to encourage implementation of best management practices in the watershed. 4. The VBWD will continue to contract with a watershed educator to assist with the VBWD's watershed education efforts. 5. The VBWD will work with cities and townships to develop staff training and provide educational support, as requested.

4.3.5 Background and History Related to Public Education and Public Involvement

Past and current VBWD public education and public involvement efforts include the following:

- **Website** (www.vbwd.org) – The VBWD website includes organizational information as well as technical documents, beyond the minimum required by the Board of Water and Soil Resources. Information contained at the website includes:

  - Permitting information (application form, fees, Rules and Regulations, etc.)
  - Manager, staff, and consultant information
  - Information about current projects and initiatives
  - Agendas and minutes from Managers' meetings
  - Information regarding stormwater best management practices
  - Historic data, including:
    - water quality
    - lake levels
    - groundwater levels
    - precipitation
  - VBWD annual reports
  - Links to educational resources and other agency websites

  Throughout the process of updating the watershed management plan or performing plan amendments, the VBWD also posts information related to revising the Plan on the website, including opportunities for stakeholder input.

- **Volunteer monitoring efforts** – The VBWD participates in the Metropolitan Council's Citizen Assisted Monitoring Program (CAMP), which relies on citizen volunteers to collect data for the VBWD's lakes. The VBWD also financially supports a stream monitoring program where Stillwater Area High School students collect and identify macroinvertebrates from streams (Valley Creek and Raleigh Creek). The VBWD will consider implementing a

similar volunteer monitoring program at Kelle's Creek (see Section 4.4 – Stream Management and Restoration). Lake water levels are also recorded by resident volunteers.

- **Citizen Advisory Committee (CAC)** – The VBWD maintains a Citizen Advisory Committee comprised of interested individuals who are appointed by the Managers, after nomination by their communities. The committee is responsible for assisting in the planning and development of VBWD policies and activities, as requested by the Managers. One member of the CAC also performs lake level monitoring.

- **Technical Advisory Committee (TAC)** – The VBWD maintains a Technical Advisory Committee. The Committee consists of representatives from the cities and townships, counties and Soil and Water Conservation Districts within VBWD. The committee is responsible for advising the Managers on technical matters, as requested by the Managers.

- **Cooperative Educational Outreach Efforts** – The VBWD cooperates with other groups to inform the public about watershed issues. Past examples include participation in the Neighborhood Wilds Program (the program is no longer sponsored by the Minnesota Department of Natural Resources), participation with other Washington County watershed districts in developing and staffing a booth at the Washington County Fair, participation in the Afton Citizens' Forum, and participation in the Washington County Groundwater Open House. The VBWD was a founding member of the East Metro Watershed Resource Education Program (EMWREP), which was established in 2006. EMWREP is a partnership of east metro watershed management organizations, Washington County, cities, and a township designed to provide education about various water resource issues and to engage the public in projects to improve regional water quality (see Section 4.3.7). Through its participation in EMWREP, the VBWD supports full time education staff.

- **Information Requests** – VBWD provides information to individuals when requested.

- **2015-2025 Watershed Management Plan, Planning Process** – As part of the plan update process, the VBWD held an issue identification and prioritization workshop on October 30, 2013. The workshop was attended by over 40 participants (not including VBWD Managers or consultant staff) including city and township staff, elected officials, agency staff, and watershed residents. In preparation for the workshop, the VBWD:

    - solicited input from city and township staff via a mailed survey
    - solicited input from residents via an online survey at the VBWD website
    - requested input from plan review agencies via a plan update notification letter
    - advertised the workshop at the VBWD website, via local media, and through correspondence with targeted stakeholders

4.3.6 Identified Public Education and Public Involvement Issues

The VBWD faces several issues related to public education and public involvement. This section discusses the public education and public involvement concerns identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Issues identified by the parties listed above were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. The VBWD Managers considered the results of that workshop and identified and organized the major public education and public involvement issues into four topics:

1. Awareness of the VBWD, its role, and its accomplishments (e.g., flood control projects, stream improvements, etc.)

2. Education and awareness of property owners regarding their impact on water resources

3. Expanded educational programs targeting specific topics or groups, including:

    a. best management practices for builders/developers

    b. public works stormwater facility maintenance training

    c. helping cities achieve MS4 compliance

4. Continued involvement of the Citizen Advisory Committee (CAC)

Public education and public involvement issues that pertain to particular water bodies are discussed in Section 5 – Subwatershed Management Plans.

4.3.6.1 Awareness of the VBWD's Role and Accomplishments

The VBWD depends on the support of its residents (including individuals, groups, and businesses), cities and townships, and other agencies to successfully implement programs and projects necessary to accomplish the VBWD's mission. Without the full support of the affected communities, even well-planned projects with obvious benefits can be delayed or cancelled. The VBWD must maintain its reputation as thoughtful and effective stewards of local water resources to effectively implement its project and programs.

In its 2009 Level II Performance Review and Assistance Program (PRAP) review of the VBWD, BWSR noted that while the VBWD meets the basic requirements of public communication, many of the VBWD's accomplishments are not broadly recognized. To rectify this, the VBWD must increase its visibility and interest to the community. Major areas that need to be addressed include:

- Increase awareness of the VBWD's existence, its role in managing water resources, and its many accomplishments. This will require continued effort on the part of VBWD in its general communications, and may include:

    - press releases
    - fact sheets
    - newspaper articles
    - newsletters
    - social media postings
    - presentations to targeted groups

    Future communication efforts should focus on past, current, and ongoing projects within the watershed, increasing the visibility of the watershed's accomplishments, and reinforcing its image as an effective organization.

- Increase interest in and support of VBWD programs and projects. The VBWD must take advantage of opportunities to advertise its role and accomplishments to foster community support for its projects. This may include requests for volunteers included in press releases, social media posts, or other communications. This will require increased involvement and/or coordination with individuals, groups, businesses, and other agencies in VBWD programs and projects, and tailoring communications to create a connection between communities and VBWD projects or programs (e.g., recruiting volunteers, making more use of the CAC and TAC, working with non-profit organizations, informing the public of the process for becoming involved in VBWD programs and projects, etc.).

Increasing VBWD's visibility within the EMWREP program may provide opportunities to increase awareness of the VBWD, its role in water resource management, and its projects. EMWREP education staff participates in local community events and regularly publishes articles in local media. In 2013, EMWREP provided support for a series of public meetings in the VBWD focusing on the Watershed Restoration and Protection Strategy (WRAPS, see Section 4.1 – Water Quality) project and assisted in organizing a workshop related to the development of this watershed management plan (see Section 4.3.5).

4.3.6.2 Educating Property Owners Regarding Negative Behaviors

Water quality in lakes and streams may be significantly affected by non-point source pollution (see Section 4.1 – Water Quality). While individual property owners may not consider their actions as having a measureable effect on water resources, the cumulative impact of individual behavior is significant. All VBWD residents share the responsibility to protect water resources.

Environmentally responsible stormwater management and land use practices are not always intuitive, nor are the effects of negative behaviors always obvious. Therefore, it is the responsibility of the VBWD to raise awareness of the impact that behaviors have upon VBWD water resources, motivate changes to negative behavior and identify appropriate alternatives to that behavior.

This requires specific, targeted education of individuals, groups, businesses and others (e.g., "lakescaping" workshops for shoreline residents, meetings with lawn care companies regarding best management practices, etc.). Topics to be addressed by educational material, workshops, or other methods may include:

- Aquatic invasive species (AIS) control
- Well management and groundwater quality protection
- Fertilizer and pesticide application / lawn care best practices
- Stormwater reuse (e.g., rain barrels)
- Rainwater gardens
- Reducing impervious area
- Native plantings and vegetative buffers

Often, preventive action is less expensive and more effective than corrective action (e.g., capital projects). The benefits of preventive action must be reinforced to provide incentive for changes in individual behavior. Participation in the EMWREP and coordination with EMWREP education staff provides opportunities to educate watershed residents regarding appropriate stormwater management behaviors and the effect they have on the VBWD.

4.3.6.3 Expanded Educational Programs Targeting Specific Topics

Education efforts targeting specific audiences and/or addressing specific issues are beneficial, as they can deliver behavioral changes with less cost or effort than large, broad educational campaigns. Specific educational needs identified at the October 30, 2013 workshop include the following topics:

- **Stormwater management and erosion control best management practices for developers** – The best opportunity to establish effective stormwater management and erosion control behaviors is prior to site development. A program targeting developers prior to construction may reduce the risk of stormwater management issues occurring later. While the VBWD Rules and Regulations require the use of best management practices, increased understanding of the science behind these practices, and the consequences of their absence, may result in more effective implementation by developers.

- **Stormwater management training programs for cities** – The National Pollution Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit, updated by the MPCA in 2013, requires permit holders to develop and implement a stormwater management training program for their employees (see Appendix B-4.5 – VBWD SWPPP). While the VBWD does not have employees, the VBWD may benefit from assisting cities in developing and implementing training programs for their employees, focusing on the importance of protecting water quality.

- **MS4 compliance for VBWD cities –** In addition to assisting cities with training programs, there may be other ways for the VBWD to assist cities in demonstrating compliance with their MS4 permits. There may be opportunities to eliminate redundancies between VBWD and city activities and processes (e.g., coordinating reporting requirements).

4.3.6.4 Expanded Use of Advisory Committees

The BWSR requires metropolitan area watershed districts to maintain functioning advisory committees which provide recommendations on projects and reports, and communicate with the Managers. The VBWD maintains a Citizens Advisory Committee (CAC) and a Technical Advisory Committee (TAC, see Section 4.3.5). In its 2009 Level II PRAP review of the VBWD, BWSR suggested that the VBWD could expand the role of its CAC. Increased involvement of the CAC, in addition to providing valuable feedback to the Managers, may indirectly increase visibility of the VBWD among residents and encourage participation in VBWD activities.

4.3.7 Policy Details, Strategies, and Actions Related to Public Education and Public Involvement

4.3.7.1 PEI-A. Increase Awareness of the VBWD

The VBWD will continue communication and advertising efforts that seek to increase awareness of the VBWD's presence, its role in managing water resources, and its accomplishments. The VBWD will do this through expanded communications efforts, utilizing new forms of media where appropriate. This will include continued participation in EMWREP. Through EMWREP, VBWD retains the services of a full-time education specialist. The Managers and VBWD Engineer coordinate with the EMWREP education specialist to develop and distribute most of the VBWD educational materials, which has included:

- Regular articles for local newspapers

- Flyers and/or articles for community utility bills and/or newsletters

- Social media updates about watershed projects or events

- Press releases regarding specific events

- Watershed district newsletters in paper and web formats
- Fact sheets for communities in paper and web formats

EMWREP also coordinates and hosts workshops and presentations for watershed residents and community groups, addressing topics including rain gardens, prairie restoration, and shoreland maintenance. The VBWD will continue to work with the EMWREP to implement education programs and events intended to increase awareness of the VBWD

VBWD will maintain and regularly update its website (www.vbwd.org), and use it to communicate with and provide information to the public. For example, the VBWD will post this Plan and future reports, studies, etc. on the website.

The VBWD will continue to publish and make available required annual reports, including the VBWD's annual report to BWSR and its NPDES MS4 annual report.

The VBWD will continue to provide information to individuals upon request.

The VBWD will install informational signs at VBWD projects (existing/proposed) when appropriate and feasible.

The VBWD will consider holding tours, events and/or orientation meetings for interested residents, city staff, and community groups.

4.3.7.2 PEI-B. Increase Interest and Support of VBWD

The VBWD seeks to increase public interest in, and support of, the VBWD and its projects. To do this, the VBWD will continue its efforts to coordinate and cooperate with other groups to educate its residents regarding general watershed issues. Such efforts could include:

- Continued participation in EMWREP (see Section 4.3.7 PE-A),
- Seeking opportunities to engage the VBWD advisory committees,
- Participating in open houses, forums, etc., and
- Working with non-profit organizations and/or other agencies on communications and meetings.

The VBWD will continue to recruit volunteers and provide financial support for monitoring efforts (e.g., CAMP and stream sampling, lake level monitoring) and involvement in other VBWD programs and projects. The VBWD will provide training for volunteers who participate in VBWD monitoring activities. The VBWD will implement a recognition program (certificates, letters of appreciation, events, thank you ads, etc.) for VBWD volunteers and advertise the actions and achievements of volunteers, where appropriate.

The VBWD will continue to involve local units of government and other agencies in its rule-making process (see Appendix A-4.5 – VBWD Rules and Regulations), and will work with affected local units of government, community groups, residents, and other agencies in the implementation of capital projects, studies, etc.

The VBWD will seek opportunities to incorporate public education and public involvement into all of its proposed projects. Some examples of public education and public involvement efforts include:

- Notices to residents, community groups, businesses, cities, and other agencies directly affected by proposals/projects
- Press releases to city newsletters, environmental group/special interest newsletters, local newspapers, etc.
- Updates about projects or events via social media
- Open houses, workshops, and/or forums for the public
- Public hearings prior to project adoption with opportunities for citizen input and questions
- Presentations to cities, townships and other interested parties
- Policy/project fact sheet to send upon request and distribute at meetings
- Brief cable television presentation on project/proposal

The VBWD will continue to coordinate with EMWREP to develop and distribute its educational materials, including those listed above (see Section 4.3.7 PE-A).

The VBWD will maintain its Citizen Advisory Committee (CAC) and seek to develop meaningful responsibilities for the committee and opportunities for engagement. Committee members will be appointed by the Managers.

The VBWD will use its Technical Advisory Committee (TAC) on an as-needed basis. Depending on the particular issue, TAC members might include representatives from each of the affected cities and townships, counties, and Soil and Water Conservation Districts within VBWD, as well as representatives from various state, regional, and federal governments, and research organizations and institutions. The committee will be responsible for advising VBWD on technical matters. The VBWD will also involve the University of Minnesota, the U.S. Department of Agriculture, and other outside sources for technical assistance, as necessary.

4.3.7.3 PEI-C. Promote Positive Behaviors

The VBWD seeks to raise awareness of the positive and negative impacts that behaviors of individuals and businesses can have on the watershed's water resources, through dissemination of education materials to targeted groups and through other public information efforts.

VBWD will coordinate/cooperate with other groups, agencies and others to promote and reinforce behaviors that have a positive impact on the water resources, identify appropriate alternatives to behaviors that have a negative impact on water resources, and to motivate changes in negative behaviors. The VBWD will continue to work with EMWREP to promote practices with positive impacts on the watershed, through the distribution of educational information, presentations, workshops, and other activities (see Section 4.3.7 PE-A). Through EMWREP, the VBWD will continue to contract with a watershed educator to assist with this and other watershed education-related efforts.

The VBWD will continue to implement an incentive program to encourage implementation of best management practices in the watershed. This incentive program will continue to focus on residents, but can also apply to businesses, developers, and others, and is separate from the incentive program targeting developers discussed in Section 4.5 – Stormwater Runoff Management. VBWD cost share programs, as of 2015, include:

- **Assistance for Individuals** – this program provides technical assistance and up to $5,000 per pound of phosphorus treated or retained on site by implementing a BMP project to improve surface water quality.

- **Plant Grant Program** – this program provides up to $500 for native plans and seeds for habitat and water quality projects such as rainwater gardens, shoreland stabilization, and restoration of wetlands, prairies, and woodlands.

- **Community Grants** – this program provides technical and financial assistance to groups and municipalities for using BMPs to improve surface water quality of lakes, streams, and wetlands. These projects generally either involve public dollars as matching funds and/or multiple landowners

More information about the VBWD's cost share programs is provided from the VBWD website at: http://www.vbwd.org/GrantForms.htm.

The VBWD will continue its educational program targeting developers working within the VBWD, seeking to provide them with greater information regarding stormwater management and erosion control best management practices.

The VBWD will assist cities by developing presentation materials regarding stormwater management topics for staff trainings. The VBWD will work with cities to identify ways the VBWD may assist cities in complying with their MS4 permits (e.g., maintaining a watershed illicit discharge inventory). In addition, the VBWD will continue to train contractors working for the VBWD, as needed. The VBWD will provide additional educational support to cities and townships at their request.

List of Tables

4.4 Stream Management and Restoration

4.4.1 Importance	The streams in the VBWD are an important community asset. These resources supply aesthetic (and sometimes recreational) benefits, enhance property values, provide wildlife habitat and may provide fishery resources. The high quality of the watershed's natural resources makes it an attractive place for people to live. Preserving the high quality of the watershed's streams is critical to maintaining a high quality of life among the citizens residing in the watershed and in the larger metropolitan region. VBWD's responsibilities with respect to streams include those related to water level and floodplain management, water quality, erosion and sediment control, and habitat and shoreland management (see also Sections 4.7, 4.1, 4.8, and 4.6, respectively). Addressing stream flooding issues continues to be a high priority because flooding has the highest potential for causing damages to property and infrastructure. Increased flow due to urbanization may also cause impacts to the natural environment (e.g., excessive erosion) beyond those naturally experienced. The VBWD Managers also recognize that preserving water quality and maintaining adequate flow in the watershed's streams is important for human enjoyment of the water resources, and for maintaining wildlife habitat and fishery resources. The VBWD Managers will seek to manage the stormwater and water resources in the watershed to maintain adequate streamflow and stream water quality.
4.4.2 General Issues	The physical conditions of a stream, its water quality and quantity, and the diversity of plants and wildlife are dependent on the hydrology, groundwater quality/quantity, and the physical conditions of the resource. Hydrology and groundwater quantity are dependent on the weather, the topography of the landscape, the soils (including infiltration through the soils), the land cover, and other factors. Stream water quality is dependent upon land cover and land use in the watershed as well as the physical condition of the stream. Changes to any of these factors will impact streams. While some of the factors are difficult to control, some activities and changes to land cover can be regulated and/or managed.

4.4.3 Mission	To manage and protect our water resources within the limits of VBWD jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Improving and protecting the quality of surface water and groundwater resources. Managing the quantity of water and minimizing the negative impact on the VBWD from floods, high flows, and droughts. Understanding and responding to the effects of community growth and related activities on groundwater and surface water resources.
4.4.4 Policies to Accomplish Mission	SM&R-A. 1. The VBWD will monitor the physical condition of VBWD's perennial streams (Valley Creek and Kelle's Creek) and major intermittent stream (Raleigh Creek) on a regular basis. 2. The VBWD will monitor perennial streams (Valley Creek and Kelle's Creek) for biological indicators on a regular basis. 3. The VBWD will report monitoring results. SM&R-B. Stream degradation problems will be prevented through administration of VBWD's permit program, review of community plans, and education. SM&R-C. VBWD will implement stream management and stream restoration and stabilization projects and actions to address identified streambank erosion, gully erosion and other stream degradation problems. SM&R-D VBWD will not allow new buildings to be constructed within the 100-year floodplain of a stream. The VBWD will seek solutions to existing flooding problems.

4.4.5 Background and History Related to Stream Management and Restoration

There are two perennial streams and several intermittent streams within the Valley Branch Watershed District (VBWD). A perennial stream is a stream that flows throughout the year. Valley Branch Creek (called Valley Creek by local residents, other agencies, and in this Plan) and Kelle's Creek are the two perennial streams within the VBWD. Valley Creek and a number of its tributaries are Minnesota Department of Natural Resources (MDNR)-designated trout streams and are listed as MDNR Public Waters (see Section 3.8). Groundwater supplies the baseflow for both Valley Creek and Kelle's Creek. Valley Creek has been monitored and managed by VBWD since the District's creation. Kelle's Creek and its tributary watershed were incorporated into the VBWD in 2011, following the dissolution of the Lower St. Croix Watershed Management Organization (LSCWMO). A 2011 major amendment to the VBWD Plan incorporated the Kelle's Creek watershed and several implementation items planned and/or initiated by the LSCWMO. Kelle's Creek represents a unique

and high quality resource within the VBWD. It is similar to Valley Creek (see Section 5.20) as a perennial, groundwater-fed stream. Kelle's Creek is not listed as a MDNR-designated trout stream.

Intermittent streams are streams that flow during or after a snowmelt or rain event. Several intermittent streams lie within the VBWD. Some of the longer intermittent streams within the VBWD are listed in Section 3.8 and shown in Figure 3-14. Several of the intermittent streams in the VBWD are not named, but are identified by their upstream and downstream endpoints. Raleigh Creek (formerly known as Eagle Point Creek) is the only intermittent stream assigned a management classification by the VBWD (see Section 4.1). Raleigh Creek begins northwest of Eagle Point Lake, starting near I-694 and Highway 5 in the City of Lake Elmo.

The VBWD realized the importance of streams early in its history. In 1972, the VBWD began collecting samples and monitoring the water quality of Valley Creek. The VBWD continues to monitor Valley Creek today (see Section 4.1 and Section 5.20 for details of the VBWD's monitoring program). Based on the early water quality data, the VBWD chose to protect Valley Creek by diverting runoff from upstream areas and preventing it from flowing into the North Fork of Valley Creek. Project 1007 prevents poor quality upstream water from flowing into Fahlstrom Ponds, which prior to the construction of Interstate 94 would overflow into Metcalf Marsh, Lake Edith, and eventually the North Fork of Valley Creek.

The VBWD has strived to prevent flooding and erosion within and adjacent to streams. After the VBWD formed in November 1968, it began reviewing development plans on a voluntary basis only. Since the adoption of the first rules and regulations of the VBWD in 1972, the VBWD has required the review of projects which could have an effect upon the streams within the VBWD. The most recent VBWD rules and regulations were adopted in 2013 and address streams, including specific requirements for Valley Creek and watersheds draining to trout streams.

The VBWD has undertaken specific stream management and restoration activities, including:

1) Working with a large group of stakeholders to prepare the *Valley Creek Subwatershed Plan developed by the Valley Creek Subwatershed Advisory Committee, June 2002*. This document includes:

    a. Subwatershed Description,

    b. Goals, Strategies, and Actions, and a

    c. Recommended Implementation Program

    This document also includes a 1999 Natural Resources Inventory (VBWD also provided financial support for this effort), an Alternative Stormwater Best Management Practices (BMP) Guidebook, and a proposed buffer plan.

2) Financially supporting a stream monitoring program where Stillwater Area High School students collect and identify aquatic insects (macroinvertebrates) from streams. The VBWD has supported this program for a number of years. Initially, the students collected the macroinvertebrates from a station on Valley Creek. More recently, they have collected samples from Valley Creek and Raleigh Creek. The students use the macroinvertebrate data to determine the health of the stream(s).

3) Restoring the channel and relieving flooding along Raleigh Creek. In 1998, the VBWD completed a channel modification project that removed old abutments on the creek south of 28th Street North.

4) Inspecting Valley Creek, Kelle's Creek and Raleigh Creek for erosion, developing erosion monitoring programs, and proposing stabilization projects.

5) Contributing funding to the Department of Natural Resource's Neighborhood Wilds Program in 2003, which included improving the overbanks of the south branch of Valley Creek through removal of invasive species (e.g., buckthorn) and planting a diverse mix of native plants.

6) Computing 100-year flood levels for Valley Creek and Raleigh Creek. In 2003-2004, the VBWD computed these flood levels for Washington County to use in their efforts to re-map the FEMA (Federal Emergency Management Agency) Flood Insurance Rate Maps.

7) Intensively monitoring water quality of Raleigh Creek and other intermittent streams in 2007 and 2008. This information will be used to make future decisions around management of Raleigh Creek.

8) Monitoring the physical condition of portions of Raleigh Creek in 2005 (annual monitoring was abandoned in 2007 due to intermittent flow conditions).

9) Monitoring the physical condition of other streams besides Valley Creek, Raleigh Creek and Kelle's Creek as needed.

10) Ongoing implementation of a volunteer monitoring program for Valley Creek.

11) Participating in the Metropolitan Council's Watershed Outlet Monitoring Program (WOMP) to collect continuous flow data for Valley Creek.

12) Partnering with the St. Croix Watershed Research Station to monitor continuous flow and water quality at stations on the South Fork and the North Fork of Valley Creek, and Kelle's Creek beginning in 2011.

13) Constructing three projects within the watershed to protect Valley Creek in 2008. The VBWD constructed a 0.4-acre infiltration basin at the top of an actively eroding ravine that

drains directly into Valley Creek, stabilized approximately 2,500 feet of the South Fork of Valley Creek, and stabilized approximately 2,200 feet of the Main Stem of Valley Creek.

14) Stabilizing erosion sites along Raleigh Creek. In fall of 2009, the VBWD completed a project that included stabilizing approximately 1,500 feet of streambank along two reaches of Raleigh Creek and installing outlet structures on two stormwater ponds.

15) Stabilizing erosion sites along the unnamed stream connecting Long Lake and Lake DeMontreville (DeMontreville Ravine) in 2009. The design consisted of bank grading, installation of a series of boulder riffle grade-controls, construction of a sedimentation basin at the downstream end, and re-vegetation. The VBWD solicited input from the MDNR, BWSR, Lake Elmo Parks Commission, and the Lake Elmo City Council. Construction was hampered by extremely wet conditions during the fall months and was completed in 2010.

16) Stabilizing a streambank erosion site along Farney Creek, a small intermittent stream draining to Eagle Point Lake. Following identification of bank erosion between Stillwater Boulevard and 10th Street by a resident, the VBWD installed biologs and filled and seeded the site. High flows later washed out the fill, and the VBWD installed rip-rap in early 2013.

17) Completing a streambank stabilization feasibility study of Kelle's Creek in 2013.

4.4.6 Identified Stream Management and Restoration Issues

The stream management and restoration issues facing the VBWD include ongoing issues carried over from the 2005 Plan as well as emerging issues. These issues were identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Because streams (like all water resources) receive their water from the surrounding watershed, stream management needs to take place at the watershed level. Thus, many of the other issues facing the VBWD (e.g., flooding, water quality) are applicable to streams. Issues affecting streams, but not unique to streams, are addressed primarily in other sections of the Plan (see Section 4.1 Surface Water Quality, Section 4.2 Groundwater Management, and Section 4.7 Water Level and Floodplain Management). Discussion of issues in this section is limited to those aspects directly applicable to the management of VBWD streams.

Stream-related issues were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. The VBWD Managers considered the results of that workshop and identified the following major issues:

- Management of high and low water levels
- Stream monitoring and reporting
- Stream degradation and restoration

Stream management and restoration issues that pertain to particular waterbodies are discussed in Section 5 – Subwatershed Management Plans.

4.4.6.1 Management of High and Low Water Levels

As with lakes and wetlands, water levels of streams are a concern to VBWD residents, local units of government, and others. Flooding can be a threat to public health and safety, and can result in significant economic losses. Increased flooding due to urbanization can result in flows and water levels beyond the natural capacity of the stream channel, resulting in negative environmental consequences. For the perennial portions of Valley Creek and Kelle's Creek, low water levels are also a concern. Lower water levels can significantly change the ecological function of the creek and could also result in lower property values of the adjacent lands.

4.4.6.1.1 Low Flows

Low flows, also called "baseflow," are often dependent on the inflow of groundwater to the stream from the surrounding surficial aquifer. Research by the St. Croix Watershed Research Station of the Science Museum of Minnesota determined that approximately 85% of the baseflow in the South Fork of Valley Creek is from groundwater, while the North Fork of Valley Creek receives nearly all of its baseflow from Lake Edith, which is assumed to be fed by groundwater.

In summer 2006, the LSCWMO measured baseflow at two locations during conditions with low antecedent moisture; the baseflow measurements indicated the stream was gaining groundwater inflow between the two locations evaluated (EOR, 2007). The LSCWMO also performed a spring inventory along Kelle's Creek in June, 2006, identifying several areas of high groundwater discharge to the stream. Since groundwater is such a critical factor in the flow and health of perennial streams in the VBWD, groundwater quality and quantity need to be protected. See Section 4.2 for a discussion of groundwater management information, issues, and policies.

4.4.6.1.2 High Flows and Floodplain Management

The VBWD manages activities in the floodplains of VBWD, including streams. VBWD management of floodplains is described in greater detail in Section 4.7 Water Level and Floodplain Management. The VBWD rules and regulations (2013, as amended) require a VBWD permit for all work within the waters and floodplain of VBWD. The VBWD rules and regulations apply to all lakes, ponds, streams,

marshes and other wetlands in VBWD, not just water bodies that have been mapped by the FEMA on Flood Insurance Rate Maps.

It is sometimes difficult for VBWD to set minimum building elevations for homes adjacent to streams because the 100-year flood level varies as you move along the stream. Often, VBWD will set a range of minimum building elevations to cover the entire property. VBWD has determined 100-year flood levels for some streams that have not been mapped on FEMA Flood Insurance Rate Maps. Information about VBWD flood levels and FEMA flood levels is available from the VBWD engineer.

VBWD is aware of some homes within the floodplain of Valley Creek (see Section 5.20) and Raleigh Creek (see Section 5.11). Additional homes may be within the floodplain of other intermittent streams. Many of these homes were constructed prior to establishment of flood levels and before VBWD began implementing its permit program. The Kelle's Creek management plan (EOR, 2007) identified flooding issues adjacent to Kelle's Creek in the City of Afton, although individual homes within the floodplain have not been identified (see Section 5.37). Flooding of the St. Croix River can also result in flooding of the old village area in Afton and back up water into Kelle's Creek. Specific flooding issues are described in greater detail in Section 5 Subwatershed Management Plans.

See the Floodplain Management portion of Section 4.7.6 for more information about the authority of the MDNR, counties and cities in floodplain management, including flood insurance requirements.

4.4.6.2 Stream Monitoring and Reporting

Monitoring performed on VBWD streams can be subdivided into four categories:

1) Physical condition of the stream (including such factors as riffles, pools, bottom material, bank stability, bank vegetation)

2) Quantity of the water (including flow and water level)

3) Quality of the water (including water chemistry parameters such as pH, temperature, dissolved oxygen, fecal coliform bacteria, etc. – water quality monitoring of streams is described in greater detail in Section 4.1 – Water Quality)

4) Diversity of macroinvertebrates (i.e., aquatic insects) and other stream inhabitants (which are indicators of water quality and overall stream health)

As urbanization and land use changes continue in the VBWD, additional information is necessary to assess stream conditions, determine if there are physical (erosion), habitat, or water quantity problems, track changes, detect trends, and better understand processes. Monitoring of the physical condition of streams is necessary to identify erosion issues and other conditions that may threaten property, human health, or the ecological function of the stream or adjacent riparian areas. Flow and

water level monitoring are useful to identify impacts of development on streams, identify possible flooding issues (see Section 4.7), and aid in the possible development of future hydrologic models.

Macroinvertebrate sampling provides an indicator of overall stream health. While water quality grab samples provide an assessment of stream water quality at the time of sample collection, benthic invertebrates provide a long-term assessment of water quality. They live on the bottom and in the vegetation of a stream as long as water quality conditions permit. As attached organisms, benthic aquatic invertebrates are exposed to all the temporal variations in stream quality and "integrate" the quality of passing water. Each type of benthic invertebrate has a different tolerance for pollution; studying the numbers and types of benthic invertebrates can indicate pollution in a stream. When sufficient pollutants enter the stream to prevent their survival, they are eliminated. Monitoring the presence or absence of biological indicator organisms provides indirect evidence of the effects of transitory changes in stream water quality. A numeric index calculated from the types and numbers of invertebrates present, such as the Hilsenhoff's Biotic Index (HBI, Hilsenhoff, W.L. 1987), is often used to quantify the results of macroinvertebrate monitoring. The MPCA has developed a biotic index that they will use to determine impairment of streams for invertebrates, referred to as M-IBI. The M-IBI provides a more comprehensive assessment of stream health than the HBI; a modified version of the HBI is included as one of the metrics for calculating M-IBI. The MPCA currently uses the M-IBI to determine stream impairment for its monitoring projects. More information regarding the M-IBI is available from the MPCA website.

While the VBWD has collected much data for Valley Creek and some data for Raleigh Creek, there is less available data for the shorter intermittent streams. Since the development of the 2005 VBWD Plan, the VBWD has monitored the water quality and physical condition of intermittent streams as requested or in response to suspected issues. This information has helped the Managers to better understand and prioritize issues within the watershed. Kelle's Creek and its tributary watershed were incorporated into the VBWD as part of a major plan amendment in 2011. Some prior data collected by the LSCWMO is available for Kelle's Creek.

The VBWD's annual report submitted to the Board of Water and Soil Resources (BWSR) and MDNR and posted on the VBWD website includes the results of the VBWD stream monitoring efforts. The St. Croix Watershed Research Station and Metropolitan Council report flow data collected at the three flow gages installed on Valley Creek. Water quality data collected as part of the Metropolitan Council's Watershed Outlet Monitoring Program (WOMP) are compiled and assessed in an annual stream monitoring assessment report (see Section 4.1 – Water Quality).

The VBWD watershed is tributary to the St. Croix River, via Valley Creek and Kelle's Creek. The VBWD does not monitor the St. Croix River. Other entities have collected data and performed studies on the St. Croix River adjacent to the VBWD (often referred to as Lake St. Croix), including:

- Minnesota Pollution Control Agency (water quality and biological monitoring)
- US Geological Survey (flow monitoring)

- US Army Corps of Engineers (water level monitoring and river morphology)
- St. Croix Watershed Research Station (water quality and nutrient loading)

The St. Croix River Association (SCRA) sponsors activities and initiatives including monitoring and research within the St. Croix River and its watershed. Overall health of the St. Croix River was evaluated in the *Lake St. Croix Nutrient Loading and Ecological Health Assessment* report commissioned by the SCRA and published in 2013 by the St. Croix River Watershed Station, US Geological Survey, and Metropolitan Council. As a tributary watershed to the St. Croix River, there may be opportunities for the VBWD to partner with the SCRA or other entities working in the St. Croix River in order to achieve common goals.

4.4.6.3 Stream Degradation and Restoration

Increased rates and volumes of runoff, resulting from urbanization and other activities, can degrade a stream's hydrology and physical condition, its water quality, its function as aquatic habitat, , and can reduce the amount of groundwater flowing to a stream. Negative impacts resulting from increased development are summarized in Table 4.4- 1, developed from information published in the *Minnesota Stormwater Manual* (2005, as amended).

Table 4.4- 1 Stream impacts resulting from increased urbanization

Type of Impact	Specific Impacts
Stream Hydrology Impacts	• **Increased frequency of bankfull and near bankfull events**: Increased runoff volumes and peak flows increase the frequency and duration of smaller bankfull and near bankfull events, which are the primary channel forming events. • **Increased flooding**: Increased runoff volumes and peak flows also increase the frequency, duration and severity of out-of-bank flooding. • **Lower dry weather flows (**baseflow**):** Reduced infiltration of stormwater runoff could cause reduced shallow groundwater inflow during dry weather periods resulting in less baseflow in streams.

Table 4.4- 1 Stream impacts resulting from increased urbanization

Type of Impact	Specific Impacts
Stream Geomorphology Impacts	• **Stream widening and bank erosion**: Stream channels widen to accommodate increased runoff and higher stream flows from developed areas. More frequent small and moderate runoff events undercut and scour the lower parts of the streambank, causing the steeper banks to slump and collapse during larger storms. • **Higher flow velocities**: Higher flow velocities result in increased streambank erosion rates, which can cause a stream to widen many times its original size. • **Stream downcutting**: Streams accommodate higher flows by downcutting their streambed. This causes instability in the stream profile, or elevation along a stream's flow path, which increases velocity and triggers further channel erosion both upstream and downstream. • **Loss of riparian canopy**http://stormwater.pca.state.mn.us/index.php/Glossary - R: As streambanks are gradually undercut and slump into the channel, the vegetation (e.g., trees, shrubs) that had protected the banks are exposed at the roots. This leaves them more likely to be uprooted or eroded during major storms, further weakening bank structure. • **Changes in the channel bed due to sedimentation**: Due to channel erosion and other sources upstream, sediments are deposited in the stream as sandbars and other features, covering the channel bed, or substrate, with shifting deposits of mud, silt and sand. • **Increase in the floodplain elevation**: To accommodate the higher peak flow rate, a stream's floodplain elevation typically increases following development in a watershed. Property and structures that had not previously been subject to flooding may now be at risk.
Aquatic Habitat Impacts	• **Degradation of habitat structure**: Higher and faster flows can scour channels and wash away entire biological communities. Streambank erosion and the loss of riparian vegetation reduce habitat for many fish species and other aquatic life, while sediment deposits can smother bottom-dwelling organisms and aquatic habitat. • **Loss of pool-riffle structure**: Streams draining undeveloped watersheds often contain pools of deeper, more slowly flowing water that alternate with "riffles" or shoals of shallower, faster flowing water. These pools and riffles provide valuable habitat for fish and aquatic insects. Increased flows and sediment loads from urban watersheds can replace pools and riffles with more uniform streambeds that provide less varied aquatic habitat. • **Reduced baseflows**: Reduced baseflows that may result from increased impervious cover in a watershed and the loss of rainfall infiltration into the soil and water table adversely affect in-stream habitats, especially during periods of drought. • **Increased stream temperature**: Runoff from warm impervious areas (e.g.. streets and parking lots), storage in impoundments, loss of riparian vegetation and shallow channels can all cause an increase in temperature in urban streams. Increased temperatures can reduce dissolved oxygen levels and disrupt the food chain. Certain aquatic species, such as trout, can only survive within a narrow temperature range. • **Decline in abundance and biodiversity**: When there is a reduction in various habitats and habitat quality, both the number and the variety, or diversity, of organisms (e.g.. wetland plants, fish, and macroinvertebrates) are also reduced. Sensitive fish species and other life forms disappear and are replaced by those organisms that are better adapted to the poorer conditions. Fish and other aquatic organisms are impacted not only by the habitat changes brought on by increased stormwater runoff quantity, but are often also adversely affected by water quality changes.

In addition to being affected by runoff, Valley Creek and Kelle's Creek both depend on groundwater for their baseflow. Any changes to the groundwater flow can reduce the baseflows of the streams and increase the streams' water temperature. In addition to urbanization, groundwater wells may divert water away from a stream, reducing its baseflow.

Stream health is also a function of chemical water quality. Chemical water quality is closely linked to watershed conditions and internal processes (see Appendix A-4.1 for background information about water quality). As urbanization increases and other land use changes occur in VBWD, nutrient and sediment inputs (i.e., loadings) from stormwater runoff and other sources can far exceed the natural inputs to the stream and deteriorate the stream's health. These changes have led the MPCA to propose revised water quality standards for nutrients and sediment in streams. Information about these standards can be found in Section 4.1 Water Quality.

The VBWD has studied many of the water quality problems in the watershed and developed recommendations for improving water quality in VBWD waterbodies, including streams. VBWD strategies and actions for improving stream water quality are described in Section 4.1 Water Quality.

Hydrologic, geomorphic, and water quality changes can impact aquatic insects and the other stream inhabitants. Insects and other inhabitants are indicators of stream health. Some insects can only survive in high quality water, whereas others can survive in much poorer quality of water. A healthy stream has a good diversity of insects and stream inhabitants. The VBWD performs macroinvertebrate monitoring to track stream degradation (see Section 4.4.6.2)

VBWD continues to conduct physical monitoring of its streams to determine if there are streambank and other erosion problems.

Stream bank, ravine and gully erosion degrade the appearance, usability, ecological health and water quality of streams. The VBWD has implemented erosion control and stabilization capital projects along watershed streams. In the past, VBWD conducted physical monitoring only in response to problems. During the last fifteen years, VBWD has conducted more monitoring to identify problems (see Section 4.8 – Erosion and Sediment Control).

Since 2003, the VBWD has identified, inventoried, prioritized and monitored erosion and sedimentation problems on an ongoing basis. The VBWD has implemented measures to correct erosion and sedimentation problems as they arise and funds allow.

4.4.7 Policy Details, Strategies, and Actions Related to Stream Management and Restoration Issues

4.4.7.1 SM&R-A. Monitoring

VBWD will regularly monitor biological indicators and streamflow of its perennial streams (Valley Creek and Kelle's Creek). The VBWD will use the MPCA's M-IBI biotic index to quantify the results of its biological monitoring efforts (see Section 4.4.6.2). The VBWD will consider working

with the MPCA to incorporate fisheries data into the M-IBI biotic index, depending upon data availability (e.g., Valley Creek, see Section 5.20).

VBWD monitoring of stream chemical water quality is described in Section 4.1 Water Quality. Section 5.20 – Valley (Branch) Creek Subwatershed Management Plan presents VBWD's monitoring policies specific to Valley Creek. Section 5.37 – Kelle's Creek Subwatershed Management Plan presents VBWD's monitoring policies specific to Kelle's Creek. VBWD may monitor the water quality of its intermittent streams, including Raleigh Creek, but only in response to an identified or suspected problem. The details of such a monitoring program will be determined at the time of implementation.

Depending upon access, the VBWD will regularly monitor the physical condition of the MDNR public water streams (Valley Creek, Raleigh Creek, and Kelle's Creek). The purpose of this monitoring is to assess stream degradation, including the identification of streambank and gully erosion sites. VBWD will monitor other intermittent streams only in response to problems.

The VBWD will continue to implement its volunteer stream monitoring program for Valley Creek, and will explore the feasibility of developing and implementing a similar program for Kelle's Creek.

VBWD will report the results of its stream monitoring in its annual report to BWSR, which is posted on the website.

4.4.7.2 SM&R-B. Permit & Plan Review

VBWD seeks to prevent stream degradation problems through its permit review program, review of community plans, and education efforts. The VBWD rules and regulations (2013, as amended) address the protection of VBWD streams, including specific requirements for Valley Creek and watersheds draining to trout streams. Section 4.5 – Stormwater Runoff Management describes VBWD's stormwater management requirements. When reviewing projects, VBWD will consider the effect of in-stream structures on natural habitat and the needs of people/pedestrians.

4.4.7.3 SM&R-C. Stream Management and Restoration Actions

VBWD will implement stream management and stream restoration/stabilization projects and actions to address identified streambank erosion, gully erosion, and other stream degradation problems. VBWD will prioritize projects according to the size of the affected area, the threat to public health, safety, or welfare, the damage/potential damage to the stream, and the downstream impacts of the problem. In general, VBWD will place a higher priority on addressing projects in and along its perennial streams (Valley Creek and Kelle's Creek) and its intermittent streams with larger tributary watersheds (Raleigh Creek). Such projects could include streambank stabilization, native plantings, sediment removal, and repair/ removal of structures (see Section 4.9 for details on funding methods). Where feasible, the VBWD will seek opportunities to use soft-armoring stream restoration and stabilization methods. When possible, the VBWD will avoid the use of hard-armoring techniques

(e.g., gabions, concrete structures), as such techniques can disrupt natural processes and may degrade habitat and water quality.

The VBWD will assess the underlying mechanisms of hydrology, geomorphology, biology, connectivity, and water quality when evaluating stream restoration measures to ensure that the proposed actions appropriately address the cause(s) of the issues.

4.4.7.4 SM&R-D. Flood Protection

Through the implementation of the VBWD permit program, the VBWD will not permit new buildings to be constructed within the 100-year floodplain of a stream. The VBWD will consider solutions to existing stream flooding problems. The VBWD rules and regulations will continue to require a VBWD permit for all work within the waters and floodplain of VBWD, including streams. VBWD floodplain management requirements for streams will continue to include:

1. VBWD determination or approval of flood levels,
2. VBWD setting of minimum building elevations at two feet above the "100-year flood level,"
3. Preservation of floodplains and restrictions on floodplain uses
4. Restrictions on alterations that impact floodplains.

See Section 4.7.5 (Water Level and Floodplain Management) for more information regarding VBWD's issues and policies on this topic.

List of Tables

List of Appendices

4.5 Stormwater Runoff Management

4.5.1 Importance	The quality and quantity of surface water is greatly influenced by stormwater runoff. To accomplish the VBWD goals for maintaining and improving water quality and managing water quantity, stormwater runoff must be carefully and closely managed. The VBWD manages stormwater runoff by carrying out its permit program, which includes preventive measures so that negative effects of stormwater runoff are addressed (and prevented) at the time of development or redevelopment, and not after problems develop. VBWD also actively encourages developers to use new, innovative stormwater management technologies
4.5.2 General Issues	The quality and quantity of stormwater runoff are dependent on the hydrology and the physical conditions of the watershed. Hydrology is dependent on weather, topography, soils, land use/land cover, and other factors. Changes to any of these factors will affect the quality and quantity of stormwater runoff. While some of the factors are difficult to control, changes to land use/land cover can be regulated and/or managed to minimize negative consequences.
4.5.3 Mission	To manage and protect our water resources within the limits of VBWD jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Improving and protecting the quality of surface water and groundwater resources within the VBWD; and Managing the quantity of water and minimizing the negative impact on the VBWD from floods, high flows, and droughts.
4.5.4 Policies to Accomplish Mission	SW-A. 1. VBWD will require stormwater and snowmelt runoff rates to be managed so that future peak rates of runoff crossing community boundaries and/or leaving a development are below or equal to existing rates. 2. VBWD requires stormwater volume control as specified in its Rules and Regulations document (2013, as amended). SW-B. 1. VBWD requires stormwater runoff to be treated at the time of development, through VBWD's permitting program. 2. VBWD requires developers to consider implementation of innovative stormwater control technologies where appropriate. 3. VBWD will work with local government units to adopt/revise ordinances to allow for runoff pollution prevention methods (e.g., narrower streets, smaller parking lots). 4. VBWD reviews projects and developments plans to evaluate compliance with VBWD standards. 5. VBWD requires other public agencies to conform to VBWD

	stormwater quality requirements. 6. VBWD reviews local water management plans for compliance with this Plan. 7. VBWD requires that submittals for VBWD-permitted projects show how the project will meet VBWD requirements for stormwater quality treatment, stormwater rate and volume management, and erosion control. SW-C. VBWD requires all project proposals to include detailed designs and maintenance plans for stormwater management facilities. SW-D. VBWD will continue to meet its NPDES Phase II MS4 requirements and maintain its Municipal Separate Storm Sewer System (MS4) permit. SW-E. 1. VBWD will continue to administer and enforce a permit program regulating land use and development to prevent negative impacts from stormwater runoff. 2. VBWD will allow local units of government to assume VBWD's permitting authority if certain conditions are met.

4.5.5 History Related to Stormwater Runoff Management

VBWD has been involved in managing stormwater since 1972, when VBWD established rules and regulations pertaining to developments. When VBWD first began implementing their rules and regulations, they provided only recommendations to the cities (e.g., minimum building elevations) regarding proposed developments. In the mid-1970's, VBWD began its formal permit program. The VBWD rules and regulations have always addressed the water quantity impacts of stormwater (e.g., flooding, rate control). At first, the VBWD rules indirectly addressed the water quality impacts of stormwater. VBWD rules have directly addressed the water quality impacts of stormwater since implementation of the 1995 VBWD Plan. In 2000, VBWD developed *Alternative Stormwater Best Management Practices Guidebook* (Barr Engineering, 2000). The guidebook included planning tools, site design, and best management practices for development and for agricultural lands. From this guidebook, VBWD developed a stormwater volume checklist that must be completed for all projects requiring a permit from VBWD.

Watershed districts have the statutory authority to regulate the use and development of land in their watersheds. In the Minneapolis-St. Paul Metropolitan Area, this authority exists only if the city/township does not have a VBWD-approved local water management plan, is not implementing its plan, or has authorized the watershed district to require permits for the use and development of land. Through its permit program, the VBWD manages land use and development so as to not negatively impact the watershed's water resources. The communities may develop as they choose,

but need to strike the right balance between development and natural resource needs. VBWD's role has been to offer advice and assist the communities in identifying and analyzing their problems.

The VBWD relies on the cities and townships within the watershed to provide detailed review of proposed stormwater infrastructure within their jurisdictions at the time of development or redevelopment (e.g., catch basin sizing, pipe sizing, etc.). The VBWD also relies on cities and townships to provide detailed review of municipal projects (e.g., road construction). VBWD does not normally review the design of individual stormwater system components beyond those regulating ultimate discharge from a development site, redevelopment site, or linear project. The VBWD reviews the predicted discharge from proposed projects and the estimated impacts of those projects on downstream water resources and on on-site flood levels (e.g., water levels of on-site wet stormwater ponds).

The Metropolitan Council requires cities to adopt stormwater management ordinances or local water management plans as part of their comprehensive plan updates, and encourages older, fully-developed (or nearly fully developed) cities to adopt stormwater ordinances that focus on redevelopment issues and requirements for best management practices at redevelopment sites. The Metropolitan Council's *2030 Water Resources Management Policy Plan* (Metropolitan Council, 2005) provides requirements and suggested guidance for local water management plans. The Metropolitan Council requires stormwater ordinance and local water management plans to meet the requirements of the NPDES construction stormwater permit and the minimum requirements identified in the MPCA's sample stormwater ordinance. The Metropolitan Council references the *Minnesota Stormwater Manual* (MPCA, 2005, as amended) for guidance regarding best management practices (BMPs).

Following development of the 2005 Plan, the VBWD conducted an inventory of all stormwater ponds approximately ¼ acre and larger (over 100 ponds). The initial inventory was completed over a five-year period of time (i.e., approximately 20% of the ponds were inventoried each year). There were two major steps to the inventory:

1. Locate ponds – the process included locating the ponds using two-foot contour topographic maps and field-verifying the pond locations. The inventory was limited to ponds that could be identified on two-foot contour maps.

2. Determine if ponds met stormwater quality treatment criteria – the process included development and use of a worksheet to assist in estimating if the ponds met the physical criteria for stormwater quality treatment ponds. These physical criteria included stormwater quality storage volume, bench width/depth, slopes, skimmers, trashracks, etc. Other recorded information included the property owner and if there was an easement in place.

The inventory identified nine ponds that were not performing as designed. The VBWD developed a plan to perform the needed maintenance, repairs and/or retrofitting of these ponds to provide the maximum amount of stormwater quality treatment. Higher priority was assigned to basins within the local watershed of a High Priority water body (based on classifications given in the 2005 Plan – see

Section 4.1 – Water Quality). The plan identified the estimated costs, timeframe, and responsible parties for implementing the needed maintenance, repairs, and retrofits. The VBWD cooperated with the local units of government to assign responsibilities. Through the winter of 2008 to 2009, the VBWD contracted for the removal of sediment from the nine underperforming stormwater ponds. Sediment removed from the ponds was tested per the Minnesota Pollution Control Agency's (MPCA's) guidance at the time for dredged materials and ultimately used as fill at sites with industrial land use (i.e., the material did not require landfill disposal). Following the inventory and subsequent maintenance projects, the VBWD developed guidance specifying the required performance and maintenance for new stormwater ponds (see Exhibit A of the 2013 Rules and Regulations).

4.5.5.1 National Pollution Discharge Elimination System (NPDES)

Under the U.S. Environmental Protection Agency's (EPA) Storm Water Phase II National Pollutant Discharge Elimination System (NPDES) Rules, small municipal separate storm sewer systems ("MS4s") serving populations between 10,000 and 100,000 that are located in urbanized areas are required to obtain a NPDES Phase II Storm Water permit under the Clean Water Act. The Phase II NPDES Permit Program requires cities and other public entities (such as the VBWD) to file a Municipal Separate Storm Sewer System (MS4) Permit with the Minnesota Pollution Control Agency (MPCA), which addresses how the permit holder will regulate and improve stormwater discharges. The permit must include a Stormwater Pollution Prevention Program (SWPPP) addressing all of the requirements of the permit. The SWPPP must be designed and managed to minimize the discharge of pollutants from the MS4 to the maximum extent practicable. The SWPPP must include best management practices (BMPs) that control or reduce pollutants, as appropriate for the community. Within the VBWD, the following communities and counties or portions of communities were identified as MS4s by the MPCA (as of 2007):

- White Bear Lake
- Maplewood
- North St. Paul
- Mahtomedi
- Pine Springs
- Oakdale
- Woodbury
- Grant
- Lake Elmo
- West Lakeland Township
- Washington County
- Ramsey County

The MPCA reissued the MS4 general permit in 2013. The permit focus shifted from permit program development to increasing emphasis on measured progress and implementation. Since VBWD is owner and operator of flood control projects (e.g., Project 1007, Olson Lake Estates Outlet), the VBWD is required to maintain an MS4 permit. VBWD's MS4 system discharges into an MS4 system owned and operated by MnDOT. VBWD submitted its MS4 permit application under the reissued permit in 2013 and was granted its MS4 permit in early 2014. The VBWD's SWPPP is included as Appendix B-4.5. The VBWD's SWPPP addresses six minimum control measures (MCMs) required by the permit:

1. Public outreach and education.
2. Public participation/involvement.
3. Illicit discharge detection and elimination.
4. Construction site runoff control.
5. Post-construction runoff control.
6. Pollution prevention/good housekeeping.

The VBWD SWPPP identifies the practices and programs VBWD implements to address these issues, including its permit program and inspection program. For MS4s located upstream of impaired water bodies for which a TMDL has been completed (see Section 4.1 – Water Quality), SWPPPs must meet the requirements of an approved TMDL implementation plan. As part of the VBWD's annual inspection of its stormwater management systems, the VBWD checks for non-stormwater discharges into the VBWD system.

The Phase II rules also require owners and operators of construction sites disturbing more than one acre to obtain a NPDES stormwater permit for construction activity (NPDES construction stormwater permit). The construction stormwater permit and general stormwater permit include requirements for permanent stormwater management facilities, as well as additional stormwater management requirements for construction activities discharging to or located in watersheds upstream of "Special Waters." Valley Creek and the St. Croix River are designated Special Waters (see Section 4.4 – Stream Management and Restoration, and Section 4.8 – Erosion Prevention and Sediment Control for more information).

4.5.5.2 Minimal Impact Design Standards (MIDS)

Stormwater management has evolved substantially in recent history. Historically, the goal was to move water off the landscape quickly and reduce flooding concerns. Greater understanding of hydrology and a growing public interest in sustainability has shifted the focus to mimicking natural hydrology and minimizing the amount of stormwater runoff and pollution reaching our lakes, rivers and streams.

In 2009, the Minnesota Legislature allocated funds to "develop performance standards, design standards or other tools to enable and promote the implementation of low impact development and other stormwater management techniques." (Minnesota Statutes 2009, section 115.03, subdivision 5c). Between 2009 and 2013, a work group developed the new state recommended Minimal Impact Design Standards (MIDS). MIDS is provided as guidance, but is not required by the MPCA. VBWD was the first entity to adopt the MIDS performance goal for treatment of stormwater runoff and the design sequence flowchart (slightly modified). The VBWD trigger for stormwater management requirements is 6,000 square feet of impervious area, versus the 1 acre project area trigger included in the MIDS guidance. Other cities and watershed management organizations are also starting to adopt MIDS.

4.5.6 Identified Stormwater Runoff Management Issues

The VBWD faces several issues related to the management of stormwater runoff, including existing issues carried over from the 2005 Plan as well as emerging issues. This section discusses the stormwater runoff management issues identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Issues identified by the parties listed above were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. The VBWD Managers considered the results of that workshop and identified and organized the following major stormwater runoff management issues into five topics:

1. Planning for sustainable infrastructure
2. Quality of stormwater runoff
3. Quantity of stormwater runoff
4. Maintenance of stormwater best management practices (BMPs)
5. VBWD stormwater runoff management standards

Stormwater runoff management issues that pertain to particular water bodies are discussed in Section 5 – Subwatershed Management Plans.

4.5.6.1 Planning for Sustainable Infrastructure

The installation and maintenance of stormwater infrastructure carries significant costs, but is often less than the cost to retrofit or repair environmental impacts resulting from inadequate management. To limit the future costs associated with stormwater management, the VBWD is committed to promoting low impact development and redevelopment practices as well as the use of innovative and sustainable approaches to stormwater management.

Alternative or innovative stormwater practices include porous pavement design, infiltration systems, filtration systems, constructed wetlands, stormwater re-use, stacked green infrastructure, and others. Additional information is included in the Minnesota Stormwater Manual (MPCA, 2005, as amended) Impervious surface reduction and infiltration systems are especially effective since they reduce the volume of stormwater runoff produced as well as improve water quality. They also provide the added

benefits of groundwater recharge. However, these infiltration stormwater practices are not appropriate for all site conditions. For example, infiltration BMPs are not recommended for soils with very low permeability (i.e., clays), nor in situations where the bottom of the infiltration BMP would be less than three feet above the seasonally high water table (MPCA, 2005, as amended). MIDS guidance includes a decision flowchart to identify the suitability of sites for infiltration BMPs. VBWD will require innovative stormwater practices where site conditions allow.

4.5.6.2 Quality of Stormwater Runoff

Stormwater runoff carries with it a number of contaminants affecting water quality, human health, recreation, habitat and aesthetics. The principal pollutants found in runoff include nutrients, sediments, organic materials, pathogens, hydrocarbons, metals, pesticides, chlorides, trash and debris. Table 4.5- 1, developed using information from the *Minnesota Urban Small Sites BMP Manual* (Barr Engineering, 2001), summarizes the source of these pollutants and their impacts. Of these pollutants, the VBWD recognizes that phosphorus and suspended sediment are particularly detrimental to the ecological functions and recreational use of lakes, streams, and wetlands. As a result, VBWD's permit program requires measures to reduce the influx of these pollutants to its water bodies.

Closely related to the reduction of phosphorus loads to the water bodies is the control of suspended sediment inflows. Suspended sediment – fine particles of soil, dust and dirt transported in moving water – results from stormwater runoff from streets and parking lots. Sediment loads increase when erosion occurs. Sediment is also a major source of phosphorus, which is frequently bound to the fine particles (referred to as particulate phosphorus). For this reason, many BMPs intended to remove phosphorus seek to achieve the removal of suspended particles by settling (e.g., stormwater ponds) or filtering (e.g., filtration basins).

The VBWD adopted revised Rules and Regulations in 2013. The revised rules addressing stormwater quality are based on the MPCA's MIDS guidance. Fundamentally, the MIDS guidance seeks to reduce pollutant loading by managing the volume of stormwater runoff ultimately reaching waterbodies to mimic natural conditions. Stormwater volumes are managed through infiltration or other volume reduction BMPs (e.g., reuse). Volume retention on the parcel (e.g., achieved through infiltration) prevents most pollutants contained in the retained stormwater from reaching downstream surface waters. These rules represent a higher level of water quality treatment than previously enforced in the VBWD, which will lead to improvements in stormwater runoff quality and contribute to the prevention of future water quality issues.

Table 4.5- 1 Principal Pollutants in Stormwater Runoff

Stormwater Pollutant	Examples of Sources	Related Impacts
Nutrients: Nitrogen, Phosphorus	Animal waste, fertilizers, failing septic systems	Algal growth, reduced clarity, other problems associated with eutrophication (oxygen deficit, release of nutrients and metals from sediments)
Sediments: Suspended and Deposited	Construction sites, other disturbed and/or non-vegetated lands, eroding banks, road sanding	Increased turbidity, reduced clarity, lower dissolved oxygen, deposition of sediments, smothering of aquatic habitat including spawning sites, sediment and benthic toxicity
Organic Materials	Leaves, grass clippings	Oxygen deficit in receiving water body, fish kill.
Pathogens: Bacteria, Viruses	Animal waste, failing septic systems	Human health risks via drinking water supplies, contaminated swimming beaches
Hydrocarbons: Oil and Grease, PAHs (Naphthalenes, Pyrenes)	Industrial processes; automobile wear, emissions & fluid leaks; waste oil.	Toxicity of water column and sediment, bioaccumulation in aquatic species and through food chain
Metals: Lead, Copper, Cadmium, Zinc, Mercury, Chromium, Aluminum, others	Industrial processes, normal wear of auto brake linings and tires, automobile emissions & fluid leaks, metal roofs	Toxicity of water column and sediment, bioaccumulation in aquatic species and through the food chain, fish kill
Pesticides: PCBs, Synthetic Chemicals	Pesticides (herbicides, insecticides, fungicides, rodenticides, etc.), industrial processes	Toxicity of water column and sediment, bioaccumulation in aquatic species and through the food chain, fish kill
Chlorides	Road salting and uncovered salt storage	Toxicity of water column and sediment
Polycyclic Aromatic Hydrocarbons (PAH's)	Tar based pavement sealant	Carcinogenic to humans
Trash and Debris	Litter washed through storm drain networks	Degradation of the beauty of surface waters, threat to wildlife

Based on *Minnesota Urban Small Sites BMP Manual* (Barr Engineering Company, 2001).

4.5.6.3 Quantity of Stormwater Runoff

In a natural, undeveloped setting, the ground is often pervious, which means that water (including stormwater runoff) can infiltrate into the soil. Land development dramatically changes how stormwater runoff moves in the local watershed. The changes begin during construction, when clearing and grading of the site results in less infiltration, higher rates and volumes of stormwater runoff, and increased erosion. As construction continues, ground surfaces become covered with asphalt, concrete, and other materials that are impervious and prevent infiltration of water into the soil. As a result, the rate and volume of stormwater runoff from the site further increases. These increased rates and volumes of stormwater runoff can create significant problems for downstream water resources. The increase in runoff rates from sites can also increase flooding risks and erosion. If the land drains to a landlocked basin, the additional volume of runoff can increase the water level and flood level of the basin. If the land drains to a stream, the additional volume of runoff can cause the stream to flow full for longer durations, which increases the potential for erosion. In addition, the reduced amount of infiltration means less water is being recharged into the groundwater system, which can result in decreased base flows in creeks and streams and, potentially, a loss to the long-term sustainability of groundwater drinking supplies.

In light of these impacts, stormwater rate and volume are regulated by several entities. The MPCA's MS4 general stormwater permit and NPDES construction stormwater permit both include stormwater volume requirements. The MS4 general stormwater permit requires that development projects must not increase the volume of stormwater from a project site, while requiring that redevelopment projects result in a net decrease in stormwater runoff volume. The NPDES general construction permit requires sites creating one acre of new impervious area to achieve a volume reduction equivalent to one inch of runoff over the new or additional impervious areas.

The VBWD's 2013 adopted rules include a volume reduction requirement based on the MPCA's MIDS guidance (see Section 4.5.5.2).

4.5.6.4 Maintenance of Stormwater Best Management Practices

The VBWD and cities, townships, and property owners have implemented several water quality improvement projects. After implementation of water quality improvement projects associated with new or existing development, it is essential that the projects be operated and maintained so that they provide their designed benefits. For example, water quality treatment ponds must be regularly inspected and accumulated material removed. For water quality improvement projects constructed by VBWD, this responsibility lies with VBWD unless otherwise documented. In specific cases, documented agreements assign maintenance responsibilities for VBWD water quality projects to the cities (e.g., Woodbury, Oakdale) or the Minnesota Department of Transportation (MnDOT). Maintenance responsibilities for other projects within the VBWD, but not constructed by the VBWD, may be less clear, and may fall to the VBWD.

In addition to VBWD projects, hundreds of water quality improvement projects have been constructed in VBWD as part of VBWD-permitted projects. Historically, a large number of these

projects (typically ponds) have not been adequately maintained. As a result, the designed amount of stormwater runoff treatment may no longer be achieved. The VBWD performed a study to identify ponds not adequately maintained and assumed responsibility for maintaining these ponds as part of the 2007 VBWD rule revision (see Section 4.5.5). The VBWD has memoranda of understanding with the cities of Oakdale and Woodbury specifying that those cities will maintain stormwater BMPs constructed in their communities by the cities and others (but not the VBWD).

The 2013 VBWD rules require project owners to sign a maintenance agreement acknowledging that the project owner is responsible for maintenance during and after project construction (see Appendix B of the VBWD Rules and Regulations). Maintenance tasks are identified in an attachment to the maintenance agreement. If the owner does not perform the required maintenance, the VBWD may perform the maintenance and the costs charged to the owner.

At issue is the VBWD's role and level of responsibility for maintaining and repairing water quality treatment projects, including stormwater ponds, rainwater gardens constructed as part of the VBWD's BMP cost share program, and other BMPs. As development and redevelopment occurs, the burden placed on the VBWD to maintain private stormwater management facilities will increase.

4.5.6.5 VBWD Stormwater Runoff Management Standards/Requirements

Current VBWD rules require stormwater quality treatment for projects. In previous versions of the VBWD rules, the level of treatment was based on the water quality category of the receiving water body. There were sometimes problems with implementing this policy (e.g., defining the "receiving water body"). The VBWD seeks to achieve the highest levels of stormwater quality treatment possible (and practical) at the time of development, since it is more cost-effective and it avoids future retrofitting of ponds to provide higher levels of treatment. Thus, the VBWD adopted stormwater runoff treatment rules that are independent of downstream water body classification.

Historically, stormwater quality treatment ponds were used as the primary means of removing significant amounts of sediment and some amounts of phosphorus from stormwater runoff. Stormwater quality treatment may be provided through other methods such as runoff pollution prevention and stormwater treatment best management practices (BMPs). Runoff pollution prevention methods include impervious surface reduction, good housekeeping, construction practices, soil erosion control, and sediment control. Stormwater treatment BMPs include infiltration systems, filtration systems, constructed wetlands, etc. Impervious surface reduction and infiltration systems are especially effective since they reduce the volume of stormwater runoff produced. They also provide the added benefits of groundwater recharge.

Rather than focus on specific best management practices, the VBWD's adopted rules provide a performance goal of stormwater runoff volume reduction equivalent to 1.1 inches of runoff from impervious areas. This is identical to the MIDS performance goal. The VBWD rules follow the MIDS guidance, which includes a flowchart for determining the suitability of each site for specific BMPs.

The VBWD's stormwater volume checklist encourages further reductions in stormwater volumes, although the methods listed are not required. The VBWD encourages developers to try new/innovative techniques, and the new stormwater management requirements included in the VBWD adopted rules, as well as the guidance provided in MIDS, may facilitate the use of new techniques.

Where multiple jurisdictions overlap, there is the potential for conflicting or redundant permitting procedures. For example, projects meeting certain triggers may require a permit from the city in which the project is located, another permit from the VBWD, as well as a permit from the MPCA (e.g., construction stormwater permit). The VBWD, through its adoption of the MIDS performance goal, has selected a standard endorsed by the MPCA and adopted by several other regulating bodies. As additional entities adopt MIDS, opportunities for building efficiency in the permitting process may occur.

In the past, the VBWD has allowed cities to issue permits without a VBWD permit, as long as the city permit requirements are equal to or greater than the VBWD. The VBWD will continue to allow cities to do this, but in light of the revised VBWD rules adopted in 2013, all cities need to ensure that their permitting programs meet the VBWD requirement. The adoption of MIDS will hopefully make it easier for cities to determine what their requirements must be to comply with the VBWD rules.

4.5.7 Policy Details, Strategies, and Actions Related to Stormwater Runoff Management

4.5.7.1 SW-A. Stormwater Runoff Rates and Volumes

VBWD will continue to manage stormwater and snowmelt runoff rates on a regional or subwatershed basis throughout the VBWD. Specifically, VBWD will continue to require that future peak rates of runoff crossing community boundaries and/or leaving a development are below or equal to existing rates for critical duration events with return frequencies up to and including 100 years. In some cases it may be necessary for VBWD to allow a variance from this policy. The VBWD will require approval by the Board of Managers for projects that propose the diversion of surface water across established major watershed divides (see Figure 3-2).

Generally, the VBWD requires that the rate of stormwater runoff from a site not increase as a result of development; this is especially important for flows crossing municipal boundaries. When communities wish to manage stormwater runoff on a regional basis, the use of regional detention basins commonly results in stormwater runoff rates from individual developments that could be higher or lower than existing runoff rates, depending on the site. Therefore, to allow for regional management of stormwater runoff in local water management plans, VBWD will continue to require that the rate of stormwater runoff be held to existing rates at community boundaries. The allowable runoff rates will be determined at the time local plans are developed. For those communities without an approved local watershed management plan, the VBWD regulations will apply to individual development sites.

The VBWD adopted stormwater volume control requirements in December of 2013. The volume control requirements and process for determining flexible treatment options were derived from the MPCA's MIDS guidance. The VBWD Managers selected these standards with consideration for the following:

- water quality protection/stormwater quality treatment
- groundwater sustainability and protection
- streambank erosion protection
- wetland habitat protection

The VBWD drafted changes to its rules and regulations, and followed the requirements of Minnesota Statutes to make the changes to the VBWD rules and regulations. The VBWD extensively involved local units of government and other agencies in the rule-making process.

4.5.7.2 SW-B. Stormwater Runoff Quality

The VBWD requires that all stormwater discharges and related improvements do not degrade the water quality in VBWD waters. In the past, the VBWD rules required stormwater quality treatment ponds as the only form of stormwater treatment BMP. Although the VBWD's stormwater volume checklist (implemented in the 2005 VBWD plan) moved toward reducing stormwater volumes, the VBWD believed that stronger actions were required to improve the quality of stormwater runoff within the watershed. With that goal in mind, the VBWD enacted revised rules in 2013 with a stronger water quality treatment requirement; the VBWD requires infiltration practices where such activities do not threaten the water quality of groundwater resources.

Under the adopted 2013 rules, the VBWD will continue to require treatment of all stormwater runoff. VBWD will continue to require and encourage the implementation of stormwater management practices to achieve VBWD water quality goals for water bodies in the watershed. These practices include both structural and non-structural methods that reduce runoff rates and non-point nutrient and pollutant loadings.

The VBWD requires that developers consider the use of innovative stormwater management technologies where site conditions allow, and to reduce impervious areas in new developments and redevelopment wherever possible. The VBWD will continue its program to better encourage developers to implement these techniques. The VBWD will continue to implement its incentive program, including VBWD funding of the additional cost of constructing/implementing innovative stormwater management techniques versus traditional methods, VBWD funding of demonstration projects, and the VBWD grant program for funding of projects associated with new development and retrofit projects.

The VBWD will work with local government units to adopt/revise their land use ordinances to allow for runoff pollution prevention methods (e.g., narrower streets, smaller parking lots).

The VBWD will apply the stormwater management standards/requirements in Section SW-E to ensure that stormwater quality treatment is provided at the time of development and to avoid the future cost of retrofitting stormwater facilities to provide higher levels of treatment.

Through its permit program, the VBWD will continue to review proposed projects, developments and redevelopments to evaluate compliance with VBWD stormwater quality management standards. The VBWD rules and regulations provide more information about the VBWD permit program, including the types of projects that must be submitted for review, review procedures, submittal requirements, guidelines, design criteria, etc. Appendix A-4.5 contains the current VBWD rules and regulations.

The VBWD rules and regulations require public agencies to obtain a VBWD permit for work within the watershed. If state statutes change to supersede VBWD requirements, the VBWD will work with public agencies to manage their stormwater in a manner that will protect water resources and will meet the intent of the VBWD rules and regulations.

The VBWD will review local water management plans for compliance with this Plan's goals and policies regarding water quality.

4.5.7.3 SW-C. Operation and Maintenance of Stormwater BMPs

For stormwater runoff management facilities constructed by VBWD, the maintenance responsibility lies with VBWD. For existing facilities constructed by others, either the VBWD or the cities (e.g., Woodbury, Oakdale) or the Minnesota Department of Transportation (MnDOT) is responsible, based on agreements between the VBWD and the responsible party. In such instances, the VBWD will cooperate with the responsible party to develop a mutually-agreed upon maintenance plan.

For all new projects requiring a permit from VBWD, a maintenance agreement in the general format of VBWD Rules and Regulations – Appendix B will be required. The agreement must be revised, updated and approved by a VBWD attorney prior to permit issuance. A project can be exempt from the maintenance agreement requirement if the VBWD has an applicable memorandum of understanding from the city or township in which the site is located. For sites within MnDOT right-of-way, no maintenance agreement is required. It is the developers' or communities' responsibility to maintain all projects to provide the designed benefits until the permit is closed out by the VBWD. Project owners (and their respective successors) are responsible for vegetation management of all stormwater management facilities after the permit is closed by the VBWD. The VBWD will periodically evaluate its role in the ongoing maintenance of private stormwater management facilities after the permit has been closed.

4.5.7.4 SW-D. NPDES Phase II MS4 Requirements

The VBWD will continue to conform to the NPDES Phase II MS4 requirements (see Appendix B-4.5 for current VBWD Storm Water Pollution Prevention Program (SWPPP)) that apply to VBWD's stormwater system. The VBWD will update its MS4 SWPPP as necessary to incorporate requirements of future TMDLs or other permit requirements implemented by the MPCA.

4.5.7.5 SW-E. VBWD Permitting Program

The VBWD will continue to operate a permit program that regulates the use and development of land in the watershed – the VBWD Managers believe permitting is crucial to accomplishing the VBWD's goals. See Section 8: Local Water Management Plans for more discussion. The VBWD Rules and Regulations set forth the types of activities that require a VBWD permit. Activities that require a VBWD permit under the current VBWD Rules and Regulations are summarized as follows (for details, see General section of the Rules and Regulations document):

1. Land alterations, such as grading or filling (including redevelopment projects), which disturb, remove or cover surface vegetation or other surfaces of 1 acre or more.

2. All projects which create a new or fully-redeveloped impervious surface area of 6,000 square feet or more.

3. All work within the waters and 100-year floodplains of the VBWD.

4. All projects which result in a discharge of municipal or industrial water or wastewater to a surface water drainage system (open loop geothermal systems are prohibited).

5. All subdivisions, plats, developments, and lot line modifications.

6. All projects which result in lake, stream, wetland, or pond augmentation.

7. All projects which impact a wetland.

VBWD permits are currently not required for usual agricultural practices, although VBWD encourages good conservation measures.

The VBWD requires cities and project proposers to inform the VBWD of all water and wastewater discharges, including stormwater runoff, municipal and industrial wastewater discharges, lake augmentation, and discharges requiring a National Pollutant Discharge Elimination System (NPDES) permit. Additionally, all discharges must conform to the VBWD Plan and local water management plans, as well as meet the applicable requirements of State and Federal agencies, including Minnesota Rules 8410, MPCA stormwater permit requirements, and MDNR permit requirements.

Applicants proposing developments within the tributary watershed of Valley (Branch) Creek should note that the creek is designated as trout habitat by the MDNR. VBWD will work with the MDNR and the City of Afton and other appropriate entities to ensure that developments within this watershed maintain the unique in-stream values of the creek and do not impact the integrity of the fishery.

Transfer of VBWD Permitting Authority to Local Units of Government

If a local unit of government (city, township, or county) within VBWD wishes to assume the permitting authority for all land alteration activities (i.e. take over permitting authority from the

VBWD), the local unit of government must first prepare a local water management plan, obtain VBWD approval of the local plan, and then adopt and enforce stormwater management and erosion control ordinances. These ordinances must conform to the VBWD rules and regulations. If the VBWD revises its Rules and Regulations during the life of this Plan, then the local government unit must also revise their ordinances within one year of the VBWD's adoption of the revised rules if they wish to assume or continue permitting responsibilities.

The local unit of government assuming permit authority must also forward development and project plans and computations to VBWD that show compliance with the local plan and this VBWD Plan. No construction may begin until at least two weeks after VBWD receives this information. Section 8 provides additional information regarding requirements for local units of government that wish to assume permitting authority.

Permit Submittals, Requirements and Standards

VBWD will continue to require submittals for all improvements, developments, redevelopments and other projects within VBWD that require a VBWD permit. The submittals must accompany the permit application and must show how the project conforms to the requirements in this VBWD Plan and to the VBWD rules and regulations.

Permit submittals must be prepared by a registered professional engineer and incorporate best management practices (BMPs). The Minnesota Minimal Impact Design Standards (MIDS) guidance and Minnesota Stormwater Manual (MPCA, 2005, as amended) should be used as guides in selecting the appropriate practices and measures.

The VBWD permit submittal requirements are identified in Section 1 of the VBWD Rules and Regulations document and apply to all projects within the VBWD that require a VBWD permit. Elements of the permit submittal that are directly related to stormwater runoff management include the grading plan and hydrologic/hydraulic design exhibits. Details of the submittal requirements and exhibits are included in Section 1 of the Rules and Regulations, and include the submission of all hydrologic and hydraulic calculations and/or model results. Section 2 of the VBWD rules includes stormwater runoff management standards. These standards address required hydrologic/hydraulic analysis and design storms, peak runoff rates, and volume control (see Appendix A-4.5).

Appendix A-4.5 VBWD Rules and Regulations

Valley Branch Watershed District

Revised Rules and Regulations

December 2013

Valley Branch Watershed District
Revised Rules and Regulations
December 2013

Table of Contents

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List of Tables

List of Appendices

Forward

Introduction

This forward summarizes the reasoning behind the proposed Valley Branch Watershed District (VBWD) Rules and Regulations (Rules). The forward discusses

- the process for developing the Rules,
- the authority allowing VBWD to develop and adopt the Rules,
- the need for the Rules, and
- the justification for the Rules.

The organization of the Rules is also described.

These Rules are an update and revision from the VBWD's 2007 Rules. On November 10, 2005, the VBWD Board of Managers adopted the 2005-2015 *VBWD Watershed Management Plan* (Plan). The Plan called for the revision of the VBWD Rules to incorporate volume control standards, revise the wetland regulations, and update the Rules in general.

On August 30, 2013, the VBWD Managers sent the proposed Rules to the Minnesota Board of Water and Soil Resources and all public transportation authorities that have jurisdiction within the VBWD, as required in Minnesota Statute 103D.341, Subd. 2. In addition, the proposed Rules were sent to various stakeholders, including all cities and townships that lie wholly or partially within the VBWD. The VBWD requested comments by October 21, 2013.

As required in Minnesota Statute 103D.341, Subd. 2, the VBWD Managers published notice of a public hearing on the proposed rules. The public hearing was held on December 12, 2013, at 8:00 p.m. After the public hearing and later that evening, the VBWD Managers adopted these rules.

These rules will be published in the VBWD's legal newspapers. The Managers will provide written notice of adopted or amended rules to public transportation authorities that have jurisdiction within the watershed district. The Managers will also file these adopted rules with the county recorder of each county affected by the watershed district and the Minnesota Board of Water and Soil Resources.

Authority

State law (Minnesota Statutes 103B and 103D and Minnesota Rules 8410) requires watershed districts to prepare and adopt watershed management plans. These plans must be the basis for watershed district Rules. Minnesota Statutes (103D, 103B, and 103G) and Minnesota Rules (8410 and 8420) give watershed districts the authority to develop and implement rules and regulations. The VBWD's authority to adopt these Rules allows it to establish standards, requirements, and procedures for the review and approval or disapproval of activities within its mandated authority.

Need

The lakes, ponds, streams, wetlands, and groundwater in the VBWD are important assets. These resources supply recreational and aesthetic benefits, enhance property values, serve as sources for groundwater recharge and drinking water, provide nutrient removal, and provide wildlife habitat and fishery resources. The high quality of the VBWD's natural resources makes it an attractive place for people to live. If water quality becomes degraded, a water resource will lose its value. If water quality is not maintained, it is not just the environment that will suffer, but the commercial and recreational value of our water resources will diminish and public health may be compromised. Preserving the high quality of the VBWD's natural resources is critical to the existence of a high quality of life among the citizens residing in the watershed and in the larger metropolitan region.

The quality of lakes, ponds, streams, wetlands, and groundwater are closely linked to the surrounding environment and land use. The quality of these water resources is dependent on the watershed's hydrology and the physical conditions of the resource. Hydrology is dependent on the weather, the topography of the landscape, the soils, the land cover, and other factors. Changes to any of these factors will influence the water quality of a water resource. While some of the factors are difficult to control, changes to land cover can be regulated.

To accomplish the VBWD goals of protecting water resources and preventing negative consequences, the VBWD will manage stormwater runoff, erosion and sedimentation, wetlands and vegetative buffers through enforcing these Rules.

Justification

The quality and quantity of water in a water body is greatly influenced by stormwater runoff. Stormwater runoff carries pollutants that cause adverse environmental impacts to the VBWD's water resources. As development in the VBWD increases, more and more land will be converted into impervious surfaces, such as buildings/rooftops, driveways, sidewalks, roads, and parking lots. These surfaces cannot absorb stormwater (cannot infiltrate), which means that as runoff flows over these surfaces; it picks up pollutants and gains speed and volume. When compared to land with less impervious surfaces, these stormwater flows contain more pollutants, are a higher temperature, move at a faster rate, and contain more volume. The downstream impacts of such flows include water quality degradation, increased erosion and sedimentation, increased flooding, wetland habitat degradation, and negative groundwater effects.

Human activities (especially construction and the removal of vegetation) often accelerate the natural process of erosion and sedimentation. For example, when a construction site is cleared and graded, stormwater runoff rates and volumes increase because there is less infiltration, less interception, fewer natural depressions, and compacted soil. This results in increased erosion, sedimentation, and decreased infiltration. Increased soil erosion releases significant amounts of sediment that may enter receiving lakes, streams, ponds, and wetlands. Sediment deposition decreases water depth, degrades water quality, smothers fish and wildlife habitat, and degrades aesthetics. Sedimentation can also cause flooding when it blocks portions of the stormwater system. Suspended sediment clouds water resources and disturbs aquatic habitats.

Sediment is also a major source of phosphorus. Scientific studies show that phosphorus is usually the nutrient that limits algal growth in freshwaters. Reducing phosphorus in a lake, therefore, is required

to reduce algal abundance and improve water transparency. Failure to reduce phosphorus concentrations will allow the water body to degrade at an unnatural, accelerated rate.

Human activities can affect the amount of water in water bodies. When too much water enters lakes, ponds, wetlands, and streams, they exceed their storage or conveyance capacity and flood. Flooding has the potential for causing severe damage and great property loss. Past and potential future impacts of flooding in the watershed include damage to structures, utilities and transportation facilities, flood fighting costs, post-flood cleanup costs, business losses, increased expenses for normal operating and living during a flood situation, and benefits paid to owners of flood insurance. Other losses that could be suffered during flooding include a loss of life, disruption of normal activities, potential health hazards from contaminated water supplies, dislodged fuel storage tanks, and flooding of wastewater collection and treatment facilities. Without controls, increased urbanization of a watershed will cause average annual flood damages to increase.

Conversely, a lack of water can have negative effects on water resources. Maintaining an adequate amount of water is important for human enjoyment of the water resources, and for maintaining wildlife habitat and fishery resources.

Human activities can negatively impact wetlands. Excavation, filling, and activities that change the hydrology and the quality of the stormwater flowing into the wetlands can destroy the wetland functions and values. Wetlands come in many different shapes, sizes, and types, and perform a variety of physical, chemical, and ecological functions. A healthy watershed is one in which wetlands are an integral part of the ecosystem.

Groundwater quality and quantity is closely linked to the surface environment. Because most VBWD residents obtain their drinking water from groundwater, it is especially important to ensure that these aquifers are uncontaminated, protected from future contamination and provide adequate supplies. Several VBWD water bodies are groundwater-dependent and need an adequate supply of clean groundwater to maintain water levels and sustain their natural habitats. Maintaining a clean, safe groundwater supply is critical to human and environmental health and to the economic and social vitality of our communities. Groundwater can be contaminated by a number of human activities. When groundwater contamination occurs, water suppliers (public and private) experience added financial and social costs to manage the affected water supply.

Organization

These Rules and Regulations are split into 13 Rules. In general, they follow the suggested format of Washington County's 2003 report, "Comparative Review of Watershed District Rules and Recommendations for Standardization." However, some Rules were grouped together because the VBWD policies and standards are too inter-related to separate. In other cases, VBWD does not have a specific policy or standard for a topic listed in the Washington County report; therefore, VBWD has no rule on that topic.

Purposes

Policies

1. To implement the purposes for which the Valley Branch Watershed District (VBWD) was created.

2. To carry out the vision and mission contained in the VBWD *Watershed Management Plan* (Plan), which are

   VBWD Vision:
   Always be careful stewards of the water resources within our watershed boundaries.

   VBWD Mission:
   To manage and protect our water resources: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by:

   A. Promoting open communication with our constituents, both our citizen base and pertinent governmental units.

   B. Improving and protecting the quality of water for all water bodies within the VBWD.

   C. Managing the quantity of water and minimizing the negative impact on the VBWD from floods, high flows, and droughts by providing public works projects and other prudent measures.

   D. Understanding the effects of community growth and other activities on groundwater, initially focusing on the groundwater-surface water interface.

   E. Continuing to enforce the Wetland Conservation Act requirements as the responsible local unit of government[1].

   F. Educating our constituents and the local units of government within the VBWD on water quality and quantity issues, management, and means of improvement.

3. To carry out the policies contained in the VBWD Plan.

4. To coordinate the VBWD's activities with other governmental agencies.

5. To ensure that the water resources are considered, protected and preserved within the VBWD.

[1] The Local Government Unit (LGU) on state land is the agency with administrative responsibility for the land.

6. To ensure that future regional water management needs are considered in the development of individual subdivisions and other developments and local water management plans.

7. To protect the public health, safety and welfare.

Purpose of Standards

1. To aid the Managers in their review process.

2. To provide the Managers' staff with the criteria to be used for their reviews and recommendations.

3. To inform permit applicants of the criteria against which their proposed developments will be reviewed.

4. To provide the communities with guidelines for the development of local water management plans.

Application

1. General activities that require a VBWD permit:

   A. Land alterations, such as grading or filling (including re-development projects), which disturb, remove or cover surface vegetation or other surfaces of 1 acre or more;

   B. All projects which create a new and/or fully-reconstructed impervious surface area of 6,000 square feet or more,

      Notes:

      i. Pavement, utility, and other projects that alter 6,000 square feet or more of the underlying soils (e.g., soils under a road's sand or gravel base, soils under a building's foundation, etc.) require a VBWD permit and conformance to Rule 2.

      ii. Pavement milling and overlay projects and pavement rehabilitation projects not altering the underlying soils (i.e., soils under the pavement's sand or gravel base) do not require a VBWD permit.

      iii. Bridges that create 6,000 square feet or more of impervious surface require a permit. Bride re-decking projects where no other ground is disturbed and the project does not involve another activity requiring a VBWD permit are exempt for needing a VBWD permit. Bridges and bridge replacements creating less than 6,000 square feet of impervious surface require a permit if the project involves another activity requiring a VBWD permit.

   C. All work within the waters and floodplain of the VBWD;

D. All projects which result in a discharge of municipal or industrial water or wastewater to a surface water drainage system;

Note:

Open loop geothermal systems are prohibited.

E. All subdivisions, plats, developments, and lot line modifications;

F. All projects which result in lake, stream, wetland, or pond augmentation; and

G. All projects which impact a wetland.

Note:

Valley Branch Watershed District is the Local Governmental Unit (LGU) responsible for administering the Wetland Conservation Act (WCA) within the VBWD, except the LGU responsible for administering the WCA on state land is the agency with responsibility for the land.

General Policies

1. To implement the purposes of these Rules and Regulations, the Managers intend to do the following:

   A. Assist municipal officials in the preparation of local watershed management plans and land development guides.

   B. Review permit applications and required supporting documents for activities listed within these Rules and for permit applications filed with the Minnesota Department of Natural Resources pursuant to Minnesota Statutes Chapter 103G. The Managers desire to become informed of improvements and land development proposals during the early planning stages. It is the intent of the Managers that the communities be the primary vehicles for directing developers to submit proposed improvement plans to the VBWD. The VBWD will review proposed improvements when the appropriate community is aware of the improvement proposal.

   C. Exercise control over proposed developments only to the extent necessary to protect the waters of the VBWD from unreasonable impacts which are inconsistent with the policies contained in the Plan and these Rules.

   D. Submit to the communities the VBWD comments, recommendations, requirements, and all VBWD actions regarding proposed improvements. All VBWD requirements shall be included in the community permits.

   E. Coordinate the VBWD review with the communities and, when appropriate, with Counties, Minnesota Department of Natural Resources, Minnesota Pollution Control Agency, and other appropriate local, State, and Federal agencies.

2. All permits issued by the VBWD shall remain valid unless: (1) the work is not initiated within one year of permit issuance, (2) work is idle for 12 consecutive months, or (3) work is not completed within 3 years of permit issuance date.

Key Definitions and Acronyms

For the purposes of these Rules, the following words have the meanings set forth below. References in these Rules to specific sections of the Minnesota Statutes include any amendments, revisions, or recodification of those sections.

Agricultural activity – the use of land for the production of agronomic, horticultural, or silvicultural crops, including nursery stock, sod, fruits, vegetables, flowers, forages, cover crops, grains, and Christmas trees. Agricultural activity also includes grazing.

Bank Application Form – a wetland bank application form available from the Minnesota Board of Water and Soil Resources (BWSR).

Best management practices (BMPs) – measures taken to minimize the negative effects on the environment. BMP guidance is documented in Protecting Water Quality in Urban Areas (MPCA, 2000), Metropolitan Council Urban Small Sites Best Management Practices Guidebook (Metropolitan Council & Barr Engineering Company, 2001) and Minnesota Stormwater Manual (MPCA, 2005).

Blow counts – the number of blows per foot of a standard penetration resistance test, as described in American Society for Testing of Materials (ASTM) D1586.

Board of Managers or Managers – the Board of Managers of the Valley Branch Watershed District.

Bridge -- the portion of a road, highway, utility, or associated structure that crosses the bed or bank of waters.

BWSR – Minnesota Board of Water and Soil Resources.

Closed Loop Geothermal Systems – a system that circulates a fluid for heat-transfer through pipes or coils buried beneath the land surface and does not discharge the fluid after circulating the fluid through the pipes or coils.

Complete Permit Application – a complete and signed VBWD permit application form; the VBWD permit fee; a Runoff Water Management Plan showing the features and information required by the Watershed Management Plan and these Rules; computations, agreements and documentation required by these Rules; a wetland delineation report or documentation prepared by a wetland scientist indicating there is no wetland on the site; all necessary wetland forms and information; and an erosion control plan.

CWPA – Combined Wetland Permit Application

Criteria – specific details, methods and specifications that apply to all permits and reviews and that guide implementation of the VBWD's goals and policies.

Day or Days – working days when used in a time period of 15 days or less and calendar days when used in a time period greater than 15 days. The day of the event shall not be used in counting any time period.

Development - any proposal to subdivide land, any land disturbing activity, redevelopment affecting land, or creation of impervious surface including, but not limited to, road construction or reconstruction or improvement and construction or reconstruction of stormwater conveyance systems.

Developed Site – see Ultimate Development.

Drainage System – those features of the watershed such as lakes, ponds, streams, and waterways which contain and convey waters of the VBWD.

Drainageway or waterway – any natural or artificial channel which provides a course for water flowing either continuously or intermittently.

DNR – Minnesota Department of Natural Resources.

Excavation – the displacement or removal of soil or other material.

Existing Conditions – current conditions of the site.

Feasible – technically achievable at a cost, in the VBWD's determination, not substantially disproportionate to the stormwater management benefit to be gained.

Floodplain – the area adjoining a watercourse, or natural or constructed water basin, including the area around lakes, wetlands, stormwater ponds, lowlands, and intermittent and perennial streams that is inundated by the 100-year 24-hour rainfall event, the 10-day 100-year snowmelt event, or as calculated using the VBWD's simplified method for landlocked basins. See Rule 5.

Flowage Easement – an easement held in public ownership to reserve areas along waterways and around storage sites and around or along other parts of the drainage systems for the passage or retention of waters, construction of drainage improvements, and maintenance.

Fully Reconstructed Impervious Surface – areas where impervious surfaces have been removed down to the underlying soils. Activities such as structure renovation, mill and overlay projects, and pavement rehabilitation projects that do not alter underlying soil material beneath the structure, pavement, or activity are not considered fully reconstructed impervious surfaces. In addition, other maintenance activities such as catch basin and pipe replacements shall not be considered fully reconstructed impervious surfaces. Reusing an existing building foundation and re-roofing of an existing building are not considered fully reconstructed.

Hydrologic Soil Group – a term used in soil surveys that refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of bare soil to permit infiltration. The slope and the kind of plant cover are not considered, but are separate factors used in predicting runoff. Soils are assigned to four groups (Groups A, B, C, and D). Group A soils have a high infiltration rate when thoroughly wet and have a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. Group D soils, at the other extreme, have a very slow

infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained. See the Soil Survey of Washington and Ramsey Counties.

Impervious surface – a surface that has been compacted or covered with a layer of non-porous material (including buildings/structures), or is likely to become compacted from expected use, so that it is highly resistant to infiltration by water. Compacted aggregate roads and road shoulders are impervious surfaces.

Kelle's Coulee Watershed – all land that ultimately drains to Kelle's Coulee (sometimes called Kelle's Creek); including areas that are typically landlocked, but would overflow to Kelle's Coulee.

Lake Edith Watershed – all land that ultimately drains to Lake Edith, including areas that are typically landlocked, but would overflow to Lake Edith.

LGU – Local Government Unit

Local Watershed Management Plan – a comprehensive local water management plan pursuant to Minnesota Statutes, sections 103B.235.

Lot – a parcel of land designated by plat, metes and bounds, registered land survey, auditors plot, or other accepted means and separated from other parcels or portions by the description for the purpose of sale, lease or separation.

Lot Line – property line bounding a lot, except that where any portion of a lot extends into a public right-of-way or a proposed public right-of-way, the line of the public right-of-way shall be the lot line.

Minimum Building Elevation – the elevation of the lowest floor of the building.

MNRAM 3.0 – Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.0 (MNRAM 3.0) or updated versions.

MPCA – Minnesota Pollution Control Agency.

Municipality – any city or township wholly or partly within the Valley Branch Watershed District.

Normal Water Elevation – the long-term average water level.

Notice of Decision – Notice of Wetland Conservation Act decision, a completed form provided by BWSR or similar.

NPDES – National Pollutant Discharge Elimination System, a federal stormwater regulation program administered by the MPCA.

NPDES Construction Stormwater Permit – a permit program administered by the MPCA (incorporates by reference Minnesota Rules 7090.0060), which is officially called General Permit Authorization To Discharge Storm Water Associated With Construction Activity Under The National Pollutant Discharge Elimination System/State Disposal System Permit Program.

Open Loop Geothermal System – a system that circulates a fluid for heat-transfer through pipes or coils buried beneath the land surface and discharges the fluid, often over land or to a lake, wetland, ditch, or stream, after circulating the fluid through the pipes or coils.

Ordinary High Water level (OHW) – an elevation associated with a water body determined by the DNR, and used to determine DNR jurisdiction. In general, it is the elevation delineating the highest water level which has been maintained for a sufficient period of time to leave evidence upon the landscape. The ordinary high water level is commonly that point where the natural vegetation changes from predominantly aquatic to predominantly terrestrial. For watercourses, the OHW is typically the elevation of the top of bank of the channel. The OHW does not correlate to a 100-year, 50-year, 10-year, or any other flood level.

Parcel – any area of land capable of being described with such definiteness that its location and boundaries may be established.

Person – an individual, firm, partnership, association, corporation, limited liability company, municipal corporation, city, village, county, town, school district, state agency, or other political subdivision of the State of Minnesota.

Plan – VBWD's 2005-2015 *Watershed Management Plan* (Plan) or as amended, revised, updated, replaced, or superseded.

Plats – maps of a subdivision showing the location and boundaries of individual parcels of land subdivided into lots, with streets, easements, etc., drawn to a scale.

Proposed Conditions – see Ultimate Conditions.

Public health, safety, and welfare – extends to and includes any act or thing tending to improve or benefit or in any way affect the general public either as a whole or as to a particular community or part thereof. This definition is to be construed liberally to give meaning and effect to the goals and purposes of the Valley Branch Watershed District and also statutes and ordinances relating to floodplain management and shoreland use.

Rate of Runoff – the amount of runoff per unit of time for a given storm event, often expressed as cubic feet per second (cfs).

Reconstruction – the rebuilding, repair or alteration of a structure, surface, or facility.

Rules – the Rules and Regulations of the Valley Branch Watershed District.

Runoff – the amount of excess precipitation or snowmelt that is not permanently stored in depressional areas or infiltrated into the soil.

SCS – Soil Conservation Service, now called the Natural Resource Conservation Service (NRCS).

SDS – State Disposal System.

Sequencing – the process of demonstrating that a proposed wetland activity will comply with the principles of the Wetland Conservation Act. The process is called sequencing because there is a specific order of priorities in the Wetland Conservation Act. See Minnesota Rules 8420.0520.

Standards – a preferred or desired level of quantity, quality, or value.

Storage site – an area which is reserved for holding water.

Stream – perennial (streams that flow throughout the year, such as portions of Valley Creek) and intermittent streams (streams that flow during/after a snowmelt or rain event). Longer intermittent streams are identified in Section 4.3.5 of the 2005-2015 VBWD *Watershed Management Plan*.

Structure – anything that is constructed or placed on the ground and that is intended to remain for longer than a brief, temporary period of time.

Subdivision, subdivide – the separation of an area, parcel, or tract of land under single ownership into two or more parcels, tracts, lots.

Surface Water Drainage System – those natural or artificial features of the watershed such as lakes, ponds, wetlands, streams, waterways, and storage sites which contain and convey and/or manage waters of the VBWD.

Swede Hill Creek Watershed – all land that ultimately drains to the St. Croix River, including areas that are typically landlocked, and is within the City of Afton and Valley Branch Watershed District that is not within the Valley Creek, Lake Edith, or Kelle's Coulee watersheds.

TEP – Technical Evaluation Panel.

Ultimate Development – the level of development as proposed in a permit application and/or the future development as proposed in a city, township, or county comprehensive land use plan.

Valley Creek Watershed – all land that ultimately drains to Valley Creek, including areas that are typically landlocked, but would overflow to Valley Creek.

VBWD – Valley Branch Watershed District

Vegetative Buffers - zones of undisturbed vegetation, preferably native vegetation, adjacent to lakes, streams, and wetlands.

Volume of runoff – the amount of stormwater runoff in cubic units, often noted as acre-feet.

Watercourse - a channel that has definable beds and banks capable of conducting confined runoff from adjacent land.

Waters – a watercourse or a natural or constructed water basin, including the area around lakes, wetlands, stormwater ponds, lowlands, and intermittent and perennial streams

Watershed – an area bounded peripherally by a drainage divide, which collects precipitation and contributes runoff to a particular drainage system.

Watershed Management Plan (Plan) – the VBWD's 2005-2015 *Watershed Management Plan* or as amended, revised, updated, replaced or superseded.

WCA – Wetland Conservation Act.

WCA Rules – Minnesota Board of Water and Soil Resources (BWSR) Minnesota Rules Chapter 8420, as amended.

Wetland – any area identified as a wetland under Minnesota Statutes section 103G.005, subdivision 19.

Wetland Conservation Act – The Minnesota Wetland Conservation Act of 1991, (Minnesota Laws 1991, chapter 354, and subsequent amendments).

Wetland Functions – a process or series of processes that take place within a wetland. These include the storage of water, transformation of nutrients, growth of living matter, and diversity of wetland plants, and they have value for the wetland itself, for surrounding ecosystems, and for people. Functions are typically grouped broadly as habitat, hydrologic, or water quality.

Wetland Impact – a measurable or predictable change to the wetland's size, quality, or biological diversity.

Wetland Replacement Plan – A plan conforming to Minnesota Rules 8420 for replacing wetland values where avoidance of activity is not feasible and prudent.

Wetland Values - the benefits wetland functions provide to people.

Required Submittals and Exhibits

The VBWD requires submittals for all projects within the VBWD that require a VBWD permit. The submittals must accompany the permit application and must show how the project conforms to the requirements in these Rules and Regulations and the VBWD Watershed Management Plan. **Electronic submittal of all documents and models is strongly encouraged.**

The following submittals and exhibits must be submitted for all projects within the VBWD that require a VBWD permit:

1. **A completed and signed permit application form.**
2. **Evidence of ownership for the project site.**
3. **The required permit application fee (see Rule 11).**
4. **Grading Plan/Mapping Exhibits:**

   Electronic copies of the plans should be submitted. If electronic copies are not submitted, one 11-inch by 17-inch copy (and two full-sized copies if originals are larger than 11 inches by 17 inches) of the plans shall be submitted. The plans shall be prepared by a registered professional engineer and shall include the following:

   A. Property lines and delineation of lands under ownership of the applicant.

   B. Delineation of the subwatersheds contributing runoff from off-site, proposed and existing on-site subwatersheds, and flow directions/patterns.

   C. Location, alignment, and elevation of proposed and existing stormwater facilities.

   D. Delineation of existing on-site wetlands, shoreland and/or floodplain areas (including any buffers).

   E. Existing and proposed normal water elevations and the critical (the highest) water level produced from the 100-year 24-hour storms, the 100-year 10-day snowmelt event, or the VBWD simplified method for landlocked basins or an approved alternative for all on-site wetlands, ponds, depressions, lakes, streams and creeks (see Rule 5).

   F. Ordinary High Water (OHW) elevations and datum, as determined by the DNR (if applicable).

   G. Existing and proposed site contour elevations related to NAVD 1988 datum (preferred) or NGVD, 1929. Datum must be noted on exhibits.

   H. Drainage easements covering land adjacent to ponding areas, wetlands, and waterways up to their 100-year flood levels and covering all ditches and storm

sewers. Access easements to these drainage easements and to other stormwater management facilities shall also be shown.

I. Minimum building elevation for each lot.

J. Identification of downstream water body.

5. Hydrologic/Hydraulic Design Exhibits:

Electronic files of the following shall be submitted. If an electronic copy is not submitted, one paper copy shall be submitted. The calculations shall be prepared by a registered professional engineer.

A. All hydrologic and hydraulic computations completed to design the proposed stormwater management facilities shall be submitted. Model summaries must be submitted. The summaries shall include a map that corresponds to the drainage areas in the model and all other information used to develop the model.

B. A table (or tables) must be submitted showing the following:

i. A listing of all points where runoff leaves the site and the existing and proposed stormwater runoff rates and volumes.

ii. A listing of the normal water levels under existing and proposed conditions and the water levels produced from the storm and runoff events listed above for all on-site wetlands, ponds, depressions, lakes, streams, and creeks.

C. A completed VBWD stormwater volume reduction checklist (see Rule 2 and Appendix A).

6. Erosion Control and Sedimentation Prevention Exhibits (see Rule 3):

A. Electronic copies shall be submitted. If electronic copies cannot be submitted, one 11-inch by 17-inch copy (and two full-sized plans if originals are larger than 11-inches by 17-inches) which show how waterborne sediment will be prevented from leaving the site during and after construction to prevent sedimentation of downstream water bodies. The plans shall include a construction sequencing schedule.

B. A copy of the Stormwater Pollution Prevention Plan (SWPPP), prepared by a qualified individual, which conforms to the MPCA's NPDES Construction Stormwater Permit requirements. The NPDES permit requirements cover both temporary and permanent erosion prevention and sediment control measures, and apply to all construction projects that disturb one or more acres of land. The SWPPP must conform to the special requirements for "Special Waters" (Valley Creek and the St. Croix River), when applicable. The SWPPP shall also show how erosion will be prevented during construction on individual building sites. Any applicable local standards shall be incorporated into the plan.

7. **Construction plans for all proposed stormwater management facilities.** Construction specifications must be provided upon request.

8. **A maintenance agreement in the format of Appendix B,** as revised and updated by the VBWD Attorney.

9. **Four copies of the Wetland Delineation Report**, which also must include a summary of the MnRAM evaluation (Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.0 or updated versions), and classification determination according to VBWD's wetland management classification system (see Rule 4).

10. **Five copies of Part 1 of the Combined Wetland Permit Application (CWPA)** for all projects proposing to alter wetlands, which may not require wetland replacement (see Rule 4).

11. **Five copies of the Wetland Replacement Plan, including Parts 1 and 2 of the CWPA**, for all projects requiring wetland replacement (see Rule 4).

12. **Draft Declaration of Covenants** that lists the VBWD-required minimum floor elevations.

13. **Other exhibits required by or to show conformance to these Rules and Regulations.**

Permit Application Process

1. The VBWD Engineer must receive from the applicant a complete permit application, all necessary supporting documents, and the permit application fee 14 calendar days prior to a meeting at which application is to be considered. Supporting documentation must include the deed of ownership for the project site. If the permit applicant does not yet own the property, a preliminary VBWD permit can issued, but will not be effective until the VBWD receives the proof that the permit applicant owns the property.

2. The VBWD Engineer will review each permit request with respect to VBWD policies and criteria.

3. The VBWD Engineer will notify the applicant concerning

    A. Applicable VBWD criteria and policies.

    B. Additional required information where necessary with copies to the appropriate community and other concerned agencies

4. The VBWD Engineer will place the development proposal on the agenda when all the required information is received and all VBWD policies are met or a variance is requested and supporting written documentation is submitted. The Engineer will then submit a written report to the Managers at least two (2) days prior to the Managers meeting.

5. The issuance or denial of a permit shall be based on the policies contained in the Watershed Management Plan and these Rules and Regulations.

6. The Managers will act on a complete permit application within 60 days of receipt or as required by the Rules of the Wetland Conservation Act.

7. The granting of a VBWD permit in no way purports to permit acts which may be prohibited by other governmental agencies.

8. The required surety (see Rule 14) must be submitted prior to the commencement of any permitted activities.

Enforcement and Severability

1. The VBWD may exercise all powers conferred upon it by Minnesota Statutes, Chapter 103, in enforcing these Rules and Regulations.

2. If for any reason a section or subdivision of these Rules and Regulations should be held invalid, such decision shall not affect the validity of the remaining Rules and Regulations.

3. These Rules and Regulations shall conform to Minnesota law and if inconsistent therewith, the latter shall govern and these Rules and Regulations are amended accordingly.

Appellate Procedure and Review

1. Any person aggrieved by enforcement of these Rules and Regulations or by any Order of the VBWD may appeal there from in accordance with the appellate procedure and review as provided in Minnesota Statutes Chapter 103D.

Amendment Procedure

1. Any person may petition the Managers for the purpose of amending or changing these Rules and Regulations.

2. The Managers may initiate changes or amendments to these Rules and Regulations.

3. All changes and amendments to these Rules and Regulations, whether initiated by the Managers or by any other person, will require a majority vote of the Managers.

Permit Close-Out

1. The Managers will certify completion of a permitted project or element of the project and authorize the release of any required security upon inspection and submittal of information verifying completion of that project or an element of that project in accordance with the approved plans and conditions of the permit. For consideration of permit close-out or a reduction in the security amount, the permit holder must at least 14 calendar days prior to a meeting at which completion is to be considered, provide proof that all required documents have been recorded (including but not limited to easements) and must provide as-built drawings. For consideration of completion of an element of a project (partial completion), the permit holder must provide documented proof that all components of the completed project are built according to the approved plan, which may include recording of documents (including but not limited to easements) and as-built drawings.

The as-built drawings must include:

A. the surveyed bottom elevations, water levels, and general topography of all basins;

B. the size, type, and surveyed invert elevations of all pond outlets;

C. the surveyed elevations of all pond, street, and other emergency overflows;

D. other important features to show that the project was constructed as approved by the Managers and protects the public health, welfare, and safety.

E. the surveyed minimum floor elevations and low building opening elevations of constructed structures;

F. the required minimum floor elevations for all lots and un-built structures; and

G. the locations and elevations of septic systems, if they have been constructed.

2. All surveys must be certified by a Minnesota registered land surveyor.

3. The permit holder must provide documentation that constructed infiltration facilities perform as designed. Methods to document infiltration performance must be approved by the VBWD Engineer prior to documentation. Available options for documentation include:

A. Time and date-stamped photographs showing that the infiltration basin drains dry within 48 hours (or 24 hours, if required) after a natural precipitation event approximately equivalent to the design storm.

B. Time and date-stamped photographs showing that the infiltration basin drains dry within 48 hours (or 24 hours, if required) after the basin is filled with water from municipal water supply, water trucks, or stormwater ponds.

C. Double-ring infiltrometer tests or other field tests approved by the VBWD Engineer.

4. The Managers will not release the permit holder's remaining fee and performance bond or other security until all of information is submitted, all temporary erosion prevention and sediment controls (such as silt fence) are removed, and stormwater ponds and pipes are free of sediment. No activity will be certified as complete if there are any unpaid fees or other outstanding permit violations.

Rule 2: Stormwater Management

Policies

1. To carry out the responsibility of managing the VBWD's water resources and to implement the goals and policies of the VBWD Plan, the Managers must be informed of all water and wastewater discharges within the VBWD. This includes stormwater runoff, municipal and industrial wastewater discharges, lake augmentation, and any discharge that requires a National Pollutant Discharge Elimination Program (NPDES) permit.

2. All discharges and related improvements must conform to the applicable requirements of State and Federal agencies including, but not limited to, Minnesota Rules Chapter 8410, MPCA stormwater permit requirements, and DNR permit requirements.

3. All stormwater discharges must be in general conformance with the VBWD Plan and local watershed management plans.

4. All discharges and related improvements, including those from municipal or industrial water or wastewater or utilities or soil or groundwater remedial actions, shall not unreasonably raise water levels or degrade the water quality of the waters of the VBWD.

5. Discharges from open-loop and closed-loop geothermal systems to the land or surface waters of VBWD are prohibited. Therefore, open-loop geothermal systems are prohibited.

6. **Rate Control:** Stormwater and snowmelt runoff rates will be managed so that future peak rates of runoff crossing community boundaries and/or leaving a development are below or equal to existing rates.

7. **Volume Control:** Stormwater volume will be controlled so that surface water and groundwater quantity and quality are protected.

8. **Water Quality:**

   A. All stormwater runoff will be treated at the time of development.

   B. Developers are encouraged to try new and innovative stormwater management techniques.

   C. The VBWD will work with local government units to adopt/revise ordinances to allow for runoff pollution prevention methods (e.g., narrower streets, smaller parking lots).

   D. Projects and development plans will be reviewed to evaluate compliance with VBWD standards.

   E. Other public agencies will be required to conform to VBWD stormwater quality requirements.

F. Local watershed management plans will be reviewed for compliance with the VBWD Plan.

9. Submittals will be required for VBWD-permitted projects that must show how the project will meet VBWD requirements for stormwater quality treatment, stormwater rate and volume management, and erosion control.

Standards

1. Any permitted activity shall meet the management policies, standards, and criteria set forth in the VBWD Plan.

2. The permit applicant must comply with the requirements of the NPDES Construction Stormwater Permit. For trout streams (projects within the Lake Edith and Valley Creek watersheds), these requirements include temperature control measures ranging from minimizing impervious surfaces (most preferred) to special pond designs.

3. The permit applicant shall complete analyses of stormwater runoff volumes and rates, and flood levels for existing and proposed conditions. Analyses must include the 2-year, 10-year, and 100-year 24-hour storms with VBWD-approved time distribution; the 100-year 10-day snowmelt event; and the VBWD simplified method for landlocked basins (or an approved alternative). Section 4.5 of the VBWD Plan and Rule 5 provide more information about the VBWD simplified method and floodplain management requirements for permit review in general.

4. The following computer programs will be accepted: HydroCAD, XP-SWMM, MIDS Calculator, and TR 20. Other programs may be accepted, but the permit applicant must inquire prior to submitting the computations. Reservoir routing procedures and critical duration runoff events shall be used for design of detention basins and outlets.

5. The peak rate of stormwater runoff from the developed site shall not exceed the existing peak rate of runoff for all critical duration events, up to and including the 100-year return frequency storm event for all points where discharges leave a site during all phases of development. Design criteria shall be the 2-, 10-, and 100-year 24-hour storms with respective 2.8, 4.2, and 7.3-inch rainfall depths with VBWD-approved time distribution and the 7.2-inch 100-year 10-day snowmelt event. The runoff curve number for existing agriculture areas shall be less than or equal to the developed condition curve number. If storm sewer systems are designed for an event less than a 100-year event, the plans and computer modeling analyses must include secondary overflows for events exceeding the storm sewer systems level-of-service up through the critical 100-year event.

6. The stormwater runoff volume must be controlled. The VBWD design standards for controlling stormwater runoff volumes are the following:

A. **New, Nonlinear Developments:** For new, nonlinear developments that create 6,000 square feet or more of new impervious surface on sites without restrictions, stormwater runoff volumes will be controlled and the post-construction runoff volume shall be retained on site for 1.1 inches of runoff from impervious

surfaces. In other words, the volume retained shall be 1.1 inches times the impervious surface without any abstractions/losses.

B. **Reconstruction/Redevelopment Projects:** Nonlinear redevelopment projects on site without restrictions that create 6,000 square feet or more of new and/or fully reconstructed impervious surfaces shall capture and retain on site 1.1 inches of runoff from the new and/or fully reconstructed impervious surfaces.

C. **Linear Projects:** For linear projects (roadways, sidewalks, and trails) without restrictions and not part of another development that create 6,000 square feet or more of new and/or fully reconstructed impervious surfaces, shall capture and retain the larger of the following:

- 0.55 inches of runoff from the new and fully reconstructed impervious surfaces
- 1.1 inches of runoff from the net increase in impervious area

D. **Sites with Restrictions:** If a site has restrictions where infiltration is not feasible or advised, such as karst topography, very fast or very slow infiltrating soils, shallow bedrock, a shallow confining layer/rough terrain, shallow groundwater, Drinking Water Management Supply Areas, and/or potential stormwater hotspots, as determined by the applicant and agreed upon by the VBWD or as determined by the VBWD, the applicant must follow these flexible treatment options, as summarized in the design sequence flow chart in Appendix C.

i. Project must first attempt to design the site to achieve retention of at least 0.55 inches of runoff from the proposed impervious surfaces and remove 75% of the annual total phosphorus load leaving all points on the site. Options considered and presented shall examine the merits of relocating project elements to address varying soil conditions and other constraints across the site.

ii. If the project cannot achieve the standards listed in Standard 6Di above, the project shall achieve volume reduction to the maximum extent practicable and remove 75% of the annual total phosphorus load leaving all points on the site. Options considered and presented shall examine the merits of relocating project elements to address varying soil conditions and other constraints across the site.

iii. If the project cannot achieve the standards listed in Standard 6Dii above, the project shall achieve volume reduction to the maximum extent practicable and remove 60% of the annual total phosphorus load leaving all points on the site. Options considered and presented shall examine the merits of relocating project elements to address varying soil conditions and other constraints across the site.

iv. Off-site mitigation (including banking or cash or treatment on another project) will be considered by the VBWD on a case-by-case basis. In all cases, the receiving water shall be protected.

E. **Additional Stormwater Volume Requirements and Design Standards**

i. The permit applicant must complete the VBWD's stormwater volume checklist (see Appendix A).

ii. Sites within the Valley Creek and Lake Edith Watersheds ultimately drain to a trout stream, and must comply with the Minnesota Pollution Control Agency (MPCA) NPDES Construction Stormwater Permit standards.

iii. Infiltration facilities must drain down within 48 hours, as required by the MPCA NPDES Construction Stormwater Permit. For sites within the Valley Creek, Lake Edith, Kelle's Coulee, and Swede Hill Creek watersheds, infiltration facilities must drain down within 24 hours, as required by the MPCA Construction Stormwater Permit. For stormwater volume control management facilities above ground with vegetation (e.g., bioretention basins), the period of inundation shall be calculated using the maximum water depth below the surface discharge elevation and the soil infiltration rate. The maximum water depth for stormwater volume control management facilities above ground with vegetation (e.g., bioretention basins) is 1.5 feet.

iv. Infiltration facilities should be located in permeable soils and a minimum 3-foot distance is required from the bottom of the practice to the seasonally high water table, bedrock or other impeding layer per the MPCA NPDES Construction Stormwater Permit.

v. Infiltration facilities must conform to the minimum setbacks required by the Minnesota Department of Health, as summarized below:

MN Department of Health Minimum Setbacks for Infiltration Facilities[2]

Setback From	Minimum Distance (feet)
Property Line	10
Building Foundation (with slopes directed away from building)	10
Private Well and Public Water Well	50
Septic System Tank/Leach Field	35

[2] Pages 437 and 440 of Minnesota Pollution Control Agency's The Minnesota Stormwater Manual, November 2005

vi. For an infiltration facility with a tributary area of two acres and less, and with less than 0.7 acres of impervious surfaces, at least 50% of the in-flow volume from impervious surfaces must be pre-treated prior to entering the feature. Pre-treatment can consist of vegetative swales, filter strips, sediment forebays/traps, grit chambers or other measures.

vii. For an infiltration facility with a tributary area of greater than 2 acres or 0.7 acres or more of impervious surfaces, 100% of the in-flow volume from impervious surfaces must be pre-treated prior to entering the feature. Pre-treatment for these facilities must be designed to remove at least 25% of the inflow sediment loads.

viii. For proposed infiltration facilities with drainage areas of two acres or more or with 0.7 acres or more of impervious surfaces, a soil boring with blow counts will be required. The soil boring will be required to go to a depth of at least five feet below the proposed bottom of the infiltration facility. If fractured bedrock is suspected, the soil boring should go to a depth of at least ten feet below the proposed bottom of the infiltration facility. The soils will be classified using the Unified Soil Classification system. The least permeable soils horizon will dictate the infiltration rate.

ix. The permit applicants are encouraged to make detailed analyses and accurately determine the infiltration rates of the proposed infiltration facility. However, in the absence of a detailed analysis, the VBWD Engineer's recommendations and requirements shall be based upon the following rates:

VBWD Soil Infiltration Rates

Proposed Infiltration Facility with Drainage Area Less than 2 Acres And Less than 0.7 Acres of Impervious Surfaces	
Hydrologic Soil Group Based on Soil Survey	**Infiltration Rate (inches/hour)**
A	0.8
B	0.3
C	0.2
D	Infiltration not feasible or unlikely to be successful without soil corrections. See Standard 6D, Sites with Restrictions.
Proposed Infiltration Facility with Drainage Area 2 Acres or More Or 0.7 Acres or More of Impervious Surfaces	
Unified Soil Classification	**Infiltration Rate (inches/hour)**
GW, GP, SW	1.6
SP	0.8
GM[1], SM[1]	0.5
All Others	Infiltration not feasible or unlikely to be successful without soil corrections. See Standard 6D, Sites with Restrictions.

[1] The VBWD highly recommends that the GM and SM soils be collected and analyzed by a laboratory to determine the appropriate infiltration rate.

7. An infiltration facility must be designed so that volumes in excess of the design volume are safely conveyed into the downstream stormwater system.

8. To prevent soil compaction, the proposed infiltration facility must be staked off and marked during construction to prevent heavy equipment and traffic from traveling over it. If infiltration facilities are in-place during construction activities, sediment and runoff must be kept away the facility, using practices such as diversion berms and vegetating around the facility's perimeter. Infiltration facilities must not be excavated to final grade until the contributing drainage area has been constructed and fully stabilized. The final phase of excavation should remove all accumulated sediment and be done by light tracked equipment to avoid compaction of the basin floor. To provide a well-aerated, highly porous surface, the soils of the basin floor should be loosened to a depth of at least 3 feet prior to planting. For sites where blow counts per foot exceed 10, the soils of the basin floor should be loosened to depth of at least 5 feet prior to planting. The upper 10 inches of soil should also be tilled prior to planting.

9. As specified in the close-out process in Rule 1, prior to the release of any remaining fee or security, the permit holder must provide documentation that constructed infiltration facilities perform as designed.

10. The determination of whether a design will result in an erosion problem shall be based on generally accepted engineering design manuals or practices.

11. Best Management Practices shall meet the standards established in the VBWD Plan for runoff water quality management and erosion control plans.

12. A maintenance agreement in the general format of Appendix B as revised and updated by the VBWD (attorney) is required prior to issuance of a VBWD permit, unless the VBWD has a memorandum of understanding for the city or township in which the site lies. For sites within Minnesota Department of Transportation right-of-way, no maintenance agreement is required.

13. Land used for stormwater management facilities shall be preserved by dedication and/or perpetual easement to the Valley Branch Watershed District. These easements shall cover those portions of the property which are adjacent to the facility and which lie below the 100-year flood elevation. Adequate access must be provided to all stormwater management facilities for inspection, maintenance, and landscaping upkeep, including appropriate equipment and vehicles. For sites within a city or township in which the VBWD has a memorandum of understanding, the easement shall be granted to that city or township. For sites within public right-of-way, no easement is required.

Rule 3: Erosion and Sedimentation Control

Policies

1. To minimize the erosion which can occur as a result of land alteration, the Managers require that all projects which may affect the waters of the VBWD implement temporary and permanent erosion control measures. The permit applicant shall be responsible for removal of all temporary measures upon completion of the project.

2. A permit will not be required for usual agricultural practices, but the Managers will encourage good conservation measures.

3. If an erosion problem develops, the Managers will require action to correct the problem and prevent recurrence.

4. Submittals will be required for VBWD-permitted projects that must show how the project will meet the VBWD requirements for preventing sediment from leaving a site and for controlling erosion.

Standards

1. The Metropolitan Council's Minnesota Small Sites Best Management Practices Manual shall serve as the minimum guidelines for erosion control measures.

2. All activities shall be in compliance with the NPDES Construction Stormwater Permit as administered by the MPCA. (See Appendix E.)

3. If grading activities are proposed upstream of wetlands, appropriate sediment-control practices are required. All dikes, ditch checks, sediment ponds and other features shall be designed in accordance with the erosion control plan requirements of the VBWD's Plan.

4. Plans shall include commonly accepted restoration methods.

5. Any disturbed areas shall be seeded and mulched within 7 days after the area is no longer actively being worked. All exposed soil areas with a slope of three feet horizontal to one foot vertical (3H:1V) or steeper must have temporary erosion protection or permanent cover within 3 days after the area is no longer actively being worked. The Managers may, if requested and conditions warrant, allow more time before seeding and mulching is required.

6. All erosion and sediment control measures shall be installed prior to alteration and shall be maintained until turf is established. The VBWD Engineer and/or VBWD Inspector shall be notified three days prior to commencement of grading to schedule an inspection of the project's erosion controls. The erosion controls must be in place and properly installed before grading will be permitted.

7. All construction-related sediment shall be removed from ponding areas upon completion of construction.

Rule 4: Wetland Management and Vegetative Buffers

Policies

1. To protect the quantity, quality, and biological diversity of the wetlands within the VBWD, all projects below the 100-year flood level of a wetland will be regulated by the VBWD Managers.

2. The VBWD has adopted the Minnesota Wetland Conservation Act of 1991, (Minnesota Laws 1991 Chapter 354, codified as Minnesota Statute Sections 84 and 103, as amended), and the accompanying rules of the BWSR (Minnesota Rules Chapter 8420, as amended), herein referred to as the WCA and the WCA Rules, respectively.

3. The VBWD will continue as the Local Government Unit (LGU) administering the WCA throughout the VBWD, as long as the cities and townships in VBWD continue to designate the VBWD as the LGU. The LGU responsible for administering the WCA on state land is the agency with responsibility for the land. For all projects requiring a VBWD permit, the VBWD will continue to administer the wetlands management provisions of its rules and regulations, regardless of LGU status for the WCA. In addition, in the event that the WCA should ever be repealed, the VBWD will incorporate the WCA requirements into the VBWD rules and regulations.

4. The VBWD will continue to accept the DNR's waived permit jurisdiction for Public Waters Work Permit program projects on a case-by-case basis. In these cases, a DNR representative will be included on the Technical Evaluation Panel (TEP).

5. Upland vegetative buffers will be required adjacent to lakes, streams, and wetlands because they reduce the amount of phosphorus from runoff, prevent shoreline erosion, discourage waterfowl nesting/feeding, and provide additional wildlife habitat.

Standards and Procedures

1. The WCA, as amended, and its implementing rules as set forth in Minnesota Rules Chapter 8420, as amended, are incorporated into this rule and shall govern in all cases where the VBWD is the LGU responsible for administering the WCA with any exceptions and additions defined elsewhere in these Rules.

2. Any wetland alteration shall not reduce the existing storage volume in the immediate watershed. Storage volume will be determined as stated elsewhere in these Rules. Wetland alterations shall meet all other requirements of these Rules.

3. A pre-permit application meeting between the permit applicant and the VBWD or TEP is strongly encouraged for all projects involving potential wetland impacts and wetland banks.

4. All wetlands within the property of the permitted project shall:

    A. Have boundaries and types determined by methodologies set forth in Minnesota Rules Chapter 8420.0405, as amended,

    B. Be evaluated with the Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.4 (MNRAM 3.4) or updated versions, and

5. Be classified according to VBWD's wetland management classification system (see Appendix D). Based on the wetland's management classification, proposals must conform to the wetland management standards and guidelines shown in Appendix D, Table D-2.In addition to the requirements of the WCA for replacement wetlands, the replacement wetlands, including the purchase of wetland bank credits, shall be located within the VBWD, unless the Managers find the need for exception.

6. The VBWD may permit the excavation of some wetlands. However, no excavation will be allowed in wetlands classified as Type 7 or Type 8 wetlands as defined by the Circular 39 classification system developed by the U.S. Fish and Wildlife Service. Excavations in Type 3, 4, and 5 wetlands are regulated activities under the WCA and may require replacement. The VBWD may permit excavation in existing wetlands when the following apply:

    A. The applicant can show that the activity will not affect all property owners contiguous to the wetland.

    B. The excavated spoil material will not be placed within a wetland.

    C. The wetland is a Manage 2 wetland, as classified in Appendix D.

    D. No more than 50 percent of a Type 1, 2, or 6 wetlands is excavated, unless it is an approved action as stated in Minnesota Rules 8420.0526 and will not result in a conversion of wetland to upland or deep water habitat (greater than 2.0 meters).

    Considerations will be given to allow excavations of existing wetland areas so that adjacent replacement wetlands are hydrologically and ecologically connected to existing wetlands or if the proposed excavation is certain to result in greater functions and values as determined by MNRAM 3.4 or an updated version.

7. In addition to the requirements of the WCA for wetland banking applications, two of the three TEP members must meet on the site prior to the LGU decision. The permit applicant is responsible for obtaining all other permit approvals (i.e., U.S. Army Corps of Engineers).

8. The applicant is to provide all copies needed for proper distribution and recording at the time application is made.

9. For all projects which may decrease the quantity, quality, or biological diversity of a wetland, including projects that may qualify for a WCA exemption or No Loss, the applicant shall submit five copies of the Combined Wetland Permit Application (CWPA) and one VBWD permit application form for consideration. Once the CWPA has been

received, the VBWD will follow the completeness review, notification, and review procedures defined in the WCA. The VBWD may determine a CWPA is incomplete when seasonal constraints prevent on-site review and verification of the wetland delineation. The VBWD will review the application based on the policies and standards of the VBWD Plan, the WCA, and these Rules. The permit applicant and any TEP member can request a meeting to further discuss the CWPA at any time between the *Notice of Application* and the *Notice of Decision*. After the TEP has been given opportunity to review and comment on the CWPA, the VBWD will consider the TEP comments and decide if the CWPA conforms to the WCA rules, the VBWD Plan, and these Rules.

10. Prior to the VBWD issuing a permit for the construction of wetland replacement sites, the permit applicant must submit a draft *Declaration of Restrictions and Covenants,* an *Affidavit of Landowner,* and *Consent to Replacement Wetland.* Once the VBWD Attorney has approved the draft *Declaration of Restrictions and Covenants*, which shall include a metes and bounds survey of the wetland replacement area, the *Declaration of Restrictions and Covenants* must be recorded. Proof of recording the *Declaration of Restrictions and Covenants* and *Consent to Replacement Wetland,* along with a signed and notarized *Affidavit of Landowner* must be submitted to the VBWD Attorney prior to impacting a wetland.

11. Decisions made under the WCA may be appealed to the BWSR under WCA Rules part 8420.0905.The applicant shall post a cash surety or letter of credit equivalent to 150 percent of the estimated cost of the replacement wetland, to be determined by the permit applicant and approved by the VBWD Engineer, including: the cost to construct, vegetate, conduct at least five years of effective vegetation management, monitor (consisting of at least three site visits during each growing season for at least five years), and create and publish annual monitoring reports; or the cost of obtaining and finalizing the purchase of suitable wetland banking credits. Additional cash sureties may be required based upon conditions imposed on the applicant by the VBWD.

12. In accordance with the WCA Rules part 8420.0810, replacement wetlands and wetland bank sites will require monitoring, vegetation management, and the submittal of annual reports to the TEP and VBWD by October 1 of each monitoring year for five years after construction certification with possible extensions of up to five years. Monitoring programs and the submittal of annual reports to the TEP are the responsibility of the applicant and are to be performed according to the WCA Rules. If the permit holder fails to submit an annual report to the TEP, VBWD will pursue enforcement action, per WCA or prepare the annual monitoring report at the expense of the permit holder. The VBWD may perform vegetation management under some circumstances, at the expense of the applicant. If at the end of five years, the replacement wetland components meet the approved performance standards, future monitoring will not be required. If the project fails to meet the goals of the approved wetland replacement plan, VBWD will take enforcement actions, per WCA, or conduct wetland replacement at the expense of the permit holder.

13. Upland Vegetative Buffer Strips.

Upland buffer vegetation shall be provided around wetlands, streams, and lakes as discussed in the following paragraphs and Rule 4, Standard 6c. Native, non-invasive vegetation is preferred. Buffer vegetation shall not be cultivated, cropped, pastured, mowed, fertilized, subject to the placement of mulch or yard waste, or otherwise disturbed, except for periodic cutting or burning that promotes the health of the buffer, actions to address disease or invasive species, mowing for purposes of public safety, temporary disturbance for placement or repair of buried utilities, or other actions to maintain or improve buffer quality, each as approved by the VBWD or when implemented pursuant to a written agreement executed with the VBWD. No new structure or impervious surface shall be placed within a buffer. Grading within upland buffers must result in slopes of five feet horizontal to one foot vertical or flatter with eight feet horizontal to one foot vertical buffers encouraged. No fill, debris or other material shall be excavated from or placed within a buffer without VBWD approval.

A. **Wetlands:** A minimum 25-foot vegetative buffer strip immediately adjacent and contiguous to the delineated wetland boundary or the Ordinary High Water level (OHW), whichever is greater in elevation, shall be provided for all permitted activities. Average buffer widths at wetlands shall conform to Appendix D. A mowed access path within the buffer is allowed, but must not exceed a width of 6 feet. Access paths shall not be located where concentrated runoff will flow to the wetland.

B. Streams:

i. **Valley Creek:** A minimum 100-foot vegetative buffer strip measured perpendicular from the edge of water on each side of the creek shall be provided and maintained at all times for all permitted activities adjacent to the perennial portion of Valley Creek. Exceptions from this requirement for areas, such as water crossings, are allowed if the permit applicant fully documents the circumstances and reasons that the buffer encroachment is necessary. A mowed access path within the buffer is allowed, but must not exceed a width of 6 feet. Access paths shall not be located where concentrated runoff will flow to the creek.

ii. **Raleigh Creek & All Intermittent Streams (including the intermittent reaches of Valley Creek):** An average 50-foot wide vegetative buffer strip and a minimum 25-foot wide foot vegetative buffer strip measured perpendicular from and on both sides of the centerline shall be provided and maintained at all times for all permitted activities adjacent to the stream. Exceptions from this requirement for special situations, such as water crossings, are allowed if the permit applicant fully documents the circumstances and reasons that the buffer encroachment is necessary. A mowed access path within the buffer is allowed, but must not exceed a width of 6 feet. Access paths shall not be located where concentrated runoff will flow to the creek.

Drainageways that serve local projects (such as road ditches) and convey runoff to a stormwater management facility prior to draining to a stream or other VBWD water are not considered intermittent streams by the VBWD and are not required to have vegetative buffers.

C. **Lakes:** A minimum 35-foot wide buffer strip measured perpendicular to the OHW extending 35 feet inland shall be provided. A mowed access path and shoreline is allowed, but must not exceed 30% of the landowner's shoreline width or 30 feet, whichever is less. For shorelines less than 20 feet wide, a 6 foot-wide access path is allowed. Access paths shall not be located where concentrated runoff will flow to the lake.

   For this rule, lakes are defined as Silver Lake, Long Lake, Lake DeMontreville, Lake Olson, Lake Jane, Lake Elmo, Horseshoe Lake, Lake Edith, and Sunfish Lake. Other non-stormwater pond basins will be considered wetlands and will need to conform to the required vegetative buffers discussed elsewhere in these Rules. (These lakes are the VBWD waters with a "P" designation in the Minnesota Department of Natural Resources' public water inventory. Acorn Lake and Eagle Point Lake were given a "P" designation, but are considered wetlands by the VBWD because of their shallow depths.)

D. **Stormwater Ponds**: A stormwater pond is a pond constructed in an upland area with a permanent pool, the purpose of which is to treat stormwater runoff. A minimum 10-foot wide buffer strip measured perpendicular from the normal water elevation extending 10 feet inland shall be provided.

E. **Exceptions:**

   i. For roads and sites with existing homes, if a VBWD permit is needed for an activity, the buffer widths listed in these Rules and Regulations are strongly encouraged, but may not be feasible and practical. The VBWD Managers will review these situations on a case-by-case basis.

   ii. For streambank and shoreline stabilization projects, the buffer widths listed are strongly encouraged, but not required.

Rule 5: Floodplain Management

Policies

1. It is in the best interest of the public health, safety, and welfare that the Managers regulate the development and the use of floodplains.

2. Alterations or work within the floodplain or waters of the VBWD will be reviewed to:

   A. control floodplain encroachments

   B. prevent adverse environmental impact

Standards

1. Flood Level Determination

A. Ultimate development of the tributary watershed shall be assumed.

B. Design criteria shall be the 2-, 10-, and 100-year storms. The 100-year 10-day snowmelt event shall also be modeled. See Rule 2, Standard 5.

C. Flood levels shall be either determined or approved by the VBWD Engineer.

D. Many depressions within the VBWD are landlocked. That is, they have no surface water outlet. Because there is no surface outlet, runoff collecting in these depressions is removed only by seepage and evaporation. Under these circumstances, a detailed flood level analysis should include the effects of seepage and evaporation. Analysis of this type can be very complex.

In order to determine appropriate flood levels for these depressions, a simpler method of analysis was devised. With this method, the approximate 100-year flood level is determined using the annual runoff volumes shown in the following table:

VBWD Simplified Method Runoff Volumes for Calculating Flood Levels of Landlocked Depressions

Land Use	100-Year Annual Runoff Volume (inches)	Average Annual Runoff Volume (inches)	Differences; Net 100-Year Annual Volume (inches)
Impervious	32	16	16
Turfed	18	8	10
Water Surface	12	-6	18

For a natural landlocked pond, the average year's runoff volume is assumed to be dissipated by the average seepage rate of the pond. The additional runoff for a wet

year is assumed to be stored in the pond above the normal pond level (the long-term average water level of the pond). If the applicant can demonstrate that seepage will be greater than is assumed by this method, a less conservative flood level may be accepted.

The 100-year flood level is the level at which the depression will store the runoff volume calculated using the above table and the tributary watershed. Storage below the normal water level of the depression shall not be included in the computations.

To use the land within the VBWD to the maximum extent desirable, the communities and developers are encouraged to make detailed analyses and accurately determine 100-year flood levels. However, in the absence of a detailed analysis, the VBWD Engineer's recommendations and requirements shall be based upon flood levels determined using the above approximate method.

2. Minimum Building Elevations

A. Adjacent to all waters of the VBWD, the Managers shall set the minimum building elevation at two feet above the 100-year flood elevation. The minimum building elevation for each lot shall be noted on the grading plan.

B. The VBWD Managers may deviate from their usual minimum building elevation requirement if the applicant provides site-specific data (e.g., soil borings) that show buildings will be protected from flooding.

3. Floodplain Preservation and Uses

A. Floodplains adjacent to existing and future waters and waterways shall be preserved by dedication and/or perpetual easement to the VBWD. These easements shall cover those portions of the property which are adjacent to the water or waterway and which lie below the 100-year flood elevation.

B. Filling and crossing of waters of the VBWD.

i. **Lakes, ponds and storage sites:** Fill volumes shall be limited so that the cumulative effect of all possible filling will not raise the 100-year flood level more than 0.1 foot.

ii. **Waterways:** Fill and other alterations shall be limited so that the cumulative effect of all possible alterations shall not increase the 100-year flood level more than 0.5 foot.

C. The Board of Managers may determine that certain areas of the VBWD are or will be in a flood situation and will not allow any filling until the situation has been corrected.

D. Uses of Floodplain Adjacent to Waters of the VBWD

i. Buildings or other improvements to be located in the floodplain or materials to be stored in the floodplain will be permitted only when:

a. It can be shown that the building or improvements to be located in the floodplain will not be significantly damaged by flooding.

b. It can be shown that the improvements and materials will not unreasonably endanger life or property.

c. It can be shown that the improvements and materials will not unreasonably affect the water resource.

4. Floodplain Alterations

A. Alterations which will unreasonably impact another community will not be permitted. Such alterations may include: The outletting of landlocked ponds to another community and modifying lake outlet elevations.

B. Alterations which will unnecessarily impact the waters of the VBWD will not be permitted.

C. Alterations not in conformance with the VBWD Plan and applicable Minnesota Law will not be permitted.

Rule 6: Illicit Discharge and Connection

Policies

1. The VBWD will regulate the contribution of pollutants to the District's municipal separate storm sewer system (MS4) by any user;

2. The VBWD will prohibit Illicit Connections and Discharges to the District's MS4;

3. The VBWD will carry out all inspection, surveillance and monitoring procedures necessary to ensure compliance with this Rule;

4. The VBWD will require a District permit for new direct connections, changes to existing hydrology, and other impacts related to the proper function, access, and maintenance to the District's MS4 or easements;

5. The VBWD will not allow new direct connections or other impacts to the District's MS4 if the connection shall cause or exacerbate water conveyance or structural problems in the system, including but not limited to surcharging and flooding.

6. This Rule shall apply to all water entering the storm drain system of VBWD's MS4 generated on any developed and undeveloped lands unless explicitly exempted by VBWD. A permit and stormwater management plan is required under this rule for new direct connections, replacement of existing connections, changes to existing hydrology, or other impacts to the Beltline Interceptor, other components of VBWD's MS4, or its easements.

7. In this Rule, pollutant is defined as anything which caused or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or other discarded or abandoned objects, ordinances, and accumulations, so that some may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.

Standards

1. **Connection to the VBWD's MS4 System**

   A. New direct connections and replacement of existing connections shall be completed using a method that is approved by the VBWD.

   B. Peak flow rate, the total volume of flow, and the timing of the flow for new connections must be managed to not cause new water conveyance problems or exacerbate existing water conveyance problems.

2. Discharge Prohibitions

A. **Prohibition of Illegal Discharges.** No person shall discharge or cause to be discharged into the municipal storm drain system or watercourses any materials, including but not limited to pollutants that cause or contribute to a violation of applicable water quality standards, other than stormwater.

B. **Prohibition of Illicit Connections.** The construction, use, maintenance or continued existence of illicit connections to the storm drain system without a VBWD permit is prohibited.

i. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

ii. A person is considered to be in violation of this Rule if the person connects a line conveying sewage to the VBWD's MS4, or allows such a connection to continue.

3. Suspension of MS4 Access

A. Suspension due to Illicit Discharges in Emergency Situations. The VBWD may, without prior notice, suspend MS4 discharge access when such suspension is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of persons, or to VBWD's MS4 or Waters of the United States. If the violator fails to comply with a suspension order issued in an emergency, VBWD may take such steps as deemed necessary to prevent or minimize damage to VBWD's MS4 or Waters of the United States, or to minimize danger to persons or the environment.

B. Suspension due to the Detection of Illicit Discharge. Any person discharging to the VBWD's MS4 in violation of this Rule may have their MS4 access terminated if such termination would abate or reduce an illicit discharge. The VBWD shall notify a violator of the proposed termination of its MS4 access. The violator may petition the VBWD for a reconsideration and hearing. A person commits an offense subject to enforcement if the person reinstates MS4 access to facilities terminated pursuant to this Section, without the prior approval of the VBWD.

4. Monitoring of Discharges

A. **Applicability.** This section applies to all facilities that have stormwater discharges associated with industrial activity, including construction activity.

B. **Access to Facilities**

i. The VBWD shall be permitted to enter and inspect facilities subject to regulation under this Rule as often as may be necessary to determine compliance with this Rule. The discharger shall make the necessary arrangements to allow access to representatives of the VBWD.

ii. Facilities operators shall allow VBWD ready access to all parts of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit to discharge stormwater, and the performance of any additional duties as defined by state and federal law.

iii. If the VBWD has been refused access to any part of the premises from which stormwater is discharged; VBWD may seek issuance of a search warrant from any court of competent jurisdiction.

5. **Requirement to Prevent, Control, and Reduce Stormwater Pollutants by the Use of Best Management Practices.** The owner or operator of a commercial or industrial establishment shall provide, at their own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the municipal storm drain system or watercourses through the use of these structural and non-structural BMPs. Any person responsible for a property or premise, which is, or may be, the source of an illicit discharge, may be required by VBWD to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of pollutants to the municipal separate storm sewer system.

6. **Watercourse Protection.** Every person owning property through which a watercourse passes shall keep and maintain that part of the watercourse within the property free of trash, debris, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the watercourse. In addition, the owner or lessee shall maintain existing privately owned structures within or adjacent to a watercourse, so that such structures shall not become a hazard to the use, function, or physical integrity of the watercourse.

7. **Notification of Spills.** Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which result or may result in illegal discharges or pollutants discharging into stormwater, the storm drain system, or water of the U.S., said person shall take all necessary steps to ensure the containment and cleanup of such release. In the event of such a release of hazardous materials, said person shall immediately notify emergency response agencies of the release. In the event of a release of non-hazardous materials, said person shall notify VBWD in person or by phone or facsimile no later than the next business day following discovery of the release.

8. **Enforcement.**

A. **Notice of Violation.** Whenever the VBWD finds that a person has violated a prohibition or failed to meet a requirement of this Rule, VBWD may order compliance by written notice of violation to the responsible person. Such notice may require without limitation:

i. The performance of monitoring, analyses, and reporting;

ii. The elimination of illicit connections or discharges;

iii. That violating discharges, practices, or operations shall cease and desist;

iv. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property;

v. Payment of a fine to cover administrative and remediation costs; and/or

vi. The implementation of source control or treatment BMPs.

B. **Abatement.** If abatement of a violation and/or restoration of affected property are required, the notice shall set forth a deadline within which such remediation or restoration must be completed. Said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work shall be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.

C. **Appeal of Notice of Violation.** Any person receiving a Notice of Violation may appeal the determination of the VBWD. The notice of appeal must be received within 5 days from the date of the Notice of Violation. Hearing on the appeal before the VBWD Board of Managers shall take place within 15 days from the date of receipt of the notice of appeal. The decision of the VBWD shall be final.

D. **Enforcement Measures after Appeal.** If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation, or, in the event of an appeal, within 3 days of the decision of the VBWD Board of Managers, then representatives of the VBWD are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent, or person in possession of any premises to refuse to allow VBWD or its agents to enter upon the premises for the purposes set forth above.

E. **Cost of Abatement.** VBWD may assess costs for abatement. Within 30 days after abatement of the violation, the VBWD shall notify the property owner of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within 10 days. If the amount due is not paid within a timely manner as determined by the decision of the municipal authority or by the expiration of the time in which to file an appeal, the charges shall become a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

F. **Injunctive Relief.** It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this Rule. If a person has violated or continues to violate the provisions of this Rule, the VBWD may petition for a preliminary or permanent injunction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

G. **Violations Deemed a Public Nuisance.** In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provisions of this Rule is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

H. **Relation to Other Rules.** None of the enforcement provisions of this Rule shall abridge or alter the right of the VBWD to seek remedies provided for under Rule 1 herein.

I. **Exceptions**

i. The following discharges are exempt from discharge prohibitions established by this Rule: water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wetland flows, swimming pools (if dechlorinated - typically less than one PPM chlorine), street wash water, and firefighting activities.

ii. Discharges specified in writing by the VBWD as being necessary to protect public health and safety.

iii. Dye testing is an allowable discharge, but requires a verbal notification to the VBWD prior to the time of the test.

iv. Any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system.

Rule 7: Groundwater Management

Policies

1. Negative impacts (e.g., reduced flow to surface water bodies, lowered lake or wetland levels, well interference) to groundwater dependent resources will be prevented through permit review, community plan review, and education efforts.

2. Negative impacts (e.g., flooding) to surface waters due to groundwater quality mitigation efforts (e.g., pump-out systems) will be prevented through permit review, community plan review, and education efforts.

Standards

1. See other Rules, including but not limited to Rule 2, Rule 4, and Rule 5.

Rule 8: Individual Sewage Treatment Systems

Policies

1. Since septic systems are already regulated by the MPCA, the counties and the communities, VBWD will not take on this role, but VBWD will cooperate with other units of government to address specific concerns or issues.

2. VBWD supports Washington County's requirement that septic systems not be placed within drainage easements, which effectively prevents installation of septic systems within the 100-year floodplain of VBWD waters. (See Rule 5, Standard 3A.)

Rule 9: Water Appropriations

Policies

1. To manage the water resources of the VBWD, the Managers must be informed of the proposed appropriation of ground and/or surface waters.

2. The Managers require that the effect of the proposed appropriation be defined before approval is granted.

Standards

1. In all cases of appropriation of waters requiring a DNR permit, a copy of the permit application must be filed with the Managers for their review and comment.

2. The Managers will act on the DNR permit application within 30 days, or as required by the DNR, after receipt of the complete application.

Policies

1. The Application Fee is to be used to defray the VBWD's review, inspection, and administration costs. The amount of the application fee is set by the Managers and can be found by contacting the VBWD. Any costs incurred by the VBWD greater than the submitted fee will be billed to the applicant.

2. No fee is required by governmental units applying for a VBWD permit.

3. Any unused portion of the fee over $500 will be returned to the permit holder.

Rule 11: Sureties and Performance Bonds

Policies

1. To assure compliance with these Rules, the Managers may require the posting of a performance bond or other security where it is shown to be reasonable and necessary under the particular circumstances of any permit application filed with the VBWD.

2. Where a municipality or other governmental agency includes in its requirements that the applicant furnish a performance bond or other security, the VBWD may require an additional performance bond from the applicant.

3. At the Managers' discretion, the VBWD may reduce the amount of the security held for a project if the permit holder requests a reduction with documentation of the project's progress.

Rule 12: Variances

Policies

1. The Managers may grant variances from these Rules when they find that due to unique physical conditions of the land or waters involved, extraordinary and unnecessary hardship may result from strict compliance. Such variances will not have the effect of nullifying the intent and purpose of these Rules, or the VBWD Plan.

2. In considering the variance, the Managers shall consider the effect upon the entire VBWD and VBWD Plan.

3. An application for a variance shall be submitted to the Managers and shall document the exceptional conditions and peculiar difficulties claimed and resulting impacts from approval of the variance.

4. The Managers shall approve or deny the variance within 60 days of receipt of a complete variance application.

Rule 13: Local Government Responsibilities

Policies

1. The communities are responsible for:

A. Land use plans and zoning ordinances

B. Local watershed management plans

C. Shoreland and floodplain ordinances

The Managers will review these plans and documents to minimize adverse impacts to the waters of the VBWD and to ensure regional water management needs are included in the local watershed management plans.

2. Communities are responsible for enforcing minimum building elevations established by the VBWD.

3. Communities are responsible for maintaining stormwater management facilities where easements covering the facility have been granted to the community or to support the VBWD in using the easement to maintain the facility.

4. Communities shall submit copies of developers' agreements and/or grading permits of proposed subdivisions and development plans for review by the VBWD.

5. In cases of mining operations, a copy of the permit application must be filed with the Managers for their review and approval.

Appendices

Appendix A

Stormwater Volume Checklist

Stormwater Volume Checklist

The completion of this checklist is required for all projects requiring a permit from Valley Branch Watershed District.

Project Name:

For detailed information on stormwater management techniques and policies, see the Alternative Stormwater Best Management Practices Guidebook, published by Valley Branch Watershed District, April 2000. Call 952-832-2622 to receive a copy.

Site Design to Reduce Stormwater Runoff	Yes	No	If No, Why Not?
Building Locations			
Are stable natural drainageways, swales, and ravines preserved under proposed conditions?			
Are buildings set back 40 feet from the top of natural slopes greater than 18% over a length of 100 feet in the absence of stricter bluff ordinances?			
Cul-de-Sac Design			
Are all proposed cul-de-sac radii less than 39 feet?			
Are the centers of proposed cul-de-sacs unpaved, depressed islands (with rainwater gardens) with minimum diameters of 20 feet?			
Driveway Design			
Are proposed houses set back no more than 20 feet from the front property line?			
Are proposed long driveways limited to only 12 feet wide at the street?			
Are proposed driveways crowned and/or draining to green areas/rainwater gardens?			
Are proposed driveways shared?			
Are wheel track driveways being proposed?			
Are driveways proposed to be constructed with pervious pavement?			
Are turfed geotextile pavers proposed for summer temporary overflow parking along driveways?			
Parking Lot Design			
Are proposed 90-degree parking stalls 9 feet wide or less?			
Are proposed 90-degree parking stalls 18 feet long or less?			
Are 30% of the proposed spaces dimensioned for compact cars only?			
Are turfed geotextile pavers proposed for summer spillover parking areas?			
Are parking lots proposed to be constructed with pervious pavement?			
What is the minimum number of parking stalls required by the city? (please fill in number)			
What is the maximum number of parking stalls required by the city? (please fill in number)			
How many parking stalls are proposed? (please fill in number)			
Are the minimum number of parking stalls being proposed?			
Have the total number of proposed parking stalls been reduced because of shared parking with a nearby business?			
Will the impervious areas be disconnected to promote filtration and infiltration?			
Will the parking lot drain into infiltration islands/rainwater gardens?			
Will snow from the parking lot be plowed and stored in pervious areas?			
Street Design			
Are proposed streets crowned and curbless?			
Will pervious pavement be used?			
Will runoff be directed to vegetated swales and infiltration basins/rainwater gardens?			
Will perforated subsurface pipes, tanks, and storage systems be constructed?			
Will parking be needed and allowed on both sides, one side, or not at all on the streets? (please fill in answer)			
Are low-volume residential streets a maximum of 24 feet wide when parking & grass shoulders are proposed on both sides or when parking is not allowed?			
Are residential minor streets a maximum of 28 feet wide?			
Are residential collector streets a maximum of 31 feet wide?			
Path/Trail Design			
Will paths and sidewalks be constructed with porous material (wood chips or pervious pavement)?			
What is the narrowest width the city allows? (please fill in width)			
What is the width of proposed trails? (please fill in width)			
Rooftop Runoff			
Will 100% of the roof runoff be directed to permeable surfaces?			
Will rooftop storage be used?			
Will a green roof be constructed?			
Will rain barrels/cisterns be used or required?			
Continued on back			

Planting Design	Yes	No	If No, Why Not?
Do the specifications include loosening soils to a depth of 24 inches to a maximum compaction of 85% standard proctor density prior to planting?			
Do the specifications include tilling the upper 10 inches of soils prior to planting?			
Are islands proposed to be vegetated instead of paved?			
Does the planting plan include trees that at maturity will provide canopy over at least 50% of the paved area?			
Are deep-rooted trees, shrubs, wildflowers, and grasses planned in at least 25% of the project's green space?			
Open Space Subdivision Design			
Is 50% or more of the site preserved as natural area?			
Best Management Practices for Use in Development			
Buffers			
What is the proposed buffer zone along streams, wetlands, and lakes? (fill in width)			
Vegetated Swales			
Are vegetated swales proposed to convey stormwater?			
Will vegetated swales have native, deep-rooted vegetation?			
Vegetated Filter Strips			
Are filter strips proposed for sheet flows from impervious areas?			
Infiltration Basins			
Are infiltration basins proposed for the project?			
Was the infiltration rate of the soils at the proposed infiltration basins measured/tested?			
Was a soil boring conducted at all proposed infiltration basins?			
Using the Unified Soil Classification System, what is the classification of the least permeable soil layer at the proposed infiltration basin? (please fill in)			
What is the Hydrologic Group classification of the soil at the proposed infiltration basins? (please fill in)			
Is the base of the infiltration basin at least 3 feet above bedrock and the water table, or an impermeable layer?			
What is the depth to bedrock from the bottom of the proposed infiltration basin? (please fill in)			
Is the basin proposed to be planted with deep-rooted vegetation?			
Is the basin designed to treat the VBWD-required runoff volume and to infiltrate the stormwater within 48 hours?			
Is the basin set back at least 10 feet from all property lines?			
Is the basin set back at least 10 feet from building foundations?			
Is the basin set back at least 50 feet from private wells/public water wells?			
Is the basin set back at least 35 feet from septic systems?			
What is the drainage area to the infiltration basin? (please fill in)			
For infiltration basins with drainage areas less than two acres, will at least 50% of the inflow volume to the infiltration basin be pre-treated?			
For infiltration basins with drainage areas greater than two acres, will at all of the inflow volume to the infiltration basin be pre-treated?			
Will the proposed infiltration basin be staked off and marked during construction to prevent compaction?			
Who will maintain the infiltration basin? (please write name and attach contract)			
Sand Filters			
Are sand filters proposed on the site?			
Who will maintain the sand filter? (please write name and attach contract)			
Is the sand filter designed to accommodate 3/4-inch of runoff from its impervious drainage area?			

Appendix B

Maintenance Agreements

STORM WATER QUALITY TREATMENT FACILITY
MAINTENANCE AGREEMENT

THIS AGREEMENT is made this _____ day of _____, 20____ by and between the Valley Branch Watershed District (hereinafter referred to as "VBWD") and _____ (a Minnesota corporation or an individual) (hereinafter referred to as "Owner(s)") with reference to the following facts and circumstances:

A. _____ is/are the fee Owner(s) of certain real property situated in the city of _____, _____ County, Minnesota, legally described as follows:

(Type Legal Description Here)
(hereinafter referred to as "Property")

B. As a condition of its approval of the development of the Subject Property, VBWD has required that the Owner(s) enter into an agreement for the maintenance of the Storm Water Quality Treatment Facility for the Property. This Storm Water Quality Treatment Facility is located within the boundaries of the Property on construction plans prepared by Owner(s).

C. The Owner(s) desires to set forth its agreement with respect to the maintenance of the Storm Water Quality Treatment Facility and the cost of such maintenance.

NOW, THEREFORE, in consideration of the foregoing facts and circumstances, and for other good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged, the parties hereto agree as follows:

1. The Owner(s) shall grant to VBWD the necessary easements and rights-of-way and/or maintain perpetual access from public rights-of-way to the water quality unit for VBWD, its agent or contractor.

2. VBWD shall record this Agreement with the Recorder of the County of Washington, Minnesota. The Owner(s) shall pay a $100.00 processing and filing fee to VBWD upon submission of this Agreement.

3. The Owner(s), for itself and respective successors and assigns, hereby waives any statutory right which it may have to contest any assessment for costs hereunder by VBWD.

4. Until such time as the permit with VBWD for the project is closed out:

    4a. For the purposes of this Agreement, maintenance of the Storm Water Quality Treatment Facility shall include, but not be limited to, annual inspection, annual maintenance reporting and certification by a professional engineer (provided by Owner(s)) that the facility is functioning in accordance with the approved plans and minimum maintenance standards set forth by VBWD as set forth and defined in Exhibit A.

    4b. If necessary, Owner(s) shall undertake at its expense periodic dredging or removal of silt buildup and other deposited materials within the Storm Water Quality Treatment Facility to maintain its treatment capacity and proper operation, as established in the

construction plans. Any maintenance needs required by VBWD shall occur within 30 days of the certified inspection.

4c. Upon receipt of the annual certification of inspection and maintenance report, VBWD may inspect the facility to ensure that the facility meets the minimum maintenance standards. Annual inspection of the facility shall not render VBWD responsible for identifying ongoing maintenance needs.

4d. The Owner(s) shall be solely responsible for the maintenance of the facility, and shall bear all costs of such maintenance. If the Owner(s) do(es) not undertake the necessary maintenance within thirty (30) days of notification by VBWD, VBWD may contract such maintenance, but the costs reasonably incurred by VBWD for contracting such maintenance shall be reimbursed to VBWD by the Owner(s).

5. After the VBWD closes the permit, the Owner(s) for itself and respective successors and assigns, will remain responsible for vegetation management of all stormwater management facilities, including but not limited to weeding and maintaining the originally planned and installed vegetation species and varieties.

6. The terms and conditions of this Agreement shall be binding upon, and shall inure to the benefit of, the parties hereto and their respective successors and assigns.

IN WITNESS WHEREOF, the parties hereto have caused this document to be executed as of the day and year first above written.

VALLEY BRANCH WATERSHED DISTRICT

By_____
Its President

By_____
Its Secretary

_____
Owner

_____
Owner

STATE OF MINNESOTA)
) ss
COUNTY OF WASHINGTON)

The foregoing was acknowledged before me this _____ day of _____, 20____, by Lincoln Fetcher and Donald Scheel, respectively the President and Secretary of the Valley Branch Watershed District, State of Minnesota.

_____
Notary Public

STATE OF MINNESOTA)
) ss
COUNTY OF WASHINGTON)

The foregoing was acknowledged before me this _____ day of _____, 20____, by _____.

_____
Notary Public

DRAFTED BY:
LAWSON, MARSHALL, McDONALD,
GALOWITZ & WOLLE, P.A.
Lawyers
10390 39th Street North
Lake Elmo, MN 55042
Telephone: (651) 777-6960
(BW)

U:\CLIENT\VBWD\agreement.1.wpd

Exhibit A

Minimum Maintenance Standards for Stormwater Quality Treatment Facilities

1) Infiltration Facilities
   a) Debris
      i) Clear litter and vegetation debris from the contributing drainage area
      ii) Clean bottoms of the facilities
      iii) Clear debris from inflow pipes and/or inlet areas
      iv) Clear debris from overflows
   b) Forebays
      i) Remove trapped sediment if less than 50% of storage volume is remaining
   c) Vegetation
      i) Mow and fertilize as per Operations and Maintenance Plan
      ii) Remove undesirable vegetation and restore any dead vegetation that was installed as part of the project
      iii) Correct/stabilize any erosion problems
   d) Sediment Removal
      i) Remove any sediment that has accumulated in basin
      ii) Remove winter sand deposition every spring
   e) Inlets/Outlets
      i) Repair as needed
      ii) Remove any sediment or oil from catch basins and/or manholes
   f) Filter Bed
      i) Remove and replace upper layers of soil if basin does not drain down within 72 hours.
2) Stormwater Ponds
   a) Debris
      i) Clear litter and vegetation debris from contributing drainage area
      ii) Remove floatable debris in and around the pond area including, but not limited to: oils, gases, debris and other pollutants.
      iii) Clear litter from pond inflow pipe
      iv) Clear litter from pond outlet
   b) Vegetation
      i) Maintain landscape adjacent to the pond per original design, including but not limited to: maintenance of the buffer strip and other plant materials as per original plan design.
      ii) Remove undesirable vegetation and restore any dead vegetation that was installed as part of the project.

iii) Correct/stabilize any erosion problems

c) Sediment Removal

i) Remove sediment if less than 50% of storage volume is remaining

d) Inlets/Outlets

i) Repair as needed

ii) Remove any sediment from sump catch basins and/or manholes

iii) Remove debris from trashracks

e) Emergency Overflow

i) Clear spillway of debris, obstructions, and inappropriate vegetation

ii) Repair any cracking, bulging, or sliding

iii) Maintain and correct as needed all erosion control measures, including but not limited to riprap storm sewer outlets

Disposal of materials shall be in accordance with local, state and federal requirements as applicable.

Clean up and maintenance shall occur immediately after a spill takes place. Appropriate regulatory agencies should also be notified in the event of a spill.

Annual inspection, maintenance reporting and certification shall be conducted by a professional engineer (Provided by Owner). Information must be submitted to the VBWD annually.

Appendix C

Design Sequence Flow Chart

FIGURE C-1: DESIGN SEQUENCE FLOW CHART

Version 1, 8/28/2013
Adapted from MIDS

Define Performance Goal

New, Nonlinear Developments and Reconstruction/Redevelopment Projects: Retain on site 1.1 inches of runoff from the new and/or fully reconstructed impervious surfaces

Linear Projects: Retain on site the larger of
- 0.55 inches of runoff from the new and fully reconstructed impervious surfaces
- 1.1 inches of runoff from the net increase in impervious surfaces

Conduct Site Review:
- Aerial Photos and Topographic Maps
- County Soil Surveys and other Soil Information as Available
- County Geologic Atlas
- Local Groundwater Levels
- DWSMA and Wellhead Protection Maps
- FEMA and Local Floodplain Maps
- Soil Borings and Site Survey
- MPCA Listing of Potentially Contaminated Sites
- Phase 1 and 2 Environmental Site Assessments
- TMDLs and Local Water Quality Standards
- Wetland Delineations, MNRAM Assessments, and Wetland Classifications
- Proposed Conditions, Conceptual/Preliminary Site Design
- Local zoning and land use requirements/ordinances, including stormwater rate control requirements
- Communication with Local Landowners, LGU, or Others Knowledgeable about the Site
- Site Inspection

Does the project create 6,000 square feet or more of new and/or fully reconstructed impervious surfaces? (See Note 1)
- No → VBWD Rule 2, Standard 6 does not apply
- Yes → Is the project linear?
  - Yes → Are there restraints due to lack of available ROW, off site drainage and/or rate control requirements?
    - Yes → Can a reasonable effort to acquire all of the ROW be accomplished?
      - No → Is FTO1 feasible?
        - Yes → Select FTO 1; Provide documentation of offsite run on to project area; Provide documentation of lack of right-of-way
        - No → Is FTO 1b & 2a feasible?
          - Yes → Select FTO 1b and 2a; Provide documentation of offsite run on to project area; Provide documentation of lack of right-of-way
          - No → Is FTO 2 feasible?
            - Yes → Select FTO 2; Provide documentation of offsite run on to project area; Provide documentation of lack of right-of-way
            - No → Discuss with VBWD Board of Managers whether FTO 3 will be acceptable
      - Yes
    - No
  - No → Are there zoning and land use requirements (density, parking, setbacks, etc.) that make the Performance Goal not feasible? (See Note 2)
    - Yes → Is BMP relocation feasible?
      - No → Is FTO 1 feasible?
        - Yes → Select FTO 1; Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
        - No → Is FTO 1b and 2a feasible?
          - Yes → Select FTO 1b and 2a; Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
          - No → Is FTO 2 feasible?
            - Yes → Select FTO 2; Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
            - No → Discuss with VBWD Board of Managers whether FTO 3 will be acceptable
      - Yes
    - No → Is the site located in a DWSMA, wellhead protection area, or within 200 feet of a drinking well?
      - Yes → Is infiltration in this location acceptable to VBWD, owner, and operator?
        - No → Is FTO 1b feasible?
          - No → Select FTO 2; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide DWSMA or well location map
          - Yes → Select FTO 1b; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide DWSMA or well location map
        - Yes
      - No → Are there existing or proposed structures or infrastructure (e.g., rate control BMPs, utilities, buildings, roadway, easements) that make the Performance Goal not feasible?
        - Yes → Is BMP relocation feasable?
          - No → Is FTO 1 feasible?
            - No → Is FTO 1b and 2a feasible?
              - No → Is FTO 2 feasible?
                - No → Discuss with VBWD Board of Managers whether FTO 3 will be acceptable
                - Yes → Select FTO 2; Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
              - Yes → Select FTO 1b and 2a; Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
            - Yes → Select FTO 1; Provide regulations, and/or cost estimates documenting infeasibility of meeting the original Performance Goal
          - Yes
        - No → Is karst present on site?
          - Yes → Conduct detailed site investigation → Is karst present within 1000' of proposed BMP location?
            - Yes → Is BMP relocation onsite to a location without karst feasible?
              - No → Is FTO 1b feasible?
                - Yes → Select FTO 1b; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil borings or report from a professional geologist or geotechnical engineer.
                - No → Select FTO 2; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil borings or report from a professional geologist or geotechnical engineer.
              - Yes
            - No
          - No → Is shallow groundwater or shallow bedrock present on site?
            - Yes → Conduct detailed site investigation (i.e., borings, excavations, consultation with a professional geologist). → Is there >3 feet of soil depth (> 10 feet is preferred) from bottom of BMP to bedrock and groundwater?
              - No → Is BMP relocation onsite to avoid shallow groundwater and bedrock feasible?
                - No → Can BMP be raised?
                  - Yes → Raise BMP enough to ensure 3 feet (preferably 10 feet) of soil between bottom of BMP and top of bedrock and groundwater.
                  - No → Is FTO 1b feasible?
                    - Yes → Select FTO 1b; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil borings or report from a professional geologist or geotechnical engineer.
                    - No → Select FTO 2; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil borings or report from a professional geologist or geotechnical engineer.
                - Yes
              - Yes
            - No → Is there presence of contaminated soils and/or groundwater, or hotspot runoff?
              - Yes → Can hotspot or contamination be isolated or remediated to mitigate risk of increased contamination?
                - No → Is FTO 1b feasible?
                  - No → Select FTO 2; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide Phase I or II ESAs, or other documentation of potential contamination or hotspot runoff; Provide documentation of extent of contamination and remediation alternatives considered
                  - Yes → Select FTO 1b; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide Phase I or II ESAs, or other documentation of potential contamination or hotspot runoff; Provide documentation of extent of contamination and remediation alternatives considered
                - Yes
              - No → Are there very low infiltrating soils (<0.2 inches per hour)?
                - Yes → Is BMP relocation onsite to a higher-infiltrating location feasible?
                  - No → Can BMP be sized to drain dry within 48 hours (24 hours in locations that are listed in Rule 2, Standard 6Eiii)?
                    - No → Provide soil boring or infiltration test results documenting low-infiltrating soils → Is FTO 1 (lower volume control standard) feasible, allowing the BMP to drain within 48 hours (24 hours in locations listed in Rule 2, Standard 6Eiii)?
                      - No → Is FTO 1b feasible?
                        - Yes → Select FTO 1b; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil boring or infiltration test results documenting high-infiltrating soils
                        - No → Select FTO 2; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil boring or infiltration test results documenting high-infiltrating soils
                      - Yes → Select FTO 1; Provide soil boring or infiltration test results documenting high-infiltrating soils
                    - Yes
                  - Yes
                - No → Are there very high infiltrating soils (>8 inches per hour)? (See Note 3)
                  - Yes → Is BMP relocation onsite to a lower-infiltrating location feasible?
                    - No → Can subgrade be modified to slow the rate of infiltration to less than 8 inches per hour?
                      - No → Is FTO 1b feasible?
                        - No → Select FTO 2; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil boring or infiltration test results documenting high-infiltrating soils.
                        - Yes → Select FTO 1b; No infiltration practices allowed; Explore non-infiltration volume reduction practices; Provide soil boring or infiltration test results documenting high-infiltrating soils.
                      - Yes
                    - Yes
                  - No → Are there adverse surface water hydrologic impacts from infiltration practices (e.g., Table D-2 Hydrologic Guidelines, impacting a perched wetland, etc.)?
                    - Yes → Can the BMP be relocated onsite and/or redesigned to avoid adverse hydrologic impacts?
                      - No → Select FTO 1b (or FTO 2, if FTO 1b is not feasible) while avoiding adverse hydrologic impacts; Maximize infiltration BMPs to treat up to the 0.55 inch goal, if possible; Explore non-infiltration volume reduction practices; Provide report documenting potential hydrologic impacts from infiltration on the site, prepared by registered engineer, hydrologist, or wetlands specialist.
                      - Yes
                    - No → **Complete Design Using Performance Goal** (As modified by FTO Alternatives, if applicable)

Flexible Treatment Options (FTO)

The Flexible Treatment Options (FTO) alternatives presented here should be employed when the Performance Goal is not feasible and/or allowed. The designer should document the reasons why the Performance Goal and rejected FTO alternatives are not feasible and/or allowed.

FTO 1
Applicant attempts to comply with the following conditions:
- 1a Achieve at least 0.55" volume reduction goal, and
- 1b Remove 75% of the annual TP load, and
- 1c Options considered and presented shall examine the merits of relocating project elements to address, varying soil conditions and other constraints across the site

FTO 2
Applicant attempts to comply with the following conditions:
- 2a Achieve volume reduction to the maximum extent practicable (as determined by the VBWD), and
- 2b Remove 60% of the annual TP load, and
- 2c Options considered and presented shall examine the merits of relocating project elements to address, varying soil conditions and other constraints across the site.

FTO 3
Off-site mitigation (including banking or cash or treatment on another project, as determined by the VBWD) equivalent to the volume reduction performance goal can be used to protect the receiving water body. Off-site compliance and banking credits shall be achieved through a method that protects the receiving water.

Notes:
- A. Volume reduction techniques considered shall include infiltration, reuse & rainwater harvesting, and canopy interception & evapotranspiration and/or additional techniques included in the MIDS calculator or the Minnesota Stormwater Manual.
- B. Applicant shall document the flexible treatment options decision sequence, following the order of alternatives presented here.
- C. For FTO 2, the applicant is encouraged to use BMPs that reduce volume. Secondary preference is to employ filtration techniques, followed by rate control BMPs.

Notes:

(1) Fully reconstructed impervious surfaces: Areas where impervious surfaces have been removed down to the underlying soils. Activities such as structure renovation, mill and overlay projects and other pavement rehabilitation projects that do not alter the underlying soil material beneath the structure, pavement or activity are not considered full reconstruction. In addition, other maintenance activities such as catch basin and pipe repair/replacement, lighting, and pedestrian ramp improvements shall not be considered fully reconstructed impervious surfaces. Reusing an existing building foundation and re-roofing of an existing building are not considered fully reconstructed.

(2) This is not an exhaustive list.

(3) Soils that infiltrate too quickly may not provide sufficient pollutant removal before the infiltrated runoff enters groundwater.

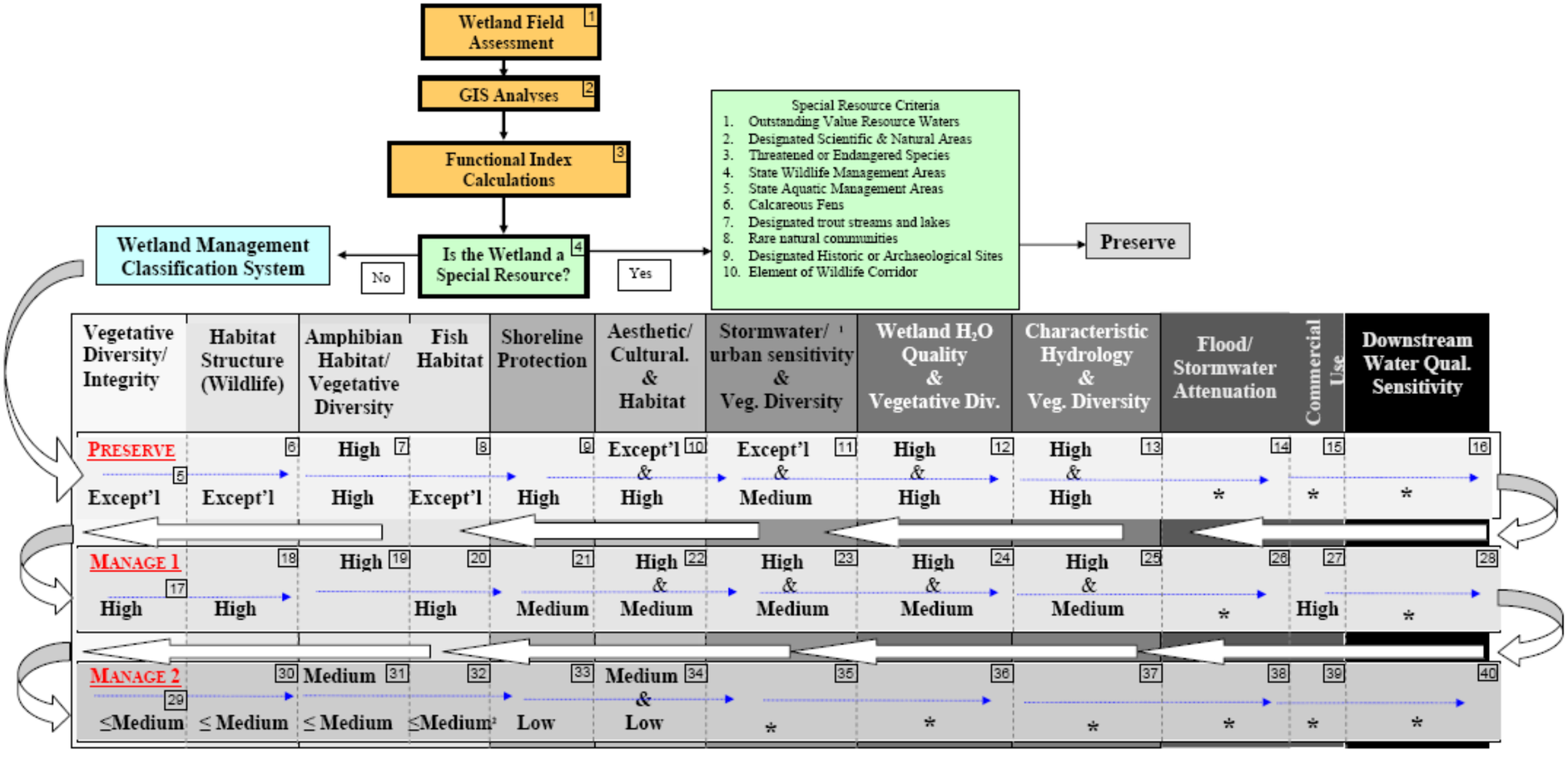
Appendix D

Wetland Inventory and Functional Assessment and Classification

Figure D-1

Wetland Management Classification Flowchart

Each wetland will be ranked into a Wetland Management group by the highest rated function for the wetland.
Follow the arrows through numbered boxes in progression through the tables; classify wetlands into the first group that applies.



Stormwater Pond — **A stormwater pond is a pond constructed in upland with a permanent pool, the purpose of which is to treat stormwater runoff.**

*** This rating does not apply here.**

Table D-2
WETLAND MANAGEMENT STANDARDS AND GUIDELINES[1]
Valley Branch Watershed District

Management Class	Average Buffer[2,3,4]	Hydrologic Guidelines
A-Preserve	100 feet Monuments required marking buffer edge.	*Bounce (10-year, 24-hour)*: Existing *Inundation*[5] *(1- & 2-year, 24-hour):* Existing *Inundation*[5] *(10-year, 24-hour)*: Existing *Runout Control*:[6] No Change Maintain existing hydrology: (The runoff volume flowing into the wetland from a 2-year 24-hour event cannot be changed by more than 10%[7]) Encourage infiltration and reduced impervious BMPs Conduct water budget analysis
B-Manage 1	75 feet Monuments required marking buffer edge.	*Bounce (10-year, 24-hour)*: Existing + 0.5 feet *Inundation*[5] *(1- & 2-year, 24-hour):* Existing plus 1 day *Inundation*[5] *(10-year, 24-hour)*: Existing + 7 days *Runout Control*:[6] No Change Maintain existing hydrology: (The runoff volume flowing into the wetland from a 2-year 24-hour event cannot be changed by more than 10%[7]) Encourage infiltration and reduced impervious BMPs
C-Manage 2	50 feet	*Bounce (10-year, 24-hour)*: Existing + 2.0 feet *Inundation*[5] *(1- & 2-year, 24-hour):* Existing plus 5 days *Inundation*[5] *(10-year, 24-hour)*: Existing + 14 days *Runout Control*:[6] 0 to 2.0 feet above existing runout Runoff volume flowing into the wetland from a 2-year 24-hour event cannot be changed by more than 25%[7]

1 Modified from Minnesota Routine Assessment Method For Evaluating Wetland Functions, Version 3.0 (MNRAM).

2 Buffers are unmowed, naturalized strips of vegetation around the perimeter of the wetland. Buffers shall be provided during development or redevelopment. Buffer widths will be measured from the delineated wetland boundary, the OHW, or the normal water level, whichever is greater in elevation. See Rule 4 for details regarding buffers.

3 A minimum 25 foot vegetative buffer strip is required around the delineated wetland boundary or the OHW, whichever is greater in elevation.

4 The average buffer widths listed are within the ranges recommended by MNRAM.

5 Defined as the time period during which wetland water levels are above the outlet elevation following the prescribed storm event.

6 If currently landlocked, new outlet should be above delineated wetland boundary elevation.

7 This is not a guideline of MNRAM, but a VBWD standard meant to meet the intent of the Wetland Conservation Act's purpose of avoiding direct or indirect impacts from activities that destroy or diminish the quantity, quality, and biological diversity of wetlands. In lieu of the applicant submitting plans and calculations that show the hydrology of wetlands will not be negatively impacted due to the proposed project, a 5-year wetland monitoring plan shall be submitted and approved by the VBWD Engineer prior to construction. If wetlands are negatively impacted by hydrology changes due to the project, the applicant will need to replace the lost wetlands.

Appendix E

National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) for construction activities as administered by the Minnesota Pollution Control Agency

Link to website for National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) for construction activities as administered by the Minnesota Pollution Control Agency

http://www.pca.state.mn.us/index.php/view-document.html?gid=18984

Appendix B-4.5 VBWD Storm Water Pollution Prevention Program (SWPPP)

Minnesota Pollution Control Agency
520 Lafayette Road North
St. Paul, MN 55155-4194

MS4 SWPPP Application for Reauthorization

for the NPDES/SDS General Small Municipal Separate Storm Sewer System (MS4) Permit MNR040000 reissued with an effective date of August 1, 2013

Stormwater Pollution Prevention Program (SWPPP) Document

Doc Type: Permit Application

Instructions: This application is for authorization to discharge stormwater associated with Municipal Separate Storm Sewer Systems (MS4s) under the National Pollutant Discharge Elimination System/State Disposal System (NPDES/SDS) Permit Program. **No fee** is required with the submittal of this application. Please refer to "Example" for detailed instructions found on the Minnesota Pollution Control Agency (MPCA) MS4 website at http://www.pca.state.mn.us/ms4.

Submittal: This *MS4 SWPPP Application for Reauthorization* form must be submitted electronically via e-mail to the MPCA at ms4permitprogram.pca@state.mn.us from the person that is duly authorized to certify this form. All questions with an asterisk (*) are required fields. All applications will be returned if required fields are not completed.

Questions: Contact Claudia Hochstein at 651-757-2881 or claudia.hochstein@state.mn.us, Dan Miller at 651-757-2246 or daniel.miller@state.mn.us, or call toll-free at 800-657-3864.

General Contact Information (*Required fields)

MS4 Owner (with ownership or operational responsibility, or control of the MS4)

*MS4 permittee name: Valley Branch Watershed District *County: Washington
(city, county, municipality, government agency or other entity)

*Mailing address: P.O. Box 838

*City: Lake Elmo *State: MN *Zip code: 55042

*Phone (including area code): 952-832-2622 *E-mail: jhanson@barr.com

MS4 General contact (with Stormwater Pollution Prevention Program [SWPPP] implementation responsibility)

*Last name: Hanson *First name: John
(department head, MS4 coordinator, consultant, etc.)

*Title: VBWD Engineer

*Mailing address: Barr Engineering Company, 4700 W. 77th Street

*City: Minneapolis *State: MN *Zip code: 55435-4803

*Phone (including area code): 952-832-2622 *E-mail: jhanson@barr.com

Preparer information (complete if SWPPP application is prepared by a party other than MS4 General contact)

Last name: Koehler First name: Jennifer
(department head, MS4 coordinator, consultant, etc.)

Title: Water Resource Engineer, PE

Mailing address: Barr Engineering Company, 4700 W. 77th Street

City: Minneapolis State: MN Zip code: 55435-4803

Phone (including area code): 952-832-2750 E-mail: jkoehler@barr.com

Verification

1. I seek to continue discharging stormwater associated with a small MS4 after the effective date of this Permit, and shall submit this *MS4 SWPPP Application for Reauthorization* form, in accordance with the schedule in Appendix A, Table 1, with the SWPPP document completed in accordance with the Permit (Part II.D.). ☒ Yes
2. I have read and understand the NPDES/SDS MS4 General Permit and certify that we intend to comply with all requirements of the Permit. ☒ Yes

Certification (All fields are required)

☒ Yes - *I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted.*

I certify that based on my inquiry of the person, or persons, who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete.

I am aware that there are significant penalties for submitting false information, including the possibility of civil and criminal penalties.

This certification is required by Minn. Stat. §§ 7001.0070 and 7001.0540. The authorized person with overall, MS4 legal responsibility must certify the application (principal executive officer or a ranking elected official).

By typing my name in the following box, I certify the above statements to be true and correct, to the best of my knowledge, and that this information can be used for the purpose of processing my application.

Name: David J. Bucheck
(This document has been electronically signed)

Title: Valley Branch Watershed District President Date (mm/dd/yyyy): 12/30/2013

Mailing address: PO Box 838

City: Lake Elmo State: MN Zip code: 55042

Phone (including area code): 651-770-1730 E-mail: djbucheck@yahoo.com

***Note:** The application will not be processed without certification.*

Stormwater Pollution Prevention Program Document

I. Partnerships: (Part II.D.1)

A. List the **regulated small MS4(s)** with which you have established a partnership in order to satisfy one or more requirements of this Permit. Indicate which Minimum Control Measure (MCM) requirements or other program components that each partnership helps to accomplish (List all that apply). Check the box below if you currently have no established partnerships with other regulated MS4s. If you have more than five partnerships, hit the tab key after the last line to generate a new row.

☒ No partnerships with regulated small MS4s

Name and description of partnership	MCM/Other permit requirements involved

B. If you have additional information that you would like to communicate about your partnerships with other regulated small MS4(s), provide it in the space below, or include an attachment to the SWPPP Document, with the following file naming convention: *MS4NameHere_Partnerships.*

II. Description of Regulatory Mechanisms: (Part II.D.2)

Illicit discharges

A. Do you have a regulatory mechanism(s) that effectively prohibits non-stormwater discharges into your small MS4, except those non-stormwater discharges authorized under the Permit (Part III.D.3.b.)? ☒ Yes ☐ No

1. If **yes:**

   a. Check which *type* of regulatory mechanism(s) your organization has (check all that apply):

   ☐ Ordinance ☐ Contract language
   ☒ Policy/Standards ☒ Permits
   ☒ Rules
   ☐ Other, explain: _____

   b. Provide either a direct link to the mechanism selected above or attach it as an electronic document to this form; or if your regulatory mechanism is either an Ordinance or a Rule, you may provide a citation:

   Citation:

   VBWD Revised Rules and Regulations (December 2013)

   Rule 6: Illicit Discharge and Connection

   Direct link:

   http://www.vbwd.org/RulesRegs/2013AdoptedRules.pdf

   ☐ Check here if attaching an electronic copy of your regulatory mechanism, with the following file naming convention: *MS4NameHere_IDDEreg.*

2. If **no:**

   Describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, this permit requirement is met:

Construction site stormwater runoff control

A. Do you have a regulatory mechanism(s) that establishes requirements for erosion and sediment controls and waste controls? ☒ Yes ☐ No

1. If **yes:**

a. Check which *type* of regulatory mechanism(s) your organization has (check all that apply):

☐ Ordinance ☐ Contract language
☒ Policy/Standards ☒ Permits
☒ Rules
☐ Other, explain: _____

b. Provide either a direct link to the mechanism selected above or attach it as an electronic document to this form; or if your regulatory mechanism is either an Ordinance or a Rule, you may provide a citation:

Citation:

VBWD Revised Rules and Regulations (December 2013)

Rule 3: Erosion and Sedimentation Control

Direct link:

http://www.vbwd.org/RulesRegs/2013AdoptedRules.pdf

☐ Check here if attaching an electronic copy of your regulatory mechanism, with the following file naming convention: *MS4NameHere_CSWreg.*

B. Is your regulatory mechanism at least as stringent as the MPCA general permit to Discharge Stormwater Associated with Construction Activity (as of the effective date of the MS4 Permit)? ☒Yes ☐ No

If you answered **yes** to the above question, proceed to C.

If you answered **no** to either of the above permit requirements listed in A. or B., describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

C. Answer **yes** or **no** to indicate whether your regulatory mechanism(s) requires owners and operators of construction activity to develop site plans that incorporate the following erosion and sediment controls and waste controls as described in the Permit (Part III.D.4.a.(1)-(8)), and as listed below:

1.	Best Management Practices (BMPs) to minimize erosion.	☒ Yes ☐ No
2.	BMPs to minimize the discharge of sediment and other pollutants.	☒ Yes ☐ No
3.	BMPs for dewatering activities.	☒ Yes ☐ No
4.	Site inspections and records of rainfall events	☒ Yes ☐ No
5.	BMP maintenance	☒ Yes ☐ No
6.	Management of solid and hazardous wastes on each project site.	☒ Yes ☐ No
7.	Final stabilization upon the completion of construction activity, including the use of perennial vegetative cover on all exposed soils or other equivalent means.	☒ Yes ☐ No
8.	Criteria for the use of temporary sediment basins.	☒ Yes ☐ No

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

Post-construction stormwater management

A. Do you have a regulatory mechanism(s) to address post-construction stormwater management activities? ☒ Yes ☐ No

1. If **yes:**

a. Check which *type* of regulatory mechanism(s) your organization has (check all that apply):

☐ Ordinance ☐ Contract language
☒ Policy/Standards ☒ Permits
☒ Rules
☐ Other, explain: _____

b. Provide either a direct link to the mechanism selected above or attach it as an electronic document to this form; or if your regulatory mechanism is either an Ordinance or a Rule, you may provide a citation:

Citation:

VBWD Revised Rules and Regulations (December 2013)

Rule 2: Stormwater Management

Direct link:

http://www.vbwd.org/RulesRegs/2013AdoptedRules.pdf

☐ Check here if attaching an electronic copy of your regulatory mechanism, with the following file naming convention: *MS4NameHere_PostCSWreg.*

B. Answer **yes** or **no** below to indicate whether you have a regulatory mechanism(s) in place that meets the following requirements as described in the Permit (Part III.D.5.a.):

1. **Site plan review:** Requirements that owners and/or operators of construction activity submit site plans with post-construction stormwater management BMPs to the permittee for review and approval, prior to start of construction activity. ☒ Yes ☐ No

2. **Conditions for post construction stormwater management:** Requires the use of any combination of BMPs, with highest preference given to Green Infrastructure techniques and practices (e.g., infiltration, evapotranspiration, reuse/harvesting, conservation design, urban forestry, green roofs, etc.), necessary to meet the following conditions on the site of a construction activity to the Maximum Extent Practicable (MEP):

   a. For new development projects – no net increase from pre-project conditions (on an annual average basis) of: ☒ Yes ☐ No

      1) Stormwater discharge volume, unless precluded by the stormwater management limitations in the Permit (Part III.D.5.a(3)(a)).
      2) Stormwater discharges of Total Suspended Solids (TSS).
      3) Stormwater discharges of Total Phosphorus (TP).

   b. For redevelopment projects – a net reduction from pre-project conditions (on an annual average basis) of: ☒ Yes ☐ No

      1) Stormwater discharge volume, unless precluded by the stormwater management limitations in the Permit (Part III.D.5.a(3)(a)).
      2) Stormwater discharges of TSS.
      3) Stormwater discharges of TP.

3. **Stormwater management limitations and exceptions:**

   a. Limitations

      1) Prohibit the use of infiltration techniques to achieve the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)) when the infiltration structural stormwater BMP will receive discharges from, or be constructed in areas: ☒ Yes ☐ No

         a) Where industrial facilities are not authorized to infiltrate industrial stormwater under an NPDES/SDS Industrial Stormwater Permit issued by the MPCA.
         b) Where vehicle fueling and maintenance occur.
         c) With less than three (3) feet of separation distance from the bottom of the infiltration system to the elevation of the seasonally saturated soils or the top of bedrock.
         d) Where high levels of contaminants in soil or groundwater will be mobilized by the infiltrating stormwater.

      2) Restrict the use of infiltration techniques to achieve the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)), without higher engineering review, sufficient to provide a functioning treatment system and prevent adverse impacts to groundwater, when the infiltration device will be constructed in areas: ☒ Yes ☐ No

         a) With predominately Hydrologic Soil Group D (clay) soils.
         b) Within 1,000 feet up-gradient, or 100 feet down-gradient of active karst features.
         c) Within a Drinking Water Supply Management Area (DWSMA) as defined in Minn. R. 4720.5100, subp. 13.
         d) Where soil infiltration rates are more than 8.3 inches per hour.

      3) For linear projects where the lack of right-of-way precludes the installation of volume control practices that meet the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)), the permittee's regulatory mechanism(s) may allow exceptions as described in the Permit (Part III.D.5.a(3)(b)). The permittee's regulatory mechanism(s) shall ensure that a reasonable attempt be made to obtain right-of-way ☒ Yes ☐ No

during the project planning process.

4. **Mitigation provisions:** The permittee's regulatory mechanism(s) shall ensure that any stormwater discharges of TSS and/or TP not addressed on the site of the original construction activity are addressed through mitigation and, at a minimum, shall ensure the following requirements are met:
   a. Mitigation project areas are selected in the following order of preference: ☒ Yes ☐ No
      1) Locations that yield benefits to the same receiving water that receives runoff from the original construction activity.
      2) Locations within the same Minnesota Department of Natural Resource (DNR) catchment area as the original construction activity.
      3) Locations in the next adjacent DNR catchment area up-stream
      4) Locations anywhere within the permittee's jurisdiction.
   b. Mitigation projects must involve the creation of new structural stormwater BMPs or the retrofit of existing structural stormwater BMPs, or the use of a properly designed regional structural stormwater BMP. ☒ Yes ☐ No
   c. Routine maintenance of structural stormwater BMPs already required by this permit cannot be used to meet mitigation requirements of this part. ☒ Yes ☐ No
   d. Mitigation projects shall be completed within 24 months after the start of the original construction activity. ☒ Yes ☐ No
   e. The permittee shall determine, and document, who will be responsible for long-term maintenance on all mitigation projects of this part. ☒ Yes ☐ No
   f. If the permittee receives payment from the owner and/or operator of a construction activity for mitigation purposes in lieu of the owner or operator of that construction activity meeting the conditions for post-construction stormwater management in Part III.D.5.a(2), the permittee shall apply any such payment received to a public stormwater project, and all projects must be in compliance with Part III.D.5.a(4)(a)-(e). ☒ Yes ☐ No

5. **Long-term maintenance of structural stormwater BMPs:** The permittee's regulatory mechanism(s) shall provide for the establishment of legal mechanisms between the permittee and owners or operators responsible for the long-term maintenance of structural stormwater BMPs not owned or operated by the permittee, that have been implemented to meet the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)). This only includes structural stormwater BMPs constructed after the effective date of this permit and that are directly connected to the permittee's MS4, and that are in the permittee's jurisdiction. The legal mechanism shall include provisions that, at a minimum:
   a. Allow the permittee to conduct inspections of structural stormwater BMPs not owned or operated by the permittee, perform necessary maintenance, and assess costs for those structural stormwater BMPs when the permittee determines that the owner and/or operator of that structural stormwater BMP has not conducted maintenance. ☒ Yes ☐ No
   b. Include conditions that are designed to preserve the permittee's right to ensure maintenance responsibility, for structural stormwater BMPs not owned or operated by the permittee, when those responsibilities are legally transferred to another party. ☒ Yes ☐ No
   c. Include conditions that are designed to protect/preserve structural stormwater BMPs and site features that are implemented to comply with the Permit (Part III.D.5.a(2)). If site configurations or structural stormwater BMPs change, causing decreased structural stormwater BMP effectiveness, new or improved structural stormwater BMPs must be implemented to ensure the conditions for post-construction stormwater management in the Permit (Part III.D.5.a(2)) continue to be met. ☒ Yes ☐ No

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within twelve (12) months of the date permit coverage is extended, these permit requirements are met:

III. Enforcement Response Procedures (ERPs): (Part II.D.3)

A. Do you have existing ERPs that satisfy the requirements of the Permit (Part III.B.)? ☒ Yes ☐ No

1. If **yes**, attach them to this form as an electronic document, with the following file naming convention: *MS4NameHere_ERPs.*
2. If **no**, describe the tasks and corresponding schedules that will be taken to assure that, with twelve (12) months of the date permit coverage is extended, these permit requirements are met:

B. Describe your ERPs:

Rule 1: Administrative Procedures of the VBWD Revised Rules and Regulations (December 2013) outlines the enforcement response procedures that includes an outline of the required submittals and exhibits for all projects requiring a VBWD permit, the permit application process, the enforcement and severability statements, the appellate procedure and review, the rule amendement procedure, and the permit close-out process.

Section 4.8 of the VBWD Watershed Management Plan also outlines the inspection/enforcement procedures if violation of the VBWD rules are observed.

Additionally, any violations of of the VBWD Rules and Regulations are discussed at the regular VBWD Board of Managers Meetings and violations and actions are documented in the meeting minutes.

IV. Storm Sewer System Map and Inventory: (Part II.D.4.)

A. Describe how you manage your storm sewer system map and inventory:

The current mapping of the storm sewer system and structures that VBWD owns and is responsible for managing includes: Project 1007 (including West Lakeland Storage Site), the Olson Lake Estates Outlet, Downs Lake Neighborhood Flood Reduction Duration Project,and the Weber Pond Outlet.

The mapping of the VBWD Project 1007 was developed based on the construction plans and GPS of the structures. Each of the Project 1007 features have been inventoried and the following infomration is included in the database: pipe length, pipe diameter, description of feature, feature name/ID, and the X and Y coordinates for each feature.

The GIS mapping of the other VBWD struture/systems is based on approximate locations of the storm sewer systems and structures.

B. Answer **yes** or **no** to indicate whether your storm sewer system map addresses the following requirements from the Permit (Part III.C.1.a-d), as listed below:

1. The permittee's entire small MS4 as a goal, but at a minimum, all pipes 12 inches or greater in diameter, including stormwater flow direction in those pipes. ☒ Yes ☐ No
2. Outfalls, including a unique identification (ID) number assigned by the permittee, and an associated geographic coordinate. ☒ Yes ☐ No
3. Structural stormwater BMPs that are part of the permittee's small MS4. ☒ Yes ☐ No
4. All receiving waters. ☒ Yes ☐ No

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

For all VBWD stormwater conveyance systems (other than the Project 1007), the VBWD will develop a more comprehensive inventory of the the various structures, pipes, and channels using GPS during the next annual VBWD inspection in Fall 2014.

C. Answer **yes** or **no** to indicate whether you have completed the requirements of 2009 Minnesota Session Law, Ch. 172. Sec. 28: with the following inventories, according to the specifications of the Permit (Part III.C.2.a.-b.), including:

1. All ponds within the permittee's jurisdiction that are constructed and operated for purposes of water quality treatment, stormwater detention, and flood control, and that are used for the collection of stormwater via constructed conveyances. ☒ Yes ☐ No
2. All wetlands and lakes, within the permittee's jurisdiction, that collect stormwater via constructed conveyances. ☒ Yes ☐ No

D. Answer **yes** or **no** to indicate whether you have completed the following information for each feature inventoried.

1. A unique identification (ID) number assigned by the permittee. ☐ Yes ☒ No
2. A geographic coordinate. ☐ Yes ☒ No
3. Type of feature (e.g., pond, wetland, or lake). This may be determined by using best professional judgment. ☐ Yes ☒ No

If you have answered **yes** to all above requirements, and you have already submitted the Pond Inventory Form to the MPCA, then you do not need to resubmit the inventory form below.

If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

The VBWD will submit the complete inventory of all stormwater pipes, structures, and ponds, wetlands, and lakes that are within its MS4 jurisdiction or collect runoff from the VBWD conveyances to the MPCA in the appropriate form by December 31, 2014.

E. Answer **yes** or **no** to indicate if you are attaching your pond, wetland and lake inventory to the MPCA on the form provided on the MPCA website at: http://www.pca.state.mn.us/ms4 , according to the specifications of Permit (Part III.C.2.b.(1)-(3)). Attach with the following file naming convention: *MS4NameHere_inventory*. ☐ Yes ☒ No

If you answered **no,** the inventory form must be submitted to the MPCA MS4 Permit Program within 12 months of the date permit coverage is extended.

V. Minimum Control Measures (MCMs) (Part II.D.5)

A. MCM1: Public education and outreach

1. The Permit requires that, within 12 months of the date permit coverage is extended, existing permittees revise their education and outreach program that focuses on illicit discharge recognition and reporting, as well as other specifically selected stormwater-related issue(s) of high priority to the permittee during this permit term. Describe your **current** educational program, including **any high-priority topics included**:

   The VBWD is primarily a rural watershed with rural residential developments, although there are some areas of urban development , especially in the western and northern portion of the watershed. The VBWD education program includes a variety of different activities that target both urban and rural residents. The VBWD shares a water resource education specialist with several other MS4s and watershed districts within Washington County to assist with education efforts. Beyond the typical activities incorporated into the VBWD education program, the current education efforts will include development of presentation for staff training in relation to stormwater management for cities within the District, nutrient (phosphorus) management focusing on yardwast and landscaping practices, and any public outreach performed as part of the TMDL studies currently underway in the VBWD.

2. List the categories of BMPs that address your public education and outreach program, including the distribution of educational materials and a program implementation plan. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

   Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the U.S. Environmental Protection Agency's (EPA) *Measurable Goals Guidance for Phase II Small MS4s* (http://www.epa.gov/npdes/pubs/measurablegoals.pdf).

   If you have more than five categories, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
	The measureable goals for this BMP category is to increase awareness of the VBWD, Increase interest and support of the VBWD including cooperation and coordination with other public entities, and promote positive behaviors (increase public awareness and understanding of non-point source pollution, impacts and need for reduction). This includes regularly updating the VBWD website, responding to information requests and providing information, recruiting and training volunteers for monitoring and other programs, continuing a VBWD volunteer recognition program, maintaining a VBWD Citizen Advisory Committee, continuing the VBWD BMP cost-share program (developed in 2007), continuing employment of a water resource education specialist (position created in 2006), continuing to seek opportunities to educate the public such as the Washington County Fair, publishing and distributing the VBWD Annual Report, holding tours and events for interested citizens, seeking input from the Technical Advisory Committee, and installing educational/informational signage at current and future VBWD projects.
Distribute Educational Materials	These activities will be performed annually or as needed.

	The measureable goals for this BMP category is to increase awareness of the VBWD, increase interest and support of the VBWD including cooperation and coordination with other public entities, and promote positive behaviors (increase public awareness and understanding of non-point source pollution, impacts and need for reduction). This includes regularly updating the VBWD website, responding to information requests and providing information, recruiting and training volunteers for monitoring and other programs, continuing a VBWD volunteer recognition program, maintaining a VBWD Citizen Advisory Committee, continuing the VBWD BMP cost-share program (developed in 2007), continuing employment of a water resource education specialist (position created in 2006), continuing to seek opportunities to educate the public such as the Washington County Fair, publishing and distributing the VBWD Annual Report, holding tours and events for interested citizens, seeking input from the Technical Advisory Committee, and installing educational/informational signage at current and future VBWD projects.
Implement an Education Program	These activities will be performed annually or as needed.
	The measureable goals for this BMP category is to increase public (citizens, government officials, businesses, and permit applications) awareness and understanding of non-point source pollution, impacts and need for reduction and the role of the VBWD in these activities, Increase interest and support of the VBWD including cooperation and coordination with other public entities, and Promote positive behaviors (increase public awareness and understanding of non-point source pollution, impacts and need for reduction). This includes regularly updating the VBWD website, responding to information requests and providing information, recruiting and training volunteers for monitoring and other programs, continuing a VBWD volunteer recognition program, maintaining a VBWD Citizen Advisory Committee, continuing the VBWD BMP cost-share program (developed in 2007), continuing employment of a water resource education specialist (position created in 2006), continuing to seek opportunities to educate the public such as the Washington County Fair, publishing and distributing the VBWD Annual Report, holding tours and events for interested citizens, seeking input from the Technical Advisory Committee, and installing educational/informational signage at current and future VBWD projects.
Education Program: Public Education and Outreach	These activities will be performed annually or as needed.
	The measureable goals for this BMP category is to increase public (citizens, government officials, businesses, and permit applications) awareness and understanding of non-point source pollution, impacts and need for reduction and the role of the VBWD in these activities, Increase interest and support of the VBWD including cooperation and coordination with other public entities, and Promote positive behaviors (increase public awareness and understanding of non-point source pollution, impacts and need for reduction). This includes regularly updating the VBWD website, responding to information requests and providing information, recruiting and training volunteers for monitoring and other programs, continuing a VBWD volunteer recognition program, maintaining a VBWD Citizen Advisory Committee, continuing the VBWD BMP cost-share program (developed in 2007), continuing employment of a water resource education specialist (position created in 2006), continuing to seek opportunities to educate the public such as the Washington County Fair, publishing and distributing the VBWD Annual Report, holding tours and events for interested citizens, seeking input from the Technical Advisory Committee, and installing educational/informational signage at current and future VBWD projects.
Education Program: Public Participation	

	These activities will be performed annually or as needed.
Education Program: Illicit Discharge Detection and Elimination	As part of this BMP, the VBWD hopes to target employees of other MS4s, businesses, and the general public of the hazards associated with illegal discharges and improper disposal of waste and what the procedures are if someone notices/observes an illicit discharge. As part of the VBWD's annual inspection of its stormwater management systems, the VBWD will continue to check for non-stormwater discharges into the VBWD system
Education Program: Construction Site Runoff Control	This BMP will target permit applicants through the VBWD permit program (review proposed projects, developments/redevelopment for compliance with rules, working with the permit applicant along the way) and the enforcement of the VBWD rules and regulations, including Rule 3: Erosion and Sediment Control. These activities are on-going.
Education Program: Post-Construction Stormwater Management in New Development and Redevelopment	This BMP will target permit applicants through the VBWD permit program (review proposed projects, developments/redevelopment for compliance with rules, working with the permit applicant along the way) and the enforcement of the VBWD rules and regulations, including Rule 2: Stormwater Runoff Management. These activities are on-going.
Education Program: Pollution Prevention/Good Housekeeping for Municipal Operations	No activity/BMP is planned because this is not applicable to VBWD since it has no employees. However, in 2014, the VBWD will be supporting communities by developing presentations used for staff trainings (in relation to stormwater) in cities within the VBWD. The VBWD will train contractors working for the VBWD, as needed.
Coordination of Education Program	The VBWD hired a water resource education specialist in 2006 to help implement the VBWD education plan. The education efforts are on-going and as needed.
Annual Public Meeting	All VBWD Board of Managers' meetings are public. The VBWD will hold special public meetings, as required. The VBWD holds annual public hearings on the SWPPP, as required (before June 30th of each year). The VBWD will continue to publish notice of the annual public hearing 30 days prior to the meeting, as required

BMP categories to be implemented	**Measurable goals and timeframes**

3. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

   David Bucheck, VBWD Board of Managers President

B. MCM2: Public participation and involvement

1. The Permit (Part III.D.2.a.) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement a public participation/involvement program to solicit public input on the SWPPP. Describe your current program:

   The VBWD holds annual public hearings on the SWPPP, as required (before June 30th of each year). The VBWD will continue to publish notice of the annual public hearing 30 days prior to the meeting, as required. Additionally, all VBWD meetings are public. Additionally, the public is given the opportunity to be involved in theVBWD Watershed Management Plan update process.

2. List the categories of BMPs that address your public participation/involvement program, including solicitation and documentation of public input on the SWPPP. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (http://www.epa.gov/npdes/pubs/measurablegoals.pdf). **If you have more than five categories**, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Comply with Public Notice Requirements	The VBWD posts and publishes notices, as required. See Section 4.9 of the VBWD Plan (2005, amended 2011).
Solicit Public Input and Opinion on the Adequacy of the SWPPP	All VBWD meetings are public and held on the second and fourth Thursdays of the month, except the fourth Thursdays of November and December. The VBWD holds its annual budget meeting in the fall, where the public can attend and comment on the proposed annual budget and activities. The VBWD has published notifications and held public meetings to discuss past MS4 SWPPPs. The VBWD is in the process of updating its Watershed Management Plan and has incorporated several opportunities/meetings for the public to provide input in the planning process including identifying water-related issues/concerns, helping in setting goals, and in making management decisions. The VBWD has lists of meeting invitees, attendees, and comments received.
Consider Public Input	The VBWD provides several opportunities for the public to provide input on the actions of the VBWD. If any public input is received on the SWPPP, the Watershed Management Plan, or the annual budgets, the VBWD Board of Managers will consider the input and will incorporate into documents, as appropriate and necessary. Public input is documented in a variety of ways including documentation in meeting minutes, in data collected and compiled during the VBWD planning process, and the written responses to public comments.

BMP categories to be implemented	Measurable goals and timeframes

3. Do you have a process for receiving and documenting citizen input? ☒ Yes ☐ No

   If you answered **no** to the above permit requirement, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, this permit requirement is met:

4. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

   David Bucheck, VBWD Board of Managers President

C. MCM 3: Illicit discharge detection and elimination

1. The Permit (Part III.D.3.) requires that, within 12 months of the date permit coverage is extended, existing permittees revise their current program as necessary, and continue to implement and enforce a program to detect and eliminate illicit discharges into the small MS4. Describe your current program:

   The VBWD illicit discharge and eliminarion program includes public education to inform of the hazards associated with illegal discharges and improper disposal of wast, annual inspection for non-stormwater discharges into the VBWD storm sewer conveyance systems and address any detections on a case by case basis, and incorporation of illicit discharge policies and standard/procedures into the VBWD Rules (Rule 6).

2. Does your Illicit Discharge Detection and Elimination Program meet the following requirements, as found in the Permit (Part III.D.3.c.-g.)?

   a. Incorporation of illicit discharge detection into all inspection and maintenance activities conducted under the Permit (Part III.D.6.e.-f.)Where feasible, illicit discharge inspections shall be conducted during dry-weather conditions (e.g., periods of 72 or more hours of no precipitation). ☒ Yes ☐ No

   b. Detecting and tracking the source of illicit discharges using visual inspections. The permittee may also include use of mobile cameras, collecting and analyzing water samples, and/or other detailed procedures that may be effective investigative tools. ☒ Yes ☐ No

   c. Training of all field staff, in accordance with the requirements of the Permit (Part III.D.6.g.(2)), in illicit discharge recognition (including conditions which could cause illicit discharges), and reporting illicit discharges for further investigation. ☒ Yes ☐ No

   d. Identification of priority areas likely to have illicit discharges, including at a minimum, evaluating land use associated with business/industrial activities, areas where illicit discharges have been identified in the past, and areas with storage of large quantities of significant materials that could result in an illicit discharge. ☐ Yes ☒ No

   e. Procedures for the timely response to known, suspected, and reported illicit discharges. ☒ Yes ☐ No

   f. Procedures for investigating, locating, and eliminating the source of illicit discharges. ☒ Yes ☐ No

   g. Procedures for responding to spills, including emergency response procedures to prevent spills from entering the small MS4. The procedures shall also include the immediate notification of the Minnesota Department of Public Safety Duty Officer, if the source of the illicit discharge is a spill or leak as defined in Minn. Stat. § 115.061. ☒ Yes ☐ No

   h. When the source of the illicit discharge is found, the permittee shall use the ERPs required by the Permit (Part III.B.) to eliminate the illicit discharge and require any needed corrective action(s). ☒ Yes ☐ No

   If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

   During the VBWD Watershed Management Plan update process (currently in progress), the VBWD Board of Managers will consider developing a map of illicit discharge priority areas along the VBWD storm sewer system alignment based on land use types (business and industrial focus),historic illicit discharges, and areas with the storage of large quantities of materials that could result in illicit discharges. This map will be developed by the Fall 2014 prior to the next annual inspection of the VBWD storm sewer system.

3. List the categories of BMPs that address your illicit discharge, detection and elimination program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

   Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (http://www.epa.gov/npdes/pubs/measurablegoals.pdf).

   If you have more than five categories, hit the tab key after the last line to generate a new row.

Established BMP categories	**Measurable goals and timeframes**
Storm Sewer System Map	Map of the VBWD storm sewer system is developed and included as Figures 3-1 and 3-2 of the VBWD Plan (2005, amended 2011)
Regulatory Control Program	The VBWD Revised Rules and Regulations (December 2013) require a VBWD permit for all projects which result in a discharge of municipal or industrial water or wastewater to a surface water drainage system. See Rule 6: Illicit Discharge and Connection. Additionally, see Section 4.4 of the VBWD Plan (2005, amended 2011)
Illicit Discharge Detection and Elimination Plan	VBWD performs annual, visual inspections of the VBWD storm sewer system, including inspection for non-stormwater discharges into the VBWD storm sewer conveyance systems and address any detection on a case by case basis. When

	feasible, these inspections will continue to be conducted during dry-weather conditions, so as to help identify any illicit discharges into the system. No other activity /BMP is planned because this is not applicable to VBWD since it has no employees. However, the VBWD will support communities in achieving this goal, if requested. The VBWD will train contractors working for the VBWD, as needed. Section 4.4 of the VBWD Plan (2005, amended 2011)
	Support efforts of other MS4s, if requested. No other activity /BMP is planned because this is not applicable to VBWD since it has no employees. However, the VBWD will support communities in achieving this goal, if requested. The VBWD will train contractors working for the VBWD, as needed.
Public and Employee Illicit Discharge Information Plan	Section 4.4 of the VBWD Plan (2005, amended 2011)
Identification of NonStormwater Discharges and Flows	VBWD performs annual, visual inspections of the VBWD storm sewer system, including inspection for non-stormwater discharges into the VBWD storm sewer conveyance systems and address any detection on a case by case basis.

BMP categories to be implemented	**Measurable goals and timeframes**
Identification of priority areas likely to have illicit discharges to the VBWD storm sewer system	During the VBWD Watershed Management Plan update process (currently in progress), the VBWD Board of Managers will consider developing a map of illicit discharge priority areas along the VBWD storm sewer system alignment based on land use types (business and industrial focus), historic illicit discharges, and areas with the storage of large quantities of materials that could result in illicit discharges. This map will be developed by the Fall 2014 prior to the next annual inspection of the VBWD storm sewer system.
Develop additional documentation of the following information in relation to illicit discharge inspections conducted during the annual inspection of the VBWD storm sewer system	During the annual inspections of the VBWD, the date, location of the structure, and observations of flows, debris, etc. are recorded. Observations of potential illicit discharges are noted. For the next annual inspection, we will include more detailed field notes on whether there is any indication of a potential illicit discharge, including the date, location, and specific observations. These illicit discharge observations will be recorded during the next annual VBWD storm sewer inspection in the Fall 2014.
Develop documentation for any additional illicit discharge activities	During the VBWD Watershed Management Plan update process (currently in progress), the VBWD Board of Managers will consider an illicit discharge tracking system that includes a summary of any observations of illicit discharges or reports of alleged illicit discharges to the VBWD. If approved by the VBWD Board, this database will track the date of the illicit discharge observation/report, the location of the observed/reported illicit discharges, the date of any follow-up actions by the permittee to address the illicit discharge, and the identification of the potential source/responsible party (if known). This database will be developed prior to the next annual VBWD storm sewer inspection in the Fall of 2014.

4. Do you have procedures for record-keeping within your Illicit Discharge Detection and Elimination (IDDE) program as specified within the Permit (Part III.D.3.h.)? ☐ Yes ☒ No

   If you answered **no**, indicate how you will develop procedures for record-keeping of your Illicit Discharge, Detection and Elimination Program, within 12 months of the date permit coverage is extended:

   During the VBWD Watershed Management Plan update process (currently in progress), the VBWD Board of Managers will consider the development of an illicit discharge tracking system that includes a summary of any observations of illicit discharges or reports of alleged illicit discharges to the VBWD. This database will track the date of the illicit discharge observation/report, the location of the observed/reported illicit discharges, the date of any follow-up actions by the permittee to address the illicit discharge, and the identification of the potential source/responsible party (if known). This database will be developed prior to the next annual VBWD storm sewer inspection in the Fall of 2014 and will be updated with any observations from the annual inspections of the VBWD system or other reports of illicit discharge to the VBWD.

5. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this

MCM:

David Bucheck, VBWD Board of Managers President

D. MCM 4: Construction site stormwater runoff control

1. The Permit (Part III.D.4) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement and enforce a construction site stormwater runoff control program. Describe your current program:

   VBWD Watershed Management Plan Section 4.8 summarizes the policies, procedures, etc. related to Erosion Prevention and Sediment Control and incorporation of erosion and sediment control into the VBWD Rules (Rule 3). The VBWD has a construction site inspector on staff who inspects construction sites in accordance with the VBWD Watershed Management Plan and the VBWD Rules. The inspector provides construction site inspection reports regularly at the VBWD Board of Managers meetings.

2. Does your program address the following BMPs for construction stormwater erosion and sediment control as required in the Permit (Part III.D.4.b.):

   a. Have you established written procedures for site plan reviews that you conduct prior to the start of construction activity? ☒ Yes ☐ No

   b. Does the site plan review procedure include notification to owners and operators proposing construction activity that they need to apply for and obtain coverage under the MPCA's general permit to *Discharge Stormwater Associated with Construction Activity No. MN R100001*? ☒ Yes ☐ No

   c. Does your program include written procedures for receipt and consideration of reports of noncompliance or other stormwater related information on construction activity submitted by the public to the permittee? ☐ Yes ☒ No

   d. Have you included written procedures for the following aspects of site inspections to determine compliance with your regulatory mechanism(s):

      1) Does your program include procedures for identifying priority sites for inspection? ☒ Yes ☐ No

      2) Does your program identify a frequency at which you will conduct construction site inspections? ☒ Yes ☐ No

      3) Does your program identify the names of individual(s) or position titles of those responsible for conducting construction site inspections? ☒ Yes ☐ No

      4) Does your program include a checklist or other written means to document construction site inspections when determining compliance? ☒ Yes ☐ No

   e. Does your program document and retain construction project name, location, total acreage to be disturbed, and owner/operator information? ☒ Yes ☐ No

   f. Does your program document stormwater-related comments and/or supporting information used to determine project approval or denial? ☒ Yes ☐ No

   g. Does your program retain construction site inspection checklists or other written materials used to document site inspections? ☒ Yes ☐ No

   If you answered **no** to any of the above permit requirements, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met.

   During the VBWD Watershed Management Plan update process (currently in progress), the VBWD Board of Managers will consider specific language related to the procedures for receipt and consideration of reports of noncompliance or other stormwater related information on struction activity submitted by the public to the permittee. This would be developed by Fall 2014 as part of the draft Watershed Management Plan development.

3. List the categories of BMPs that address your construction site stormwater runoff control program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

   Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (http://www.epa.gov/npdes/pubs/measurablegoals.pdf). **If you have more than five categories**, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Ordinance or other Regulatory Mechanism	The VBWD Board of Managers recently revised the VBWD rules, which includes Rule 3: Erosion and Sediment Control. In addition to the specific VBWD policies and standards, all construction activities in the VBWD must be in compliance with the current NPDES Construction Stormwater Permit as administered by the MPCA. Additional information related to Erosion and Sediment Control can also be found in the VBWD Watershed Management Plan,

	including Section 4.4 and 4.8. The VBWD inspectors all VBWD permitted sites in accordance with the VBWD Watershed Management Plan and the VBWD Rules. Regular inspection reports are given to the VBWD Board of Managers at the regular Board meetings. All VBWD permits issued in a given year are summarized in the VBWD Annual Report. All of these activities are ongoing
Construction Site Implementation of Erosion and Sediment Control BMPs	VBWD will continue to implement its permit program which includes enforcement of the VBWD Rules (Rule 3) and the guidance in the VBWD Watershed Management Plan, in relation to Erosion and Sediment Control. The VBWD will continue to keep a construction site inspector on staff that will regularly report to the VBWD Board of Managers. These activities are ongoing.
Waste Controls for Construction Site Operators	VBWD will continue to implement its permit program which includes enforcement of the VBWD Rules (Rule 3) and the guidance in the VBWD Watershed Management Plan, in relation to Erosion and Sediment Control. The VBWD will continue to keep a construction site inspector on staff that will regularly report to the VBWD Board of Managers. These activities are ongoing.
Procedure for Site Plan Review	VBWD will continue to implement its permit program which includes enforcement of the VBWD Rules (Rule 3) and the guidance in the VBWD Watershed Management Plan, in relation to Erosion and Sediment Control. The VBWD will continue to keep a construction site inspector on staff that will regularly report to the VBWD Board of Managers. These activities are ongoing.
Establishment of Procedures for the Receipt and Consideration of Reports of Stormwater Noncompliance	The VBWD Inspector reviews VBWD-permitted sites for compliance with the VBWD Rules and the VBWD Watershed Management Plan. The VBWD Inspector regularly reports to the VBWD Board of Managers and actions are based on the enforcement procedures outlined in the VBWD Rules and VBWD Watershed Management Plan. If problems are found on non-permitted sites and with VBWD-permitted sites that the VBWD inspector is unaware of, people can contact any VBWD Manager or contract employee and the VBWD inspector will review the issue. The public is welcome to attend all VBWD meetings. These activities are ongoing.
Establishment of Procedures for Site Inspections and Enforcement	The VBWD Inspector reviews VBWD-permitted sites for compliance with the VBWD Rules and the VBWD Watershed Management Plan. The VBWD Inspector regularly reports to the VBWD Board of Managers and actions are based on the enforcement procedures outlined in the VBWD Rules and VBWD Watershed Management Plan. If problems are found on permitted sites the Managers typically have the Inspector work with the permit holder to resolve the observed problems. If the Inspector gets no response, the Managers have their Engineer get involved. If still no response or remedy is provided, the VBWD attorney gets involved, typically working with the attorney of the community in which the project lies. These activities are ongoing.
BMP categories to be implemented	**Measurable goals and timeframes**
Documenting the Procedure for the Receipt and Consideration of Reports of Stormwater Noncompliance	During the VBWD Watershed Management Plan update process (currently in progress), the VBWD Board of Managers will consider documenting the process for notification by the public of potential non-compliance issues related to erosion and sediment control and stormwater management. This would be included in the draft of the VBWD Watershed Management Plan

	update by Summer 2014.

4. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

   David Bucheck, VBWD Board of Managers Presiden

E. MCM 5: Post-construction stormwater management

1. The Permit (Part III.D.5.) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement and enforce a post-construction stormwater management program. Describe your current program:

   VBWD Watershed Management Plan Section 4.4 summarizes the policies, procedures, etc. related to Stormwater Runoff Management and incorporation of Stormwater Runoff Management into the VBWD Rules (Rule 2). The VBWD has a permitting program that includes review of the proposed project site and stormwater management system for compliance with the VBWD Watershed Management Plan and the VBWD Rules before issuance of the VBWD Permit.

2. Have you established written procedures for site plan reviews that you will conduct prior to the start of construction activity? ☒ Yes ☐ No

3. Answer **yes** or **no** to indicate whether you have the following listed procedures for documentation of post-construction stormwater management according to the specifications of Permit (Part III.D.5.c.):

   a. Any supporting documentation that you use to determine compliance with the Permit (Part III.D.5.a), including the project name, location, owner and operator of the construction activity, any checklists used for conducting site plan reviews, and any calculations used to determine compliance? ☒ Yes ☐ No

   b. All supporting documentation associated with mitigation projects that you authorize? ☒ Yes ☐ No

   c. Payments received and used in accordance with Permit (Part III.D.5.a.(4)(f))? ☒ Yes ☐ No

   d. All legal mechanisms drafted in accordance with the Permit (Part III.D.5.a.(5)), including date(s) of the agreement(s) and names of all responsible parties involved? ☒ Yes ☐ No

   If you answered **no** to any of the above permit requirements, describe the steps that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met.

4. List the categories of BMPs that address your post-construction stormwater management program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

   Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the BMPs. Refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (http://www.epa.gov/npdes/pubs/measurablegoals.pdf). **If you have more than five categories**, hit the tab key after the last line to generate a new row.

Established BMP categories	Measurable goals and timeframes
Development and Implementation of Structural and/or Nonstructural BMPs	The VBWD Board of Managers recently revised the VBWD rules, which includes Rule 2: Stormwater Runoff Management. The rules adopted by the VBWD align with the MPCA's Minimal Impact Design Standards (MIDS), including control of discharge volume, total suspended solids, and phosphorus. Additional information related to Stormwater Runoff Management can also be found in the VBWD Watershed Management Plan, including Section 4.4. The VBWD permit program reviews proposed projects for compliance with the VBWD Rules and the VBWD Watershed Management Plan prior to issuance of the VBWD Permit. All permits issued in a given year are summarized in the VBWD Annual Report. All of these activities are ongoing.

Regulatory Mechanism to Address Post Construction Runoff from New Development and Redevelopment	The VBWD Board of Managers recently revised the VBWD rules, which includes Rule 2: Stormwater Runoff Management. Additional information related to Stormwater Runoff Management can also be found in the VBWD Watershed Management Plan, including Section 4.4. The VBWD permit program reviews proposed projects for compliance with the VBWD Rules and the VBWD Watershed Management Plan prior to issuance of the VBWD Permit. All permits issued in a given year are summarized in the VBWD Annual Report. All of these activities are ongoing.
Long-term Operation and Maintenance of BMPs	Section 4.5 of the VBWD Watershed Management Plan outlines the operation and maintenance responsibilities of the VBWD for the storm sewer system and structures under its jurisdiction. The VBWD performs annual inspections of its systems and performs any necessary maintenance. Additionally, for all VBWD permitted projects, a maintenance agreement between the land owner and VBWD is required, as outlined in Rule 2 of the VBWD Rules. Land used for stormwater management facilities are also preserved by dedication and/or perpetual easement to the VBWD or another MS4, also outlined in Rule 2 of the VBWD Rules.

BMP categories to be implemented	**Measurable goals and timeframes**

5. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

   David Bucheck, VBWD Board of Managers President

F. MCM 6: Pollution prevention/good housekeeping for municipal operations

1. The Permit (Part III.D.6.) requires that, within 12 months of the date permit coverage is extended, existing permittees shall revise their current program, as necessary, and continue to implement an operations and maintenance program that prevents or reduces the discharge of pollutants from the permittee owned/operated facilities and operations to the small MS4. Describe your current program:

   The VBWD does not have any employees, equipment, roads, storage facilities, or facilities (e.g. buildings) that require good housekeeping. The VBWD inspects its storm sewer system and structures annually and performs maintenance as needed.

2. Do you have a facilities inventory as outlined in the Permit (Part III.D.6.a.)? ☐ Yes ☒ No

3. If you answered **no** to the above permit requirement in question 2, describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, this permit requirement is met:

   The VBWD does not have any employees, equipment, roads, storage facilities, or facilties (e.g. buildings) that require good housekeeping and therefore an inventory is not necessary.

4. List the categories of BMPs that address your pollution prevention/good housekeeping for municipal operations program. Use the first table for categories of BMPs that you have established and the second table for categories of BMPs that you plan to implement over the course of the permit term.

   Include the measurable goals with appropriate timeframes that each BMP category will be implemented and completed. In addition, provide interim milestones and the frequency of action in which the permittee will implement and/or maintain the

BMPs. For an explanation of measurable goals, refer to the EPA's *Measurable Goals Guidance for Phase II Small MS4s* (http://www.epa.gov/npdes/pubs/measurablegoals.pdf).

If you have more than five categories, hit the tab key after the last line to generate a new row.

Established BMP categories	**Measurable goals and timeframes**
Municipal Operations and Maintenance Program	There is limited activity included as part of this BMP, as VBWD does not have any employees or owns any equipment. However, in 2014, the VBWD will be supporting communities by developing presentations used for staff trainings (in relation to stormwater) in cities within the VBWD. Maintenance of the VBWD's MS4 is done as determined needed after VBWD's annual inspections or special inspections. This work is performed annually or as needed.
Street Sweeping	No BMP is planned as VBWD does not own any roads.
Annual Inspection of All Structural Pollution Control Devices	VBWD performs annual inspections of the VBWD storm sewer system and structures, typically in the fall of the year. The inspection results are presented to the Board of Managers and any observations requiring maintenance are discussed and incorporated into the following year's maintenance program.
Inspection of a Minimum of 20% of MS4 Outfalls, Sediment Basins and Ponds each year on a rotating basis	VBWD performs annual inspections of the VBWD storm sewer system and structures, typically in the fall of the year. The main structures of the system (e.g., lake outlet structures/control structures) are inspected every year. The manholes are inspected on a 3-year rotating cycle.
Annual Inspections of All Exposed Stockpile, Storage, and Material Handling Areas	No BMP is planned as VBWD has no storage facilities.
Inspection Follow-up Including the Determination of Whether Repair, Replacement, or Maintenance Measures	VBWD performs annual inspections of the VBWD storm sewer system and structures, typically in the fall of the year. The inspection results are presented to the Board of Managers and any observations requiring maintenance are discussed and incorporated into the following year's maintenance program. The VBWD performed and inventory in 2005-2007 of stormwater ponds throughout the district (all of the stormwater ponds are under the jurisdiction of municipal MS4s and other cities/towns) to help the other MS4s/cities prioritize maintenance of these ponds. However, it is the responsibility of the other MS4s to maintain these BMPs.
Record Reporting and Retention of All Inspections and Responses to Inspections	VBWD performs annual inspections of the VBWD storm sewer system and structures, typically in the fall of the year. The annual inspection includes the collection of field notes and taking photographs of the structures. The inspection results are presented to the Board of Managers and any observations requiring maintenance are discussed and incorporated into the following year's maintenance program.
Evaluation of Inspection Frequency	The VBWD inspection of the storm sewer system is reviewed annually as part of the VBWD budget setting process.
Inventory of facilities that contribute to stormwater discharges	There is limited activity included as part of this BMP as VBWD does not have any facilities (buildings, etc.) that it manages.

BMP categories to be implemented	**Measurable goals and timeframes**

5. Does discharge from your MS4 affect a Source Water Protection Area (Permit Part III.D.6.c.)? ☐ Yes ☒ No

   a. If **no**, continue to 6.

b. If **yes**, the Minnesota Department of Health (MDH) is in the process of mapping the following items. Maps are available at http://www.health.state.mn.us/divs/eh/water/swp/maps/index.htm. Is a map including the following items available for your MS4:

1) Wells and source waters for drinking water supply management areas identified as vulnerable under Minn. R. 4720.5205, 4720.5210, and 4720.5330? ☐ Yes ☐ No

2) Source water protection areas for surface intakes identified in the source water assessments conducted by or for the Minnesota Department of Health under the federal Safe Drinking Water Act, U.S.C. §§ 300j – 13? ☐ Yes ☐ No

c. Have you developed and implemented BMPs to protect any of the above drinking water sources? ☐ Yes ☐ No

6. Have you developed procedures and a schedule for the purpose of determining the TSS and TP treatment effectiveness of all permittee owned/operated ponds constructed and used for the collection and treatment of stormwater, according to the Permit (Part III.D.6.d.)? ☐ Yes ☒ No

7. Do you have inspection procedures that meet the requirements of the Permit (Part III.D.6.e.(1)-(3)) for structural stormwater BMPs, ponds and outfalls, and stockpile, storage and material handling areas? ☒ Yes ☐ No

8. Have you developed and implemented a stormwater management training program commensurate with each employee's job duties that:

a. Addresses the importance of protecting water quality? ☐ Yes ☒ No

b. Covers the requirements of the permit relevant to the duties of the employee? ☐ Yes ☒ No

c. Includes a schedule that establishes initial training for new and/or seasonal employees and recurring training intervals for existing employees to address changes in procedures, practices, techniques, or requirements? ☐ Yes ☒ No

9. Do you keep documentation of inspections, maintenance, and training as required by the Permit (Part III.D.6.h.(1)-(5))? ☐ Yes ☒ No

If you answered **no** to any of the above permit requirements listed in **Questions 5 – 9**, then describe the tasks and corresponding schedules that will be taken to assure that, within 12 months of the date permit coverage is extended, these permit requirements are met:

VBWD storm sewer system and structures does not include any stormwater ponds. As a result, VBWD does not developed a procedure and schedule for the purpose of determining the TSS and TP treatment effectiveness. As previously mentioned, the VBWD peformed a pond inventory from 2005-2007 to help the other municipal MS4s/cities prioritize maintenance of the stormwater ponds under their jurisdiction.

The VBWD does operate a monitoring station at the outlet of Rest Area Pond including flow monitoring as well as water quality sampling. The outlet from the Rest Area Pond is the last inlet into the VBWD Project 1007 storm sewer system before its final outfall into the MnDOT system and ultimately Lake St. Croix.

The VBWD does not have employees or manage facilities that would require the development of a stormwater management training program based on each employee's duties.

10. Provide the name or the position title of the individual(s) who is responsible for implementing and/or coordinating this MCM:

David Bucheck, VBWD Board of Managers President

VI. Compliance Schedule for an Approved Total Maximum Daily Load (TMDL) with an Applicable Waste Load Allocation (WLA) (Part II.D.6.)

A. Do you have an approved TMDL with a Waste Load Allocation (WLA) prior to the effective date of the Permit? ☒ Yes ☐ No

1. If **no**, continue to section VII.

2. If **yes**, fill out and attach the MS4 Permit TMDL Attachment Spreadsheet with the following naming convention**:** *MS4NameHere_TMDL.*

This form is found on the MPCA MS4 website: http://www.pca.state.mn.us/ms4.

VII. Alum or Ferric Chloride Phosphorus Treatment Systems (Part II.D.7.)

A. Do you own and/or operate any Alum or Ferric Chloride Phosphorus Treatment Systems which ☐ Yes ☒ No

are regulated by this Permit (Part III.F.)?

1. If **no**, this section requires no further information.
2. If **yes**, you own and/or operate an Alum or Ferric Chloride Phosphorus Treatment System within your small MS4, then you must submit the Alum or Ferric Chloride Phosphorus Treatment Systems Form supplement to this document, with the following naming convention: *MS4NameHere_TreatmentSystem*.

   This form is found on the MPCA MS4 website: http://www.pca.state.mn.us/ms4.

VIII. Add any Additional Comments to Describe Your Program

List of Tables

4.6 Wetland, Habitat, and Shoreland Management

4.6.1 Importance	Wetlands are an abundant resource within the VBWD, providing value to the community. Wetlands come in many different shapes, sizes, and types and perform a variety of physical, chemical, and ecological functions. A healthy watershed is one in which wetlands are an integral part of the ecosystem. Wetlands are among the most productive ecosystems in the world. These resources serve as habitat and support an immense variety of species of microbes, plants, insects, amphibians, reptiles, birds, fish, and mammals. Wetlands supply recreational and aesthetic benefits, flood reduction benefits, biodiversity, low stream flow augmentation, enhance property values, serve as sources for groundwater recharge and discharge, provide nutrient cycling, provide wildlife habitat and provide fishery resources. Shoreland areas provide many of the same environmental functions as wetlands, including nutrient removal, flood reduction, and wildlife habitat. Shoreland areas are desirable locations for people to live, and as such, become a critical interface of human and natural habitats. Managing shoreland areas with consideration for their ecological functions is necessary to prevent degradation of these resources. Well-planned wetland, habitat, and shoreland protection and management efforts can have far-reaching benefits within the watershed and beyond. Active management of these areas can improve water quality and wildlife habitat, improve property values, and provide recreational and educational opportunities for the public.
4.6.2 General Issues	Wetland, habitat, and shoreland quality is closely linked to the surrounding environment and land use. The quality of wetlands or shoreland is dependent on the hydrology and the physical conditions of the resource and its watershed (e.g., extent and type of development). Hydrology and ecology are dependent on the weather, the topography of the landscape, the soils, the land cover, and other factors. Changes to any of these factors will influence the quality of a wetland. Preservation of wetlands and shoreland areas is governed by various local, state, and federal laws. Effective wetland management depends on an accurate inventory and classification of wetland resources, especially in areas expected to develop soon, and administration of a wetland management program, developed with input from community residents and agencies. Similar practices are necessary to effectively manage shoreland areas, although most shoreland areas in the VBWD are already developed, which can limit management options.

4.6.3 Mission	Healthy and well-managed wetland, habitat, and shoreland resources can be maintained by: Understanding and responding to the effects of community growth and related activities on groundwater and surface water resources. Preserving and enhancing the quantity and quality of wetlands within the VBWD. Educating and inspiring our residents, communities, and governmental units to participate in the protection and improvement of water resources within the VBWD.
4.6.4 Policies to Accomplish Mission	WL-A. The VBWD will continue to implement VBWD rules and regulations addressing wetland management standards and a wetland management classification system. WL-B. The VBWD will continue to administer the Wetland Conservation Act (WCA) as the local governmental unit (LGU) within the watershed. WL-C The VBWD will update wetland inventories and assessments in targeted areas of the VBWD, as necessary. The VBWD will coordinate with agencies, local government units, technical evaluation panel members, and other groups to share the results of the inventories, assessments, and classifications, as necessary. The VBWD will explore partnerships and potential projects related to wetland management. WL-D The VBWD will complete inventories of targeted shoreland areas to identify shoreland management issues and consider the development of shoreland management standards. WL-E The VBWD will develop an invasive vegetation education program. WL-F The VBWD will consider impacts and benefits to fish and wildlife habitat when designing VBWD projects and reviewing projects proposed by others that impact land and water resources within the VBWD.

4.6.5 History Related to Wetlands

The VBWD was one of the first watershed districts to recognize the multiple benefits of wetlands by implementing wetland protection rules. From the formation of the VBWD in 1968 until the completion of Project 1007 in 1987, the VBWD primarily focused on solving flooding problems. During this time, the VBWD regulated storage volumes in wetlands to prevent increased flooding impacts. On December 13, 1990, the VBWD adopted revised Rules and Regulations which

specifically included provisions for wetland protection. The rules required that permits be obtained for dredging, ditching, excavating, or placing of fill in wetlands. Where alterations could not be avoided, lost wetland acreage was required to be replaced at a rate not less than 1.5 times the area of the alteration.

In 1991, reacting to public concern about Minnesota's disappearing wetlands, the Minnesota Legislature approved, and Governor Arne Carlson later signed into law, the Wetland Conservation Act (WCA), one of the most sweeping wetlands protection laws in the country. An interim program became effective January 1, 1992. On January 1, 1994, the full program began. The Legislature has significantly amended the WCA several times since its inception. The VBWD became the local government unit (LGU) administering the WCA and developed draft wetland rules on November 9, 1994 adopting the WCA. The VBWD most recently revised its rules in 2013, and remains the responsible LGU for administering WCA.

4.6.5.1 Historical Wetland Identification

The Washington Conservation District (WCD) completed wetland inventory maps for the communities of Afton (1982), Lake Elmo (1982), and Baytown (1979). These maps are available through VBWD, the WCD, and the communities. In 1991 and 1992, the United States Fish and Wildlife Service finalized the National Wetland Inventory (NWI) Maps which cover VBWD. The NWI is periodically updated based on available imagery, with portions of the VBWD last updated in 2005. The NWI maps show over 1,000 wetlands in VBWD. Copies of NWI maps can be obtained from VBWD or the WCD.

The Metropolitan Mosquito Control District maps mosquito breeding sites on aerial photos, according to township, range, and section. Mosquito breeding sites include naturally flooded wetlands as well as temporary pools and artificial containers containing water after rainfall. The maps are used internally by the Metropolitan Mosquito Control District, unless a specific concern arises, and are available for inspection.

The Minnesota Department of Natural Resources (MDNR) conducted an inventory and identification of Public Waters in Minnesota in the late 1970s (see Section 3.8). The public waters inventory includes "public waters wetlands" (as identified by a "W" at the end of the MDNR's public waters inventory number assigned to that waterbody). Public waters wetlands are regulated by the Public Waters Work Permit program and Minnesota Statutes 103G. All MDNR public waters within the VBWD are identified on Figure 3-2 by their MDNR public waters number.

In 2007, the VBWD contracted with Barr Engineering Company, the Washington Conservation District, and another consultant to perform a District-wide wetland inventory, using the Minnesota Rapid Assessment Method for Evaluating Wetland Functions (MnRAM) to assess 531 wetlands. The remaining wetlands were inventoried and assessed in 2008 and 2009. In addition to the District-wide assessment, the VBWD requires project proposers submitting plans to the VBWD to perform an inventory of wetlands located within the proposed project site.

The VBWD administers the WCA within its boundaries. As the LGU, the VBWD certifies wetland banks within the District (i.e., areas of restored or constructed wetlands that may be purchased to satisfy mitigation requirements). In 2006, the VBWD certified a wetland bank within the City of Lake Elmo. The VBWD is currently working to create a wetland bank within the Wildflower Shores subdivision in Lake Elmo.

4.6.5.2 Wetland Regulations

Several agencies regulate wetlands within the VBWD, including:

- U.S. Army Corps of Engineers
- Minnesota Pollution Control Agency
- Minnesota Department of Natural Resources
- National Resource Conservation Service
- Valley Branch Watershed District
- City of Mahtomedi
- City of Maplewood
- City of Oak Park Heights
- City of Woodbury

Table 4.6- 1 summarizes the various wetland regulations and responsible agencies.

In addition to contacting VBWD, potential permittees are encouraged to also contact the U.S. Army Corps of Engineers (USACE), the MDNR, and the Minnesota Pollution Control Agency (MPCA) for wetland permit information. State and local wetland regulation programs are described in this section.

Table 4.6- 1 Summary of Wetland Regulatory Entities

Administrative Unit	Regulation	Regulatory Authority	Activities Regulated	Regulatory Trigger	Compensatory Ratio[1]	Mitigation Location
U.S. Army Corps of Engineers (USACE)	Section 10 Rivers & Harbors Act	Navigable Waters	Work in, over, or under affecting navigable capacity	Any work affecting the navigable capacity	Subjective	Subjective
	Section 404 of the Clean Water Act	Waters of the U.S. including some wetlands	Discharge of dredged or fill material and some cases excavation	Generally any fill activities	1.5:1	Starting close to impact site and working out
National Resource Conservation Service (NRCS)[2]	Food Securities Act of 1985, Swampbuster	Wetlands in agricultural areas	Alteration of wetlands for agricultural uses	Alterations on lands receiving US Department of Agriculture subsidies	1.5:1	Subjective
Minnesota Pollution Control Agency (MPCA)	Section 401 of the Clean Water Act	Waters of the U.S. including some wetlands	Work in navigable waters or fill in waters of the U.S.	Section 404 individual permit or Section 10 permit	Subjective, usually covered by Section 10 or 404 permit	Subjective
	Minnesota Rules 7050	Waters of the state (wetlands)	Water quality standards in wetlands	Work resulting in non-stormwater discharge to wetlands	Not applicable	Not applicable
Minnesota Department of Natural Resources (MDNR)	Public Waters Permit Program	Public Waters, Type 3, 4, or 5 wetlands and streams up to the ordinary high water level	Changing the course, current, or cross section	Any change other than exempt activities such as sand blankets	Variable from 2:1 to 6:1	Starting close to impact site and working out
Valley Branch Watershed District (VBWD)	Wetland Conservation Act of 1991	Wetlands defined by the Corps 1987 Wetland Delineation Manual	Filling or draining wetlands and excavating in Type 3, 4, or 5 wetlands	Greater than the deminimis area which ranges from 400 square feet to 2000 square feet	2:1	Starting close to impact site and working out
	VBWD Rules and Regulations	Wetlands defined by the WCA, as amended	Filling, draining, or excavating.	Any activities altering a wetland.	2:1	Within the VBWD

Table 4.6- 1 Summary of Wetland Regulatory Entities

Administrative Unit	Regulation	Regulatory Authority	Activities Regulated	Regulatory Trigger	Compensatory Ratio[1]	Mitigation Location
City of Mahtomedi	City of Mahtomedi Wetlands Ordinance	Wetlands defined by U.S. Fish & Wildlife Service's National Wetlands Inventory (NWI)	Alterations (clearing, filling, draining or excavating) or development	Any alterations or development affecting a wetland	2:1	Within the City, with preference given to areas within the subwatershed
City of Maplewood	City of Maplewood Wetlands Ordinance	Wetlands as defined by the applicable watershed district using MNRAM	Alterations (filling, grading, draining, construction, etc.) , discharge to	Any alterations or development affecting a wetland	2:1	Per applicable watershed district rules
City of Oak Park Heights	City of Oak Park Heights Wetlands Ordinance	Wetlands defined by the WCA and MDNR, and adjacent upland buffers.	Filling, draining, or excavating.	Platting or issuance of a building permit on unplatted land and all new commercial development	Per WCA or MDNR Public Waters Permit Program	Per WCA or MDNR Public Waters Permit Program
City of Woodbury	City of Woodbury Environmental Management Ordinance	Wetlands as defined in MN Rules 7050.0130 subpart F	Draining, filling, or discharge to	Platting or issuance of permit for new development or redevelopment	Per WCA	Per WCA and applicable watershed district rules

[1] – Compensatory ratios required by the VBWD may be more stringent, and therefore supersede the compensatory ratios required by other regulating bodies

[2] – In Minnesota, the NRCS Swampbuster program is implemented in cooperation with the Minnesota Board of Water and Soil Resources (BWSR)

4.6.5.2.1 Public Waters Work Permit program, Minnesota Statutes 103G

The MDNR is the responsible agency for administering this program. The Public Waters Work Permit program was amended in 2000 and 2002 to minimize overlapping jurisdiction with the WCA. The MDNR jurisdiction over some activities (e.g., road and shoreline access) that would change the course, current, or cross-section of a public waters wetland (those designated with a "W" in the MNDR identification number), is automatically deferred to the LGU for administering the WCA (in this case the VBWD). For other activities in public waters wetlands, the MDNR has the discretion to selectively defer jurisdiction to the LGU. The MDNR retains jurisdiction over all public waters (those designated with a "P" in the MDNR identification number). For projects in which the MDNR waives jurisdiction or projects adjacent to a public water or public waters wetland, an MDNR representative must be included on the Technical Evaluation Panel (TEP). The VBWD has accepted the MDNR's deferred jurisdiction on a case-by-case basis. For projects in which the MDNR maintains jurisdiction, an individual MDNR permit is required following MDNR rules and WCA sequencing and replacement rules. For all projects involving public waters or public waters wetlands, the VBWD coordinates with the MDNR. Figure 3-14 shows the MDNR Public Waters Inventory (PWI).

The legislative amendments passed in 2000 also allow the MDNR to reclassify public water wetlands. The changes establish a case-by-case process to allow the MDNR to initiate changes to the Public Waters Inventory (PWI), which include:

- Reclassifying public waters wetlands as public waters if the wetlands have a shoreland classification, are deepwater or lacustrine wetlands, or have state or federal ownership, and

- Removing public waters wetlands from MDNR jurisdiction and placing them under WCA jurisdiction.

The MDNR must obtain approval of all LGUs for the changes to become effective. No formal sorting process has been initiated by MDNR for reclassifying all public water wetlands.

4.6.5.2.2 Wetland Conservation Act of 1991, Minnesota Rules Chapter 8420

Local Government Units (LGUs) are responsible for administering the Wetland Conservation Act (WCA) rules (Minnesota Rules 8420). The purpose of the WCA is to maintain and protect Minnesota's wetlands and the benefits they provide. To retain the benefits of wetlands and reach the legislation's goal of no-net-loss of wetlands, WCA requires anyone proposing to drain, fill, or excavate a wetland to first try to avoid disturbing the wetland; second, to try to minimize any impact on the wetland; and, finally, to replace any lost wetland acres, functions, and values. Certain wetland activities are exempt from the act, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

The WCA rules require that drained and filled wetlands be replaced at replacement ratios of between 1:1 and 2.5:1 (depending upon the location of impact, location of replacement, and timing or

replacement). Local units of government may have more restrictive wetland regulations. The MDNR is included in enforcement of the WCA and is responsible for identification, protection and management of calcareous fens. The WCA allows for the preparation of wetland management plans by LGUs that may give them more flexibility through a regional wetland analysis. These plans need to go through a public review process and become effective upon adoption by the LGU if the Board of Water and Soil Resources (BWSR) does not disapprove it.

The Minnesota Legislature amended the WCA several times since its inception, mostly to accommodate varying needs of different geographic areas in Minnesota. The current WCA rule was effective August 2009 with subsequent WCA statute changes effective in August 2011 and June 2012. More information about WCA guidance is provided at the BWSR website: http://www.bwsr.state.mn.us/wetlands/wca/index.html

The VBWD is the LGU administering the WCA throughout the VBWD. As part of administering the WCA rules, the VBWD is responsible for making determinations on the accuracy of wetland delineations, wetland functions and values assessments, and wetland replacement plans, often with review and input by the TEP. For all projects proposing to impact more than 10,000 square feet of wetland, the VBWD must send a copy of the application to the TEP, MDNR and any persons who have requested notification. The parties notified are invited to submit comments during a review period that must be at least 15 days long (per Minnesota Statute 103G).

4.6.5.2.3 State Water Quality Standards, Minnesota Rules 7050

The MPCA is the agency responsible for administering the state water quality standards (Minnesota Rules 7050). The rules include water use classifications and water quality standards for wetlands that are narrative rather than numerical. The rules include a mitigative process to protect wetlands from significant adverse impacts and to maintain nondegradation of wetland designated uses. Although not prohibited, the MPCA discourages the use of wetlands for stormwater treatment.

4.6.5.2.4 City Wetland Regulation

The Cities of Mahtomedi, Maplewood, Oak Park Heights, Woodbury, and Lake Elmo enforce wetland and/or shoreland regulations/ordinances within their respective cities. These ordinances are applicable in addition to WCA and VBWD rules. Specific regulations vary by city, but generally require buffers and/or building setbacks from wetlands and public waters (with distances varying by wetland classification, but ranging up to 100 feet for the highest quality waterbodies). Proposers of projects located in these cities are encouraged to review the regulations and permit requirements applicable within these jurisdictions.

4.6.5.2.5 Valley Branch Watershed District Rules and Regulations

The VBWD rules and regulations incorporate the WCA rules, but the rules also have additional wetland restrictions that are not included in the WCA. Most notably, the VBWD rules and regulations include dredging, ditching, and excavation as regulated activities in all wetlands as

defined in the WCA. The VBWD allows excavation of some wetlands when the following conditions are met:

- The applicant can demonstrate the activity will not affect any property owners contiguous to the wetland
- The excavated material will not be placed in a wetland
- The wetland is classified as a VBWD Manage 2 wetland (see Appendix D of the VBWD Rules and Regulations and Section 4.6.7)
- No more than 50 percent of a Type 1, Type 2, or Type 6 wetland (as defined by the U.S. Fish and Wildlife Service's Circular 39) is excavated (unless it is an approved action listed in Minnesota Rules 8410.0526 and will not result in conversion of wetland to upland or deep water habitat greater than 2 meters in depth)

The VBWD also requires the establishment or protection of an upland buffer around wetlands for all permitted activities (see Appendix A-4.5 – VBWD Rules and Regulations and Section 4.6.6.2).

4.6.5.3 MDNR Shoreland Regulation

The consequences of unregulated shoreland development may include increased risks of flooding, water quality degradation, scenic degradation, and decreased property values. In recognition of the value of the state's water resources and their adjacent lands, the Minnesota Legislature enacted the Shoreland and Flood Plain Management Act in 1969. This was followed by the Minnesota Wild and Scenic Rivers Act in 1973. These statutes enabled the MDNR to establish standards and criteria that are periodically reviewed and amended. On July 3, 1989, the Minnesota State Legislature adopted the revised statewide standards for shoreland management. Draft updates to the shoreland management standards were proposed in 2010, but have not been adopted.

The current Minnesota statewide shoreland management standards apply to all public waters greater than 10 acres in municipalities (and 25 acres in unincorporated areas) and rivers with a drainage area greater than two square miles. The Shoreland Management Act regulates all land within 1,000 feet of public waters and 300 feet of rivers (and their designated floodplains). The standards specify minimum structure setbacks based on classifications for lakes (i.e., natural environment, recreational development, general development) and rivers (e.g., remote, agriculture, urban), and whether a property is connected to a municipal sanitary sewer system. MDNR classifications with respect to shoreland management requirements are available from the MDNR website: http://www.dnr.state.mn.us/shorelandmgmt/guide/classification.html

The MDNR has published a sample shoreland ordinance for cities to use as a template when establishing their own shoreland management ordinances. The sample ordinance regulates development and other land alterations in shoreland areas, and places special requirements on

shoreland alterations, including vegetation alterations, grading, filling, and stormwater management. The sample ordinance includes stormwater management requirements such as:

- Limitations on the percentage of impervious area for each zoning designation
- Preferred use of existing natural drainage ways, wetlands, and vegetated land for stormwater management
- Stormwater management designs that use surface drainage, vegetation, and infiltration rather than buried pipes and constructed materials/facilities when existing features are not sufficient to adequately manage stormwater
- Filtering or settling of suspended solids and skimming of surface debris prior to discharge for newly constructed stormwater outfalls to public waters

4.6.6 Identified Wetland, Habitat and Shoreland Management Issues

The VBWD faces several issues related to the management of wetlands, habitat and shoreland areas, including existing issues carried over from the 2005 Plan as well as emerging issues. This section discusses the wetland, habitat and shoreland management concerns identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Issues identified by the parties listed above were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. The VBWD Managers considered the results of that workshop and identified and organized the wetland, habitat and shoreland management concerns into the following four topics:

1. Maintaining ecological functions of wetland and shoreland areas (e.g., hydrology, water quality, connectivity, and habitat)
2. Wetland and shoreland buffers
3. Native and invasive vegetation
4. Education

Wetland, habitat and shoreland management issues that pertain to particular waterbodies or watersheds are discussed in Section 5 – Subwatershed Management Plans.

4.6.6.1 Maintaining Ecological Functions of Wetlands and Shoreland Areas

Diverse wetland systems and shoreland areas are critical components of a healthy hydrologic system and positively affect soil systems, groundwater and surface water quality and quantity, wildlife, fisheries, aesthetics, and recreation. The benefits of wetlands and shoreland can be compromised by hydrologic alterations, exotic and invasive species, and erosion and sedimentation. The effectiveness of wetland communities for wildlife habitat, and for human appreciation, is greatly increased when they are physically or functionally connected with other native communities.

4.6.6.1.1 Wetland Hydrology

The VBWD has a complex hydrologic system of landlocked waterbodies, confined and unconfined groundwater, natural surface water runoff conveyances, and controlled and managed surface water runoff features. Wetlands are a key element of the hydrologic system. Hydrologically, wetlands have several functions that can benefit humans and wildlife, including:

- Maintaining stream baseflow
- Providing flood storage
- Recharging groundwater
- Attenuating peak flows and providing erosion protection

The rolling topography in the VBWD leads to challenging water resources management issues as a result of development due to the many landlocked wetlands and lakes. An effective strategy for protecting human health and welfare against flooding is often to construct outlets from landlocked basins to increase predictability or control of floodplain impacts. This strategy, however, can negatively impact wetland systems by changing the natural hydrologic conditions under which the wetland developed, if the outlet is not constructed with consideration for these impacts.

Development of land also has the potential to change infiltration characteristics (i.e., spatial distribution, timing, and overall extent) which affect groundwater and ultimately many wetland systems, which are hydrologically connected to groundwater. In some areas of the VBWD, infiltration of precipitation and subsequent shallow groundwater flow can be a principal water source to some wetlands during portions of the year. In other areas, wetlands serve as collectors of precipitation and runoff and act as concentrated areas that contribute to recharging groundwater.

Many different human activities can affect the hydrology in wetlands. Numerous wetlands within the VBWD have already been affected by hydrologic alterations, but many have not. Some of the activities that can affect wetland hydrology include:

- Ditching and drain tiling; often for agricultural purposes, but also for flood control
- Groundwater pumping; typically from surficial aquifers, but also from confined aquifers

- Lowering natural outlet elevations; thereby draining water from areas that naturally flooded
- Watershed diversion; reducing the volume of water reaching a wetland
- Filling; can impact remaining wetland areas by increasing water level fluctuations
- Removal of wetland vegetation; often to improve access or for aesthetic reasons

4.6.6.1.2 Water Quality

Wetlands and shoreland areas are important for protecting and maintaining downstream water quality. Water quality within wetlands and shoreland areas is also important for maintaining the ecological integrity of the communities that inhabit these areas. Water quality is a primary focus of water management within the VBWD (see Section 4.1 – Water Quality).

Wetlands and shoreland areas naturally provide water quality benefits to downstream waters by:

- Preventing erosion by slowing flow velocities and intercepting wave action
- Allowing for sediment deposition by slowing flow velocities
- Physically filtering particulates (and pollutants attached to particulates) from runoff
- Biologically removing nutrients from runoff in some wetlands and at certain times of the year

However, overloading wetlands beyond their natural capacity with water, sediment or nutrients can diminish their effectiveness in providing water quality benefits.

Most natural wetland systems have developed with relatively low levels of sediment and nutrient inputs (riparian wetlands located in floodplains are an exception). When land use and/or upstream hydrologic systems become altered, the hydraulic, natural sediment, and nutrient loads can (and often do) increase in magnitude and frequency. These changes may result in tipping the ecological balance to benefit non-native and invasive plant species thereby reducing the benefits to wildlife, fisheries, amphibians, and humans. Degraded water quality in wetlands can pass on to downstream waters, contributing to degradation of additional resources.

4.6.6.1.3 Connectivity

In assessing the value of wetland communities for their benefit to water and wildlife, large wetland complexes composed of numerous wetland types are typically more valuable than small, monotype wetlands, and wetlands that are connected to other natural communities are more valuable than isolated units. When resources are either contiguous, or functionally connected by native vegetation, water or both, plant and animal species are better able to move, which can contribute to healthier populations. The benefits of connectivity are applicable to shoreland areas as well.

Connectivity can be accomplished by ensuring the protection of wetlands, shorelands, and natural connecting corridors in undeveloped areas (as well as during and after development). The VBWD's role in protecting and maintaining undeveloped, natural areas is less defined than its role regarding wetlands, waterbodies, and shoreland areas. Protection of undeveloped areas may require cooperation with cities and townships in their land-planning efforts. Connectivity may also be achieved by expanding and improving smaller patches of natural resources in developed areas, such as parks, shoreland buffer areas, and residential properties. The VBWD will consider connectivity issues during project planning and permit review to help protect the quality of wetland, shoreland, and habitat areas.

4.6.6.1.4 Wildlife, Fisheries, and Amphibian Habitat

The effectiveness of wildlife habitat relates to its quantity, quality and arrangement, and thus is dependent on the issues discussed in this section. Wetlands and shoreland areas provide valuable habitat for many types of wildlife including waterfowl, songbirds, raptors, mammals, fish, and many species of amphibians. It is difficult to determine the value of wetlands for wildlife due to the specialized requirements of each species. However, it is possible to determine wildlife, fisheries, and amphibian habitat values in a general sense.

Riparian buffers adjacent to shoreland areas maintain fish habitat by providing shade, keeping water temperature low enough in the summer to retain dissolved oxygen to support fish and to prevent lethal low temperatures in winter. Vegetation adjacent to streams provides a food source through leaf litter and insect drop and provides cover through deposition of large organic debris. By decreasing sediment loads, buffers reduce siltation of essential spawning ground and the destruction of aquatic invertebrates that are important fish food sources.

Maintaining and improving wildlife viability depends on setting management priorities (to prevent degradation and improve habitat quality) and ensuring that management activities consider the life cycles of various animals. (An example would be removing storm water sediment from a wetland supporting fisheries after the spawning season.) By considering benefits or detriments to wildlife when approaching natural resources and water resources projects, the VBWD will enrich the ecological fabric of the area and find more opportunities for partnership (and therefore funding) than otherwise.

4.6.6.2 Wetland and Shoreland Buffers

Buffers are upland, vegetated areas located adjacent to wetlands and shoreland areas. In agricultural land use areas, these are sometimes referred to as "filter strips," owing to their ability to remove pollutants carried by runoff prior to entering a wetland, pond, lake or stream.

Many of the hydrologic, water quality and habitat benefits achieved by wetland and shoreland areas (see Section 4.6.6.1) are directly attributable to or dependent on the presence of buffers. Vegetation and organic debris shield the soil from the impact of rain and bind soil particles with root materials, reducing erosion. Vegetation obstructs the flow of runoff, thereby decreasing water velocities,

allowing infiltration, and reducing the erosion potential of stormwater runoff. Leaf litter from vegetation can also increase the organic content of the soil and increase adsorption and infiltration. As a physical barrier, vegetation also filters sediment and other insoluble pollutants from runoff. Vegetation scatters sunlight and provides shade, reducing water temperature in the summer, limiting nuisance algae growth, and reducing the release of nutrients from the sediment. Buffers also have habitat benefits; native plants provide the best food and shelter for native wildlife, fish, and amphibians. Buffers provide needed separation and interspersion areas for animals, to reduce competition and maintain populations.

The presence of adequate buffers surrounding wetland and shoreland areas is critical to preserving the ecological functions and environmental benefits of downstream waterbodies, including wetlands (see Section 4.6.6.1). The VBWD recognized the importance of buffers, implementing a minimum 16.5-foot wetland buffer requirement for new development in 1996. The 2013 VBWD Rules and Regulations require upland vegetative buffers adjacent to lakes, streams, and wetlands. Specific buffer distances vary according to the type of VBWD waterbody (e.g., lakes versus streams). Establishing buffers in developed areas may be difficult, as existing structures may be located within the desired buffer area. Redevelopment poses an opportunity to establish adequate buffers in areas that are already developed.

4.6.6.3 Native and Invasive Vegetation

By nature, native plants are adapted to local conditions. When growing in their normal habitats (i.e., floodplains, shorelines, or wet meadows), under natural hydrologic conditions, with natural soil conditions, and in their natural diversity, native plants will withstand drought and flood conditions better than most non-native species.

Healthy, native plant communities provide several environmental benefits. The root systems of many native plants, including prairie grasses and flowers, help prevent soil erosion and encourage infiltration and ground water recharge. Plants provide a natural cycling of nutrients, slow runoff, and even protect shorelines from erosion (see Section 4.6.6.2).

While native wetland plant communities exist in the VBWD, numerous areas are degraded, and are less effective in performing beneficial ecological functions. The presence of non-native species and invasive species can impair the ecological, aesthetic, and recreational functions of wetland and shoreland areas. Not all non-native species are invasive; “invasive” refers to those non-native species that are able to out-compete, displace and even eliminate native species (i.e., some “non-native” species to the region are able to coexist with native species). Examples of invasive species include reed canary grass, buckthorn, Eurasian watermilfoil, tartarian honeysuckle, and purple loosestrife. The extent of invasive vegetation in shoreland areas of VBWD waterbodies is described in Section 4.1 – Water Quality. These invasive species provide fewer opportunities for wildlife and in many cases are less attractive to people and limit recreational uses of an area.

Under direction from the Minnesota Legislature, the MDNR established the Invasive Species Program in 1991. The program is designed to implement actions to prevent the spread of invasive species, including plants. Actions to remove invasive plants may require a permit from the MDNR, if the action occurs within a public water (including public water wetlands). The VBWD limits its management of invasive aquatic plants to instances where there is a demonstrated negative effect on water quality (see Section 4.1 – Water Quality). Water quality impacts of invasive species are described in Section 4.1 – Water Quality.

4.6.6.4 Education

Establishment, preservation, and enhancement of healthy wetland and shoreland systems depend on constituent education and collaboration with communities and regulatory agencies.

Wetlands and wetland regulations are generally not well-understood by the general public. When most people think of wetlands, they think of marshes with cattails, bulrushes and ducks. While those areas are wetlands, many wetlands look very different and may rarely ever have standing water present. Wetlands also provide public values that are often overlooked. Wetlands and shoreland areas are typically located on private property; proper management of these areas, to a degree, requires understanding and cooperation from property owners.

Education efforts serve to support protection and enhancement strategies, through increased public understanding and participation. Even though many of the wetland laws have been in place for over two decades, these laws are periodically revised, and many constituents may be unaware that wetlands are protected and the various restrictions on their use.

Developing programs that integrate volunteers is a way to maximize educational benefits. Volunteers gain a better understanding of the watershed and resources being protected, they are more likely to educate others and get others involved, and they feel a greater sense of personal accomplishment in witnessing improvement to their community.

4.6.7 Policy Details, Strategies, and Actions Related to Wetland, Habitat, and Shoreland Management

4.6.7.1 WL-A. Implementation of VBWD Rules and Regulations Regarding Wetland Management

The VBWD will continue to implement its wetland management standards as documented in its adopted Rules and Regulations (2013, as amended). The VBWD wetland management standards consider the wetland functions and values (quality). The VBWD requires:

1. Evaluation of all wetlands within the property of a proposed project according to the *Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.4* (MNRAM 3.4) wetland ranking methodology, or updated versions, and

2. Classification according to the VBWD's wetland management classification flowchart included in the VBWD Rules and Regulations (see Appendix A-4.5)

More information about MNRAM can be found on the BWSR website: www.bwsr.state.mn.us/wetlands/mnram/index.html. VBWD wetland management standards vary according to the wetland management classifications, which include (in order of decreasing quality):

1. Preserve
2. Manage 1
3. Manage 2

Standards applicable to the above wetland management classifications address the following wetland characteristics:

- Buffer width – the width of unmowed, naturalized strips of vegetation around the perimeter of the wetland (see Section 4.6.6.2)
- Bounce – the increase in water surface elevation following a storm event
- Inundation – the duration of time when the water surface elevation is above the wetland outlet following a storm event
- Runout control – limits on the volume of flow discharged from the wetland following a storm event

Runout control is not a guideline of MNRAM, but is an additional VBWD standard intended to meet the intent of the Wetland Conservation Act's purpose of avoiding direct or indirect impacts from activities that destroy or diminish the quantity, quality, and biological diversity of wetlands. In lieu of a project applicant submitting plans and calculations that show the hydrology (i.e., bounce, inundation, and runout) of wetlands will not be negatively impacted due to the proposed project, a 5-year wetland monitoring and maintenance plan must be submitted and approved by the VBWD Engineer prior to construction. Permit holders must submit annual reports to the VBWD for each monitoring year for five years after construction certification, with possible extensions of up to five years. The VBWD may perform vegetation management under some circumstances, at the expense of the permit holder. If at the end of five years the replacement wetland components meet the approved performance standards, future monitoring will not be required. If monitoring reveals that wetlands are negatively impacted by hydrology changes due to the project, the applicant will need to replace the lost wetlands.

The VBWD strongly encourages a pre-permit application meeting between the permit applicant, the VBWD, and the technical evaluation panel (TEP) for all projects involving potential wetland impacts and wetland banks.

The VBWD regulates all projects within the 100-year flood level of a wetland. Specific requirements and procedures for submittal of the Combined Wetland Permit Application (CWPA) and VBWD permit application are described in the VBWD Rules and Regulations (2013, as amended, see Appendix A-4.5).

The complete VBWD wetland management standards are presented in Appendix A-4.5 – VBWD Rules and Regulations.

4.6.7.2 WL-B. Administration of Wetland Conservation Act (WCA)

The VBWD has adopted the Minnesota Wetland Conservation Act of 1991, (Minnesota Laws 1991 Chapter 354, codified as Minnesota Statute Sections 84 and 103, as amended), and the accompanying rules of BWSR (Minnesota Rules Chapter 8420, as amended), collectively referred to as the WCA and the WCA Rules, respectively.

The VBWD will continue to serve as the local government unit (LGU) administering the WCA throughout the VBWD, as long as the cities and townships in VBWD continue to designate the VBWD as the LGU. The LGU responsible for administering the WCA on state land is the agency with responsibility for the land (e.g., MnDOT). For all projects requiring a VBWD permit, the VBWD will continue to administer the wetlands management provisions of its rules and regulations, regardless of LGU status for the WCA. In addition, in the event that the WCA should ever be repealed, the VBWD will incorporate the WCA requirements into the VBWD rules and regulations.

The VBWD will continue to accept the MDNR's waived permit jurisdiction for Public Waters Work Permit program projects on a case-by-case basis. In these cases, a MDNR representative will be included on the TEP.

4.6.7.3 WL-C & WL-D. Wetland and Shoreland Inventories and Assessments

The VBWD will complete and/or update wetland inventories and assessments in targeted areas of VBWD as necessary, or at the request of the cities and townships. VBWD will share the wetland inventory and assessment information with the staff of local units of government, since they are usually the first point of contact for developers. Inventories and assessments will be performed according to the *Minnesota Routine Assessment Method for Evaluating Wetland Functions, Version 3.4* (MNRAM 3.4) wetland ranking methodology, or updated versions.

The VBWD will evaluate the wetland functional assessment data and seek input from the stakeholders to identify opportunities to preserve high quality resources, to restore degraded resources, and to restore drained wetlands, or create new wetlands. Using the wetland inventory, assessment and management classification data, the VBWD will prioritize opportunities for preservation, enhancement, restoration, and creation of wetlands within the VBWD. All of Washington County is designated by the State of Minnesota as a "High Priority Region," due to the loss of more than 50 percent of the original wetlands in the region.

The VBWD will maintain a comprehensive database containing wetland function, location, type, size, hydrologic setting, and vegetation data, along with a number of other specific function and value parameters that are used to determine the overall functional ratings for each wetland, as well as the VBWD management classification. The GIS database will contain spatial data for each wetland with the ability to use all pieces of data to conduct spatial analyses or create maps.

The VBWD will consider developing an inventory of shoreland areas, focusing on VBWD high priority waterbodies and utilizing data from past and present VBWD monitoring programs (see Section 4.1). The inventory would be used to track results of macrophyte monitoring, classify shoreland areas according to their overall quality, and prioritize areas for preservation, enhancement, or restoration. The VBWD will consider the value of developing a shoreland management classification system based on applicable elements of MNRAM 3.4. Based on the shoreland data collected as part of the inventory and assessment, the VBWD will consider the need for additional shoreland management standards (note that the VBWD's current wetland management standards include management standards applicable to the shorelines of streams and lakes, in addition to wetlands).

4.6.7.4 WL-E. Develop Invasive Vegetation Education Program

Invasive plant species are a problem affecting many wetlands and shoreland areas in the VBWD (see also Section 4.1 – Water Quality). Management of invasive species requires an informed community and pro-active land stewardship throughout the watershed.

The VBWD will establish an invasive species education program to better inform its residents of the extent and impact of invasive species. The VBWD will consider establishing a "library" of invasive species control materials (brochures, flyers, websites, etc.) to accompany requests for information from residents/developers, to facilitate a clear, consistent message regarding invasive species management. The VBWD may coordinate with the MDNR to create consistency with the MDNR's Invasive Species Program. By providing educational materials describing the problems, management techniques, and restoration techniques, the VBWD can effectively initiate good land stewardship throughout the VBWD.

The VBWD will continue to collaborate with cities, townships, lake associations, and other entities to perform focused aquatic invasive species management projects, as described in Section 4.1 – Water Quality.

4.6.7.5 WL-F. Consideration of Fish and Wildlife Habitat

Wetlands and other natural areas provide valuable habitat for many types of wildlife, including waterfowl, songbirds, raptors, mammals, fish, and amphibians. The quality of wildlife habitat is dependent on many of the issues discussed in previous sections. For example, increased connectivity between wetlands and natural areas generally results in natural communities that are more valuable than those in isolated areas.

The VBWD will consider the positive and negative impacts to wildlife habitat when designing projects and in its review of projects proposed by others. The VBWD will also seek opportunities to incorporate wildlife and habitat benefits into VBWD projects not expressly designed for these purposes (e.g., flood control projects). An example of this is the revegetation of Eagle Point Lake Dam, in which an erosion problem was addressed using methods that promote natural habitat (see Section 4.8 – Erosion and Sediment Control). In undertaking these measures, the VBWD will improve the ecological quality of its water resources and surrounding areas. The VBWD will consider the connectivity of wetlands and other natural areas in the design of VBWD projects and in its review of projects proposed by others. For example, the VBWD may consider existing and proposed greenway corridor plans, local comprehensive plans, and natural resource inventories when reviewing projects. The VBWD's buffer requirements and wetland protection standards help protect habitat connectivity.

List of Tables

4.7 Water Level and Floodplain Management

4.7.1 Importance	Flood protection was the first responsibility of the VBWD. This remains a primary responsibility and has expanded to cover all issues related to water quantity – flooding, low water levels, high flows, and low flows. Addressing flooding and water level issues continues to be a high priority because of the potential for causing damages to property and infrastructure, and the risk to human health. Flood protection will remain a high priority as the watershed continues to urbanize, which increases the potential for flooding as well as the consequences of flooding. The VBWD Managers have a responsibility to manage and mitigate flood problems to the degree possible. This means the VBWD Managers need to address existing flooding problems, prevent future flooding problems that can be avoided, and minimize the impact of future flooding problems that cannot be prevented. The VBWD Managers also recognize that maintaining an adequate quantity of water in the watershed's water resources (flows, water levels) is important for human enjoyment of the water resources and maintaining ecological benefits (e.g., wildlife habitat and fishery resources). The VBWD Managers will seek to manage the stormwater and water resources in the watershed to maintain adequate quantities of water in the water resources, allowing for natural fluctuations in the hydrologic cycle (e.g., drought).
4.7.2 General Issues	Water level and floodplain management issues are dependent on the hydrology and the physical conditions of the resource. Hydrology is dependent on the weather, the topography of the landscape, the soils, the land cover, and other factors. Changes to any of these factors will influence the water levels and floodplains of a water resource/basin. While some of the factors are difficult to control, changes to land cover can be regulated and/or managed to minimize negative consequences.
4.7.3 Mission	To manage and protect our water resources within the limits of VBWD jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Managing the quantity of water and minimizing the negative impact on the VBWD from floods, high flows, and droughts. Understanding and responding to the effects of community growth and related activities on groundwater and surface water resources.
4.7.4 Policies to Accomplish Mission	WL&FM-A. VBWD will continue to collect data (including lake levels, precipitation records, snowpack monitoring, and groundwater levels) to assist in managing the water levels and floodplains of the VBWD's water resources. WL&FM-B. VBWD will report data related to water levels and flooding (including lake levels, precipitation records, snowpack monitoring, and groundwater levels).

	WL&FM-C. The VBWD will re-evaluate potential flooding issues based on the latest precipitation data and determine the appropriate level of its involvement in addressing the remaining flooding problems on a case-by-case basis. If determined necessary, the VBWD will take the appropriate water level and floodplain management actions to address flooding problems in the VBWD. WL&FM-D. VBWD will operate, maintain, and replace (as necessary) current and future VBWD flood control systems (e.g., Project 1007) to ensure they provide the designed benefits. WL&FM-E. VBWD seeks to prevent flooding problems through permit review, community plan review, and education efforts.

4.7.5 History Related to Water Level and Floodplain Management

In November 1968, citizens petitioned the State of Minnesota to form the VBWD because they wanted a government unit to solve their flooding problems. In 1970, the VBWD completed its first watershed management plan (Overall Plan, 1970), which proposed a solution to the existing flooding problems. Through the Overall Plan, the VBWD proposed a flood relief system that would have connected most of the major lakes, depressions, and storage sites in the VBWD to Valley Creek (also known as Valley Branch Creek). The 1970 Overall Plan also established flood levels along the "main stem," which included Valley Creek, the major lakes, Raleigh Creek (at that time called Eagle Point Lake Fork) and the channels between the major lakes. To prevent future flooding, the 1970 Overall Plan called for VBWD review of proposed plats and subdivisions along the VBWD drainage system and floodplain, and for the acquisition of drainage easements at the time of development.

The 1976 VBWD report, *Water Management Plan for the Main Stem of Valley Branch Watershed District* (1976 Main Stem Plan), analyzed a number of alternatives to provide flood relief and prevent future flooding problems. As development continued in VBWD and water levels began rising, residents and local governmental units increased pressure on VBWD to plan and implement a flood relief project. VBWD proposed a number of projects (Projects 1001, 1002, 1003, 1004, 1005, 1006 and 1007) and implemented two: Project 1005 and Project 1007.

Project 1005 involved the pumping of floodwaters from Lake Jane to City Park Pond (west of Sunfish Lake), in the City of Lake Elmo. The project began in 1980 and continued until 1987. The pumping provided some relief, but was not a long-term solution to the Lake Jane flooding problems.

4.7.5.1 Project 1007

VBWD prepared its second watershed management plan (1987 VBWD Plan) to implement a project to relieve flooding problems on many of the lakes within VBWD. Per the 1987 VBWD Plan, VBWD completed construction of a $4.25 million flood relief project (Project 1007). Project 1007 links the

major lakes in the northwest and central portions of VBWD to an outlet pipe along Interstate Highway 94, eventually discharging to the St. Croix River (see Figure 3-1). The project included construction of new outlets for Long Lake, Lake Olson, Deer Pond, Hedges Pond, Hedges Bog, Lake Jane, Crombie Pond, Beutel Pond, Eagle Point Lake, Lake Elmo, Horseshoe Lake, West Lakeland Storage Site, and the Minnesota Department of Transportation's Rest Area Pond. Project 1007 also incorporated two regional storage sites (West Lakeland Storage Site and Rest Area Pond) that act as regional infiltration and detention basins. Project 1007 also incorporated water quality features (see Section 4.1.5). The outlets and other individual components of Project 1007 are discussed in more detail in the appropriate portions of Section 5 – Subwatershed Management Plans.

VBWD is the owner and operator of the Project 1007 outlet system, which is comprised of approximately five miles of pipe, 60 manholes and water level control structures (including over forty catch basins/manholes), two dams, and approximately two miles of open channels. VBWD is responsible for the maintenance and repair of the entire Project 1007 system to ensure it provides the designed benefits. VBWD has contracted for any major maintenance and/or repairs required for Project 1007 since VBWD does not have staff to perform such work. In the past, City of Lake Elmo staff, Washington County Parks staff, and #M's Tartan Park staff have performed maintenance for the VBWD. The VBWD's agreement with the Minnesota Department of Transportation (MnDOT) allows MnDOT staff to shut off flows from the West Lakeland Storage Site outlet (Structure 2B) into the Interstate 94 drainage system whenever MnDOT believes it is necessary. Also, VBWD's agreement with MnDOT states that VBWD is responsible for 80 percent of all costs incurred for repair, maintenance, and reconstruction of the Rest Area Dam, with MnDOT responsible for the remainder. The VBWD's agreement with MnDOT prohibits increasing the drainage area tributary to Project 1007.

Maintenance tasks for Project 1007 have included brush removal from ditches, mowing of ditches, debris removal from structures, debris and sediment removal from the upstream end of the Lake Elmo outlet structure (see Section 5.13), manhole and catch basin casting replacement, blocking stop log leaks, removing vegetation from the Crombie Pond outlet fish barrier, and sealing groundwater inflows to manholes (see Section 5.9). VBWD repaired erosion damage in ditches and along streambanks after the drought of 1987 to 1989 prevented the establishment of a good vegetative cover.VBWD inspects the Project 1007 system, Olson Lake Estates Outlet, Echo Lake Outlet, and Weber Pond Outlet each fall to ensure that the entire system is operating effectively in anticipation of spring runoff.

As the owner and operator of Project 1007, VBWD must maintain a municipal separate storm sewer system (MS4) general permit, granted by the Minnesota Pollution Control Agency (MPCA) (see Section 4.5 – Stormwater Runoff Management). The MS4 permit includes inspection requirements for stormwater system components. The MPCA updated the MS4 general stormwater permit in 2013. VBWD updated its MS4 permit in early 2014 to conform to the requirements of the updated general permit, including inspection requirements (see Section 4.5 – Stormwater Runoff Management). VBWD inspects one-third of its system every year, which means that the entire system is inspected within three years. VBWD inspects the system more frequently under high water conditions and at

the request of residents and governmental officials. As a result of the inspections, VBWD performs or contracts for any necessary maintenance and repair work. In response to dam safety permit requirements and/or agreements with MnDOT, VBWD prepared inspection, maintenance and operating plans for the Eagle Point Lake Dam and Rest Area Dam, which require that VBWD perform an annual inspection of these dams. For the Rest Area Dam, VBWD performs a joint inspection with MnDOT staff. The inspection, maintenance and operation plans for these dams provide details regarding the items to be inspected.

VBWD is responsible for operating the Project 1007, Olson Lake Estates Outlet, Echo Lake Outlet, and Weber Pond Outlet systems. When high snowmelt runoff is expected (more than three inches of water in the snowpack, as measured during VBWD snowpack monitoring), VBWD will implement lake lowering operations for the following lakes in the Project 1007 system:

- Horseshoe Lake
- Lake Elmo
- Lake Jane, Hedges Pond, and Hedges Bog
- Crombie Pond and Deer Pond
- Lake Olson and Lake DeMontreville
- Long Lake

VBWD lowers lake levels in accordance with the MDNR-approved operating plans for the above waterbodies. The control structures contain one or more removable stop logs. The amount of lake lowering depends on the amount of water in the snowpack; the higher the water content, the lower the target water elevation. The drawdown begins at the downstream end, Horseshoe Lake, and proceeds upstream. When Horseshoe Lake reaches its target elevation, then the lowering of Lake Elmo begins. When both Lake Elmo and Horseshoe Lake are at or near their target elevations, then the lowering of Lake Jane (and Hedges Bog and Hedges Pond), Crombie Pond (and Deer Pond), and Lake Olson (and Lake DeMontreville) begins. Long Lake lowering can begin immediately after stop logs have been removed from the Lake Jane, Crombie Pond, and Lake Olson control structures. Operating plans for these outlets are included as appendices to Section 5.0 – Subwatershed Management Plans.

In 1997 and 2001, VBWD temporarily lowered water levels after snowpack monitoring predicted threatening flood conditions if water levels were not lowered. The VBWD followed the lake lowering process described above. These drawdowns prevented flooding problems in the watershed. VBWD also continues snowpack monitoring after drawdown to determine if additional lowering of water levels is needed or if stop logs need to be placed back in the structures. It is important that stop logs be replaced quickly to ensure that water levels "recover" to their normal operating level as soon as natural precipitation or snowmelt runoff allows.

Project 1007 relieved many flooding problems, but does not provide 100-year flood protection for a number of low-lying homes located on the shores of Long Lake, Deer Pond, Lake Jane, and Lake Elmo, some of which were identified after the completion of Project 1007, based on higher resolution topographic data. Project 1007 included funds that were allocated to partially cover the cost of floodproofing these homes; VBWD called this the "residual floodproofing program". At the time of Project 1007, eighteen homes were identified as being in the floodplain. These eighteen homeowners were invited to take part in the residual floodproofing program. Four of the eighteen homeowners took part in the program, and an additional home was floodproofed after completion of Project 1007. Thirteen of the original eighteen homes identified during the planning and implementation of Project 1007 remain in the floodplain. No new homes have been constructed in the floodplain adjacent to Project 1007.

4.7.5.2 Activities following the 1995 Water Management Plan

Since completion of Project 1007, VBWD identified additional homes that appear to be located in the floodplains of major VBWD water bodies. VBWD identified these homes by comparing aerial photographs and two-foot contour mapping with 100-year flood levels. The total number of homes or other structures identified in the floodplains of the major water bodies within the VBWD are described in the appropriate portions of Section 5 – Subwatershed Management Plans.

Through implementation of its third plan (Water Management Plan, 1995), the VBWD completed the following water level control and floodplain management activities:

1. Study and construct Olson Lake Estates Pond outlet –VBWD constructed an outlet from the Olson Lake Estates Pond (in Oakdale) in 1996. The project included installation of pipe to carry water from the pond, located west of Lake Olson, to downstream of the Crombie Pond outlet pipe (part of Project 1007 system).

2. Modify the Lake Elmo outlet – In 1996, VBWD installed an extension on the Lake Elmo outlet pipe. The purpose of the outlet extension was to prevent the plugging of the outlet with sand and/or debris (especially leaves).

3. Restrict the Echo Lake and Weber Pond outlets – The VBWD worked with the city of Mahtomedi to construct a new restricted outlet from Echo Lake. The purpose of the restriction was to limit the flood level of Long Lake. In 1999, the city of Mahtomedi constructed the new outlet as required by a condition of a VBWD permit. In 2001, VBWD constructed a new restricted outlet from Weber Pond to replace the temporary outlet and to limit the flood level of Long Lake. Section 5.0 –Subwatershed Management Plans provides more details about the Echo Lake and Weber Pond outlet projects.

4. Study Capaul's Pond outflow – VBWD completed a study in 1999 (*Capaul's Pond Study*) to evaluate the drainage around Capaul's Pond, determine if drainage patterns had changed since 1994, and to evaluate the effect of diverting overflows from Capaul's Pond to the DeMontreville Highlands 3rd Addition Pond. Capaul's Pond and its related overflow had

caused flooding and tree damage in the past. Section 5.0 – Individual Watershed Plans provides more details about the Capaul's Pond study.

5. Study a potential outlet system from Sunnybrook Lake, Goetschel Ponds, Lake McDonald, Cloverdale Lake and Downs Lake – The Sunnybrook Lake neighborhood has experienced flooding several times since the lakeshore homes were constructed in the late 1960s and early 1970s (prior to the establishment of VBWD flood levels and its permit program for developments). There are eight homes within the Sunnybrook Lake 100-year floodplain based on updated 2-foot topographic resolution mapping.

   In late 1998, the VBWD prepared an informational packet (Sunnybrook Lake Information Packet, December 28, 1998) that discussed the flooding problems and alternatives for managing them. The VBWD hosted a public meeting on the topic in 1999. Based on the result of the public meeting, VBWD studied three outlet alternatives (see Section 5.21 for more information). This study (*Draft Sunnybrook Lake Feasibility Study*, July 1999) led to the completion of two other studies (see the Downs Lake outlet and Fahlstrom Pond study paragraphs, below). In 2000, VBWD prepared a draft amendment to the 1995 VBWD Plan to conduct a detailed study, prepare plans, and eventually construct small capacity outlets from Sunnybrook Lake to Goetschel Pond, and from Cloverdale Lake and Goetschel Pond to Downs Lake, and from Downs Lake to Horseshoe Lake. A pump station from Fahlstrom Pond to Interstate 94 was also included in the amendment. After a public meeting and several discussions with state and county agencies, VBWD withdrew the amendment in 2001 because of a lack of agency support.

   In the spring of 2002, the VBWD completed a draft study (*Sunnybrook Lake Flood Relief Feasibility Study*) that explored several local flood relief scenarios for the Sunnybrook Lake neighborhood. Three scenarios provided protection to all of the low homes in the area:

   1. Purchasing all of the low homes

   2. Floodproofing all of the low homes

   3. Flood level reduction

   The estimated cost of these three scenarios ranged from $1.7 million to $3.5 million. The VBWD preferred the flood level reduction alternative, which included optimizing existing floodplain storage, installing a 1-cubic foot per second (cfs) lift station that would pump to a 9.4-acre constructed infiltration basin on Indian Hills Golf Course property, and installing a 0.5 cfs emergency overflow to Brown's Creek. The estimated project cost was $3.5 million. VBWD continues to work toward implementing a flood relief project for Sunnybrook Lake. Section 5.21 provides more details about Sunnybrook Lake.

6. Construct a Downs Lake outlet – In response to historic flooding issues and concerns about high waters in spring of 1987, the VBWD completed a flood control study of Downs Lake in

1988, but did not implement flood control measures as a result of that study. In 2000, the VBWD completed the *Downs Lake Study: An Evaluation of Flood Control Options* to determine the best approach for addressing flooding problems at Downs Lake, followed by several memoranda that evaluated specific details. Ultimately, the VBWD developed a project that reduces the duration of flooding in the Downs Lake area, but does not reduce the peak flood elevation. The VBWD constructed the Downs Lake Flood Duration Reduction Project in 2003. The project included installation of pipes, a valve and gates (which require manual operation). The operating plan for the gates allows the water level on Downs Lake to be lowered under certain conditions. Section 5.14 provides more details about the Downs Lake studies and the project.

7. Maintain and repair VBWD flood control systems – VBWD's maintenance and repair activities of its flood control systems are described in Section 4.7.5.

VBWD also completed the following water level control and floodplain management activities that were not included in the 1995 Water Management Plan. These activities were undertaken in response to issues that arose after completion of the 1995 VBWD Plan and were often in response to requests from other units of government.

1. Eagle Point Creek Flooding – In 1998, VBWD completed a channel modification project on Eagle Point Creek (now called Raleigh Creek) to relieve flooding problems on an adjacent property owner's land.

2. Flood level determinations –

    a. The developer of the Fields of St. Croix subdivision within the city of Lake Elmo paid the VBWD to review the 100-year flood level of Goetschel Ponds. The VBWD used its simplified method to calculate the 100-year flood level of all the basins within the subwatershed. The flood levels were reported in a December 15, 1995 letter to the developer.

    b. The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRMs) for a number of water bodies in VBWD showed only approximate floodplains for these water bodies, without established flood elevations. These approximate floodplains are called Zone A special flood hazard areas or "unnumbered A Zones." To aid property owners in determining whether or not they need flood insurance, the VBWD determined the flood elevations for the following water bodies:

        - Metcalf Marsh – 1999
        - Unnamed creek upstream of Fahlstrom Pond – 2000
        - Unnamed basin near Lake DeMontreville – 2001

c. In 2003, Washington County contracted with the VBWD to compute 100-year flood levels for several basins. Washington County was updating the FEMA Flood Insurance Rate Maps and requested that several basins be mapped, which had not been shown on the maps or were shown as "unnumbered A Zones" in the past. These basins included:

   - Sunnybrook Lake and surrounding lowlands and MDNR wetland 82-0350W, which is located within the Sunnybrook Lake subwatershed
   - Cloverdale Lake and an adjacent wetland (MDNR 82-0312W)
   - Legion Pond
   - McDonald Lake and an upstream wetland (MDNR 82-0311W)
   - Kramer's Pond
   - Friedrich's Pond
   - Fahlstrom Pond and upstream lowlands
   - Bay Lake
   - Downs Lake and adjacent wetland (Eden Park Pond – MDNR 82-0463W)

3. FEMA studies of Valley Creek and Raleigh Creek – VBWD developed XP-SWMM hydrologic/hydraulic models for Raleigh Creek and Valley Creek in 2004. VBWD provided modeling results to FEMA to aid in the development of Flood Insurance Rate Maps (FIRMs) for Raleigh Creek and Valley Creek.

4. Fahlstrom Pond study – In 2000, VBWD completed a study (*Draft Fahlstrom Pond Analysis*, June 2000) of a potential pumping station at Fahlstrom Pond. The study also reviewed the potential impacts of future development and the options for outlets on upstream landlocked ponds. The study was done at a conceptual level to collect enough information for the draft 2000 Plan amendment, discussed previously in this section.

5. Fahlstrom Pond Flood Level Analysis – In February 2003, the VBWD completed a draft report (*Draft Fahlstrom Pond Flood Level Analysis,* 2003) that computed the 1% probability flood levels for all of the basins within the Fahlstrom Pond subwatershed. The study looked at existing conditions and ultimate development conditions. The study was a cooperative project between the VBWD, the city of Woodbury, and the city of Afton.

Section 5 – Subwatershed Management Plans discusses these activities in more detail.

4.7.5.3 Activities following the 2005 Watershed Management Plan

Project 1007, and the water level and floodplain management activities implemented following the 1995 VBWD Plan, addressed many of flooding issues facing the VBWD. Following development of its fourth management plan (Watershed Management Plan, 2005) the VBWD continued to implement

its ongoing water level monitoring and flood control system inspection programs. In addition to these ongoing programs, the VBWD completed the following water level control and floodplain management activities:

1. Mergens Pond Bathymetry – VBWD developed a bathymetric map of Mergens pond in 2007, following a survey of the pond.

2. In 2008, VBWD began working with the City of Oakdale to determine the need for an outlet restriction on Acorn Lake. In 2010, the City of Oakdale and VBWD jointly determined that an outlet restriction from Acorn (Mud) Lake is not necessary.

3. Washington County Floodplain Delineation – VBWD reviewed the Washington County Flood Insurance Rate Maps (FIRMs) updated in 2008 in comparison to VBWD floodplains to identify affected properties. Throughout the year, the VBWD informed citizens of the mapping through meetings and workshops.

4. Blasko Dam Removal – In 2010, the VBWD oversaw the removal of a dam on Valley Creek in Afton on the Scott and Audrey Blasko property. The $98,000 project was completed and paid in the fall of 2010.

5. Afton Village Flood Reduction – In 2012, the City of Afton requested assistance from the VBWD for flood protection efforts. The Managers decided to provide the City some assistance with erosion issues to Kelle's Creek. In 2014, the City of Afton again requested financial assistance for flood relief, stormwater management, and water quality improvement projects in Afton Village (see Section 5.37 – Kelle's Creek Subwatershed Management Plan).

4.7.6 Identified Water Level and Floodplain Management Issues

The water level and floodplain management issues facing the VBWD include ongoing issues carried over from the 2005 Plan as well as emerging issues. These issues were identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Issues identified by the parties listed above were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. The VBWD Managers considered the results of that workshop and identified the following major water level and floodplain management issues:

- Management of high and low water levels
- Development and management of landlocked basins
- Floodplain management
- Design events and precipitation data (i.e., Atlas 14)

Water level and floodplain management issues that pertain to particular water bodies are discussed in Section 5 – Subwatershed Management Plans.

4.7.6.1 Management of High and Low Water Levels

4.7.6.1.1 High Water Levels

Both high water levels (flooding) and low water levels are of concern to VBWD residents, local units of government, and others. More concern and attention is usually paid to flooding because it is a greater threat to public health and safety, and can result in significant economic losses. Of special concern is flooding on landlocked water bodies, which prolongs the damages/impacts (see Section 4.7.6.2).

Damages caused by flooding include:

- Damage to homes, businesses and other buildings
- Damage to infrastructure (e.g., roads, bridges)
- Flooding of individual septic systems, rendering them unusable
- Damage or destruction of recreational trails and bridges

Flooding may cause other damages that are harder to quantify, including the following:

- Flooding of roads so they are impassable to emergency vehicles, residents, and school buses
- Shoreline erosion
- Destruction of vegetation, such as grass, shrubs, trees, etc.
- Unavailability of recreational facilities for use by the public (e.g., inundation of beaches) and/or restricted recreational use of water bodies (e.g., no-wake zones)
- More strain on budgets and personnel for repairing flood-damaged facilities and controlling public use of facilities during flooding events
- Alterations to mix and diversity of wildlife species as a result of inundation of upland habitats

Related to high water level issues, a number of homes were built too low and are in the floodplain. Past projects implemented and maintained by the VBWD (see Section 4.7.5) have addressed many of

the more serious flood risks. A number of homes remain in the floodplain. This is discussed in more detail in the Floodplain Management Issues part of this section.

Residents have raised specific concerns about high water levels in Sunnybrook Lake, Long Lake, Silver Lake, adjacent to Echo Lake (Echo Lake Addition), and a wetland in the northwest quarter of section 1 of Lake Elmo. Residents of the tri-lakes have raised concerns over high water levels triggering the no-wake ordinance on Lake Elmo.

4.7.6.1.2 Low Water Levels

Although less likely to result in significant economic losses, VBWD recognizes low water levels can also have negative impacts. Possible negative impacts include interference with or diminished recreational use of the water resources, through reduced or lost access to the water resource by the public and shoreline residents, reduced aesthetic enjoyment of the water resources (e.g., from mud flats, smells), loss of wildlife habitat, and winterkill of fish. Low water levels may also increase macrophyte growth, as sunlight reaches a larger portion of the lake bottom, effectively increasing the littoral zone. Issues related to low streamflows are discussed in Section 4.4 – Stream Management and Restoration.

The VBWD cannot control climate patterns (e.g., drought), which are a significant cause of deleterious low water levels. There is growing concern about the potential impact of groundwater use on surface water resources. Specifically, declining groundwater levels from unsustainable consumptive use may lead to lower water levels in lakes or reduced baseflow in streams. This issue is highlighted by the controversy surrounding water level trends in White Bear Lake, located north of the VBWD. In 2013, the MDNR developed a draft of its Groundwater Strategic Plan (MDNR, 2013). The MDNR's strategic plan identifies the need for greater understanding of the impact of groundwater management on surface water (and vice versa) and the development of guidelines for adverse impacts on surface water (see also Section 4.2 – Groundwater Management).

Residents have raised specific concerns about low water levels in Lake Elmo. City of Afton residents have also voiced concern over low water levels in Valley Creek.

4.7.6.2 Development and Management of Landlocked Basins

In the northern and eastern portions of VBWD, there are numerous landlocked basins (basins that have no surface water outlet). VBWD contains more than 50 landlocked basins greater than approximately five acres, and many of the more than 1,000 smaller wetlands and basins in VBWD are also landlocked. Landlocked basins are often located in kettle basins, which formed in glacial till and ice contact stratified drift. As glaciers retreated, large blocks of ice were left behind, which were then buried beneath glacial deposits. When the ice melted, depressions (kettle basins) were left behind, which typically have no natural outlet stream. These types of glacial deposits are characterized by rugged or "hummocky" relief. These materials, especially the glacial till, can have a relatively low permeability, which may retard seepage.

Because there is no surface outlet, runoff which collects in these depressions is removed only by seepage and evaporation. As a result, landlocked basins are subject to wide variations in water levels and their 100-year floodplains typically cover large areas. In addition, evaporation is likely to be low during periods of above-average precipitation since cooler air temperatures and cloudy days result in less evaporation. As water tables rise during periods of above-average precipitation, seepage out of landlocked basins can also decrease. The seepage from landlocked basins provides important groundwater recharge benefits. Also, landlocked basins do not discharge surface waters to downstream basins, which could otherwise be negatively impacted by the additional stormwater volume.

VBWD may be requested to provide outlets from landlocked basins to prevent damages that occur during periods of sustained high water levels, but it is not always feasible or reasonable for VBWD to do so. For example, it may not be feasible to provide outlets because of the long distances to the nearest outlet, the depth of the pipe, and the capacity of the nearest outlet. It may not be reasonable to provide outlets because of the downstream impacts on flood levels and/or water quality. It is also difficult to provide even temporary relief during flooding situations for the same reasons that it is difficult to provide permanent outlets. Residents in particular have expressed concern regarding high water levels in Downs Lake, which is considered semi-landlocked due to its relatively high overflow elevation (see Section 5.14).

4.7.6.3 Floodplain Management

Floodplain management is the management of development and other activities in or near the floodplain to prevent flood damages. The MDNR defines floodplain management as "*the full range of public policy and action for ensuring wise use of the floodplains. It includes everything from collection and dissemination of flood control information to actual acquisition of floodplain lands, construction of flood control measures, and enactment and administration of codes, ordinances, and statutes regarding floodplain land use*" (Minnesota Rules 6120.5000, Subp. 12).

Minnesota law defines the floodplain as the land adjoining lakes, water basins, rivers, and watercourses that has been or may be covered by the "100-year" or "regional" flood. See the discussion later in this section and Section 4.7.6.4 regarding the 100-year flood level and the 100-year flood event. Floodplains of larger basins and streams are mapped by the Federal Emergency Management Administration (FEMA) on Flood Insurance Rate Maps (FIRMs), which are included in community Flood Insurance Studies (FIS).

VBWD manages activities in the floodplains of VBWD. The VBWD rules and regulations require a VBWD permit for all work within the waters and floodplain of VBWD. The VBWD rules and regulations apply to all lakes, ponds, streams, marshes and other wetlands in VBWD, not just waterbodies that have been mapped by the FEMA on Flood Insurance Rate Maps or identified as public waters by the MDNR. VBWD floodplain management requirements include:

1. VBWD determination or approval of flood levels,

2. Use of a special method to determine flood levels on landlocked basins in lieu of a more detailed analysis (see Section 4.7.7– WL&FM – E, Permit & Plan Review),

3. VBWD setting of minimum building elevations at two feet above the "100-year flood level" (see Discussion of 100-Year Flood Level and 100-Year Flood Event later in this section),

4. Preservation of floodplains through easement dedication,

5. Restrictions on filling in the floodplain,

6. Restrictions on uses of the floodplain, and

7. Restrictions on alterations that impact floodplains.

VBWD determined 100-year flood levels for many water bodies that have not been mapped on FEMA Flood Insurance Rate Maps. Also, VBWD determined 100-year flood levels for many waterbodies that have been mapped by FEMA. There are discrepancies between the VBWD and FEMA 100-year flood levels in some situations. For example, the construction of Project 1007 resulted in changed 100-year flood levels on many lakes in VBWD. As a result, the 100-year flood levels shown on the FEMA Flood Insurance Rate Maps are different than the VBWD 100-year flood levels for Lake Olson, Lake DeMontreville, Lake Jane, Sunfish Lake, and Lake Elmo. The particular discrepancies are discussed in the appropriate portions of Section 5 – Subwatershed Management Plans.

Originally, the landlocked water bodies in VBWD (and in Washington County) were either mapped on FEMA Flood Insurance Rate Maps as "unnumbered A Zones" or not mapped at all. In 2003, Washington County contracted with the VBWD to determine 100-year flood levels for several basins so that the flood levels could be mapped on FEMA Flood Insurance Rate Maps (these basins are listed in Section 4.7.5.2). It is more difficult to determine the 100-year flood level for landlocked basins than for basins with outlets. Because of this difficulty and the large number of landlocked basins in VBWD, VBWD developed a simplified method for estimating the 100-year flood level on landlocked basins (see Section 4.7.7– WL&FM – E, Permit & Plan Review).

VBWD is aware of homes within the floodplains of Sunnybrook Lake, Eden Park Pond, Friedrich's Pond, Fahlstrom Pond, Project 1007 lakes, and other major water bodies (see Section 5.0 – Subwatershed Management Plans). Additional homes may be within the floodplain of other lakes, ponds, and storage basins. Many of these homes were constructed prior to establishment of flood levels and before VBWD began implementing its permit program. Establishment of flood levels and implementation of VBWD's permit program have been very effective at preventing the construction of homes, businesses and other structures within the floodplain. A remaining issue is ensuring that buildings adjacent to floodplains are constructed to the correct elevation – if they are constructed too low, they may be within the floodplain. Another issue is that septic systems may be within the

floodplain, even if homes are not within the floodplain, leading to potential water quality and human health issues during flood conditions.

VBWD has heard and responded to concerns that the VBWD's minimum building elevation (two feet above the 100-year flood level) is too restrictive, especially under perched groundwater conditions. However, under "perched" groundwater conditions, the water table could be as high as the surface water and VBWD's minimum building elevation would be appropriate. The VBWD rules and regulations are key to preventing additional flooding issues; they are simple to apply and they protect homes and businesses from flooding. The VBWD maintained its existing minimum building elevation requirements when updating its rules and regulations in 2013.

Other agencies and units of government are involved in floodplain management, including the MDNR, counties, and cities. The MDNR coordinates and assists local units of government in floodplain management, through administration/oversight of the state Floodplain Management Program (Minnesota Statutes 103F.101-103F.165 and Minnesota Rules 6120.5000-6120.6200). The MDNR provides sample floodplain ordinances for communities; the sample ordinances include a minimum building elevation of at least 1 foot above the 100-year flood elevation, but note that greater free-board (e.g., 2 feet) provides additional protection. Counties are responsible for administration of local floodplain regulatory programs, mainly in the unincorporated areas of the county, while cities are responsible for administration in incorporated areas.

Minnesota law requires flood-prone communities to (1) adopt floodplain management regulations; and (2) enroll and maintain eligibility in the National Flood Insurance Program (NFIP). If communities do not fulfill these two requirements, property owners cannot purchase federal flood insurance. All local (city and county) floodplain regulations must comply with the MDNR's floodplain management standards (Minnesota Rules 6120.5000-6120.6200).

Property owners are required to purchase flood insurance when they finance/refinance loans to buy, build, or improve structures located in areas mapped as floodplain on FEMA Flood Insurance Rate Maps. As more areas in VBWD are mapped by FEMA on Flood Insurance Rate Maps (e.g., through Washington County's FEMA mapping effort), more properties will be shown as located in the floodplain. This means more property owners will be required to obtain flood insurance or prove that they are not in the floodplain. In some cases, homes/structures that appear to be located within these FEMA-mapped floodplains may not actually be in the floodplain (e.g., lowest home elevation may be above the required elevation). To waive the mandatory flood insurance requirements, property owners must remove their homes/structures from the FEMA-mapped floodplains by obtaining a Letter of Map Amendment (LOMA) or a Letter of Map Revision (LOMR). Legislation passed by the federal government in 2012 (referred to as Biggert-Waters) enacts changes in NFIP that will increase financial solvency of the program by phasing out subsidies for flood insurance. The Homeowner Flood Insurance Affordability Act of 2014 delays the implementation of certain provisions of the Biggert-Water legislation, but may still lead to insurance premium increases for many policyholders.

4.7.6.3.1 Discussion of 100-Year Flood Level and 100-Year Flood Event

The term "100-year flood elevation" is a common term, but its definition is often confusing. The VBWD Rules and Regulations define the "100-year flood level" as the peak elevation of a water body resulting from a "100-year flood event." The 100-year flood event is defined as the amount of runoff that has a one percent chance of occurring at a given location within a one-year time period. To establish the 100-year flood level, the VBWD uses that flood level produced from the 100-year 24-hour rainfall event, the 100-year 10-day snowmelt runoff event, the District's simplified calculation method for landlocked basins (based on an annual event), or another approved method.

Thus, the 100-year flood level is not necessarily the flood level with a 1% chance of occurring in a given year based on a historical record of flood levels, but is the flood level resulting from a precipitation or snowmelt event that has a 1% chance of occurring in that year. This naming convention is commonplace, despite its technical inaccuracy. In some cases, the 100-year flood level has been extrapolated from a historical record of water levels. For example, the VBWD examined a 50-year period of record in its analysis of Sunnybrook Lake, the 2003 Fahlstrom Pond study, and the lakes in the 2003 FEMA study. The highest water level for each year was plotted on probability graph paper and a curve was created from the points. The probability of occurrence was then determined from the graph. Assuming there are no outliers, the highest of all water levels in the 50-year period has a 2% probability of occurrence, equivalent to an occurrence of once every 50-years (1/50) or twice in one hundred years (2/100=2%).

Calculating flood levels from 1% probability events at landlocked lakes is highly dependent on the assumed starting water level of the lake. Running a model with a 1% probability event and using starting water elevations that are too high or too low will produce flood levels that are too high or too low, respectively. Because flood levels on landlocked basins are so dependent on starting water elevations, a long-term simulation approach is necessary. The VBWD rules encourage detailed studies to establish 100-year flood levels at landlocked basins. In lieu of a detailed study, the VBWD developed a simplified method for calculating 100-year flood levels at landlocked basins. This method is described in Section 4.7.7.

For many VBWD waterbodies, the 100-year flood elevations are based on outdated topographic, land use, and precipitation data. With the 2013 publication of Atlas 14, the 100-year, 24-hour storm event applicable to the VBWD increased from 6.0 to 7.3 inches (see Section 4.7.6.4). This may have substantial impacts on flood elevations in the watershed.

4.7.6.4 Design Storms and Precipitation Data (Atlas 14)

Until recently, the major sources of information regarding rainfall in the region were publications TP-40 and TP-49 issued by the National Weather Bureau (now the National Weather Service) in 1961 and 1964. In 2013, the National Oceanographic and Atmospheric Administration (NOAA) published Atlas 14, Volume 8. Atlas 14 contains updated precipitation data for Minnesota and supersedes TP-40 and TP-49. Atlas 14's improvements in precipitation estimates include denser data networks, longer (and more recent) periods of record, application of regional frequency analysis, and

new techniques in spatial interpolation and mapping. Atlas 14 provides estimates of precipitation depth and intensity for durations from 5 minutes up to 60 days.

Comparison of precipitation depths between TP-40 and Atlas 14 indicates increased precipitation depths for more extreme events (e.g., the 100-year, 24-hour event within the VBWD increased from 6.0 inches to 7.3 inches). The design storm events cited in the VBWD adopted rules are based on Atlas 14 values, with the exception of 10-day snowmelt (runoff from spring snowmelt is not provided in Atlas 14). However, 100-year flood levels for most VBWD waterbodies were established prior to the publication of Atlas 14 (see Section 4.7.6.3).

According to the Soil and Water Conservation Society's (SWCS) 2003 report on climate change, total precipitation amounts in the United States (and in the Great Lakes region) are trending upward, as are storm intensities. Precipitation records in the Twin Cities area show the annual average precipitation has increased, as shown in the following examples:

- Minneapolis-St. Paul Airport station – the average annual precipitation has increased from 28.32 inches (1961–1990 average) to 30.61 inches (1981–2010 average), an 8.1% increase (data from the Climatology Working Group website: http://climate.umn.edu/).

- St. Paul station – the average annual precipitation has increased from 30.30 inches (1961–1990 average, from the Minnesota Department of Natural Resources (MDNR) State Climatology Office) to 33.45 inches (1981–2010 average), a 10.4% increase (data from the Climatology Working Group website: http://climate.umn.edu/).

4.7.7 Policy Details, Strategies and Actions Related to Water Level and Floodplain Management

This section provides the details for policies WL&FM-A through WL&FM-E (as listed in Section 4.7.4), along with the resulting strategies and actions.

4.7.7.1 WL&FM-A & B. Data Collection, Analysis and Reporting

VBWD will continue to collect data (e.g., lake levels, precipitation records, snowpack monitoring, groundwater levels) that is useful in assisting VBWD with managing the water levels and floodplains of the VBWD's water resources. If sufficient data is already being collected by others (e.g., precipitation records), VBWD may not collect additional data, but will review the available data.

Following is a description of VBWD's data collection programs related to water level and floodplain management:

Lake Level Monitoring Program – The VBWD, through citizen volunteers, collects ice-free monthly water level data from 17 water bodies:

- Long Lake
- Lake Olson
- Lake Edith
- Lake DeMontreville
- Lake Jane
- Sunfish Lake
- Eagle Point Lake
- Lake Elmo
- Horseshoe Lake
- Downs Lake
- Cloverdale Lake
- Lake McDonald
- Klawitter Pond
- Fahlstrom Pond
- Goetschel Pond
- Upper West Lakeland Storage Site
- Lower West Lakeland Storage Site

Currently, the citizen volunteers read the water levels, and summarize and interpret the data in reports for the VBWD. As part of this program, the VBWD sets benchmarks and works with the Washington Conservation District and the MDNR to set water level gauges. The VBWD will continue to summarize and analyze the pertinent data, include any additional data from the MDNR's database, and include this information in its annual report, which is posted on the VBWD website. The VBWD will continue to submit the water level data to the MDNR. In addition, the VBWD will continue the lake level monitoring and reporting program, preferably with the assistance of citizen volunteers. The VBWD will consider modifications to its lake level monitoring program annually or as need arises. The VBWD will also continue posting the ice-free monthly water level reports on the VBWD website.

Review Precipitation Data – The VBWD reviews the precipitation data collected by a citizen volunteer and official rainfall observers in and near VBWD, and compares this data to the data collected at the St. Paul airport and the Minneapolis-St. Paul International Airport. The VBWD summarizes the data and includes this information in its annual report, which is posted on the VBWD website. The VBWD will continue to review and report precipitation data.

Groundwater Level Observation Program – The VBWD monitors groundwater levels at up to 15 operational observation piezometers (14 locations were recorded in 2013). A VBWD contractor reads the groundwater levels at least quarterly. The groundwater data is used with the lake level data to develop generalized groundwater contours. VBWD includes the data and contour map in its annual report, which is posted on the VBWD website. The VBWD will continue to collect and report groundwater levels. The VBWD Managers may add or remove groundwater piezometers from its program as they determine necessary. Groundwater/surface water interactions are discussed in Section 4.2 – Groundwater Management.

Snowpack Monitoring Program – The VBWD monitors the water content of the snowpack as part of its Project 1007 operation plan. The operation plans for a number of the VBWD's Project 1007 lakes call for manipulation of their water level control structures when the water content of the snowpack exceeds three inches. Before taking "in the field" measurements, VBWD follows the snowpack monitoring measurements taken by the NOAA. When those measurements become significant (about 2 inches), VBWD contacts neighboring watershed districts to determine if they have field measurements. If these measurements are consistent with NOAA's mapped values and are below 3 inches, VBWD takes no additional action, but continues to monitor

NOAA's mapped values. If snowpack monitoring within the VBWD is needed, VBWD begins to monitor the snowpack in three representative locations within the Project 1007 tributary watershed: Pebble Park, Tablyn Park, and Tartan Park (all located in Lake Elmo). Snow depth measurements are taken at each site, and a snow sample is collected at a representative location and weighed to determine the water content of the snow. The VBWD will continue its snowpack monitoring program. See Policy WL&FM-D for more information about the operation and maintenance of VBWD flood control systems. In addition, the details of each water level control structure are discussed in the pertinent portions of Section 5 – Subwatershed Management Plans.

4.7.7.2 WL&FM-C. Water Level and Floodplain Management Actions

The VBWD will determine its level of involvement in addressing the remaining flooding problems on a case-by-case basis, and in response to requests from cities, townships, and VBWD residents. If determined necessary by the Managers, the VBWD will take the appropriate water level and floodplain management actions to address flooding problems in the VBWD. The appropriate actions will vary according to the specific flooding situation. Examples of appropriate VBWD actions include:

- Hydrologic/hydraulic studies
- Feasibility studies/preliminary design
- Design/construction of flood relief projects
- Floodproofing
- Buyout of homes in the floodplain
- No action

To adequately assess the appropriate level of VBWD involvement in a given flooding issue, the Managers must understand the extent of possible flooding. The VBWD will update its 100-year flood elevations based on the recently published Atlas 14 precipitation data, utilizing a 100-year, 24 hour rainfall event of 7.3 inches. The VBWD will evaluate the feasibility of developing a watershed-wide hydrologic/hydraulic model (e.g., an XP-SWMM model) to determine the 100-year flood elevations (as well as other purposes). The VBWD will notify affected residents of any changes in floodplain elevations and extents. The VBWD will re-evaluate existing flooding issues based on this information (e.g., did the estimated flood level increase to an extent as to include additional structures), and identify potential flooding issues not previously identified.

VBWD seeks to avoid constructing outlets from landlocked basins whenever possible. VBWD will explore and may implement other flood prevention and flood damage reduction techniques before pursuing construction of an outlet from a landlocked basin. In situations where it appears necessary to provide an outlet from a landlocked area, VBWD will evaluate the downstream impacts of the proposed outlet. Based on the limitations of downstream facilities, discharges from landlocked basins may be most feasible if they occur during off-peak runoff periods, such as after sufficient time has passed following a storm or runoff event, or during the winter months. Such outlets would likely be

able to provide relief from runoff events longer than the 100-year 10-day snowmelt. VBWD will obtain input and support from affected residents and the appropriate cities or townships before proposing to construct outlets from landlocked basins.

A remaining flooding issue from the 1995 and 2005 VBWD Plans is the Sunnybrook Lake area. The 2005 Plan identified eight homes located within the 100-year floodplain (see Section 5.21). The 2005 VBWD Plan also called for implementation of a flood relief project for the Sunnybrook Lake area, but that project has been abandoned due to lack of support from affected parties. The 1995 VBWD Plan also discusses flooding issues at other lakes (e.g., Legion Pond and Friedrich's Pond), but VBWD was not listed as the lead in project implementation. See the pertinent portion of Section 5 – Subwatershed Management Plans for information about these water bodies and proposed VBWD actions (if any).

The VBWD will implement the actions discussed in the subwatershed management plans of Section 5 and summarized in Table 6-1. All of the proposed improvement options have been recommended by an earlier feasibility study or hydrologic/hydraulic study. Projects will be implemented based on feasibility, prioritization, and available funding. (Section 4.9– Administration and Funding, describes the general funding policies of the VBWD.)

The VBWD will present the results of feasibility studies at VBWD meetings. The VBWD will inform VBWD residents, cities, townships and other stakeholders of any proposed improvement projects, prior to implementation. Section 4.3 – Public Involvement and Public Information, describes this process in more detail. Section 7 – Implementation Program describes the process that VBWD will follow when implementing such projects.

The VBWD will assist property owners in FEMA unnumbered A zones in obtaining Letters of Map Amendment (LOMAs) or Letters of Map Revision (LOMRs), on a case-by-case basis.

4.7.7.3 WL&FM-D. Operation and Maintenance of VBWD Flood Control Systems

VBWD will operate, maintain, repair, and replace all current and future VBWD flood control systems to ensure they provide the designed benefits. This means VBWD will inspect its systems and perform (or contract for the performance of) any needed maintenance and/or repairs. The water level monitoring program and the snowpack monitoring program described under WL&FM-A & B provide VBWD with the information necessary to make important decisions regarding operation of control structures/lake outlets (see Section 4.7.5.1 for more information about VBWD's drawdown operation plan for Project 1007).

Each fall, VBWD will inspect the Project 1007, Echo Lake Outlet, Weber Pond Outlet, Olson Lake Estates Outlet, Downs Lake Flood Duration Reduction Project, and any future VBWD flood control systems to ensure that the entire system is operating effectively and will be ready for spring runoff. Each VBWD flood control system structure will be inspected by VBWD (or a contractor) at least once every three years. VBWD will inspect the systems more frequently under high water conditions and at the request of residents and governmental officials.

VBWD is responsible for all maintenance, repairs, and modifications to the Project 1007, Weber Pond Outlet, Olson Lake Estates Outlet, Downs Lake Flood Duration Reduction Project, and any future VBWD flood control systems. For the Echo Lake Outlet system, VBWD will work with the City of Mahtomedi and/or adjacent landowners to make repairs or will contract for repairs.

In accordance with VBWD's inspection, maintenance and operating plans for the Eagle Point Lake Dam and the Rest Area Dam, VBWD will perform an annual inspection of these dams. For the Rest Area Dam, this will be a joint inspection with MnDOT staff. VBWD is responsible for 80 percent of all costs incurred for repair, reconstruction and maintenance of the Rest Area Dam, with MnDOT responsible for the remaining 20 percent.

4.7.7.4 WL&FM-E. Permit & Plan Review

VBWD will prevent flooding problems through its permit review program, review of community plans, and education efforts.

4.7.7.4.1 Permit Review

The VBWD considers it to be in the best interest of public health, safety, and welfare that the Managers regulate the development and use of floodplains. The VBWD will review proposed alterations or work within the floodplains or waters of the VBWD to control floodplain encroachments and prevent adverse environmental impacts. To accomplish this, the VBWD has established standards for floodplain management (see discussion in this section and Section 5.0 of the Rules and Regulations document).

The VBWD requires that flood levels be determined on all water bodies located within the proposed development site. VBWD will either approve or determine the flood levels. For landlocked water bodies, the 100-year flood level will be computed based on VBWD's simplified method, unless a more detailed analysis is undertaken that takes into account seepage and evaporation. The normal water level of a landlocked basin shall be based on available water level records and topographic maps and subject to approval by the VBWD engineer. VBWD's simplified method is discussed later in this section, along with more general discussion about determining flood levels on landlocked basins.

VBWD will continue to send copies of its permits to the affected community's building official/building inspector to help prevent the construction of homes within the floodplain.

VBWD supports Washington County's requirement that septic systems not be placed within drainage easements, which effectively prevents installation of septic systems within the 100-year floodplain.

VBWD limits filling of waterbodies so that the cumulative effect of all possible filling will not raise the 100-year flood level of lakes, ponds, wetlands, and basins more than 0.1 foot, or more than 0.5 foot on streams. Allowable fill volumes for properties adjacent to lakes are calculated as follows: the area of inundation at the 100-year flood level is multiplied by 0.1 foot to obtain the total allowable fill. This amount is then divided by the length of shoreline at the normal water level to obtain the

allowable fill (in cubic yards) per foot of shoreline. The allowable fill for a given property is the allowable fill per foot of shoreline multiplied by the shoreline of that property. If the allowable fill has been placed on that property (below the 100-year flood level) from previous activities, no additional filling on that lot will be allowed. VBWD has computed the allowable fill for the major lakes, ponds, and wetlands in the watershed. The allowable fill amounts are listed in the table at the beginning of each individual section of Section 5 – Subwatershed Management Plans. The VBWD will not increase allowable fill volumes based on increases in the 100-year flood level (i.e., updates due to analysis using Atlas 14 precipitation values).

VBWD will review and comment on all applications for a MDNR public waters work permit.

The VBWD Rules and Regulations include floodplain management standards (see Appendix A-4.5). These standards address:

- Flood level determination (including approved methods and associated analytical assumptions)
- Minimum building elevations
- Floodplain preservation and allowable uses
- Floodplain alteration

See Appendix A-4.5 for additional details regarding floodplain management standards.

4.7.7.4.2 Plan Review

Communities must submit their comprehensive land use plans and proposed revisions to VBWD for review. VBWD will review the proposed land use plan/revisions to determine the impact on flood levels, since flood elevations are based on future land use plans. If the future land use plan would result in more impervious surface than previously proposed, additional runoff volume will be generated. This could result in higher flood levels than previously computed, especially at landlocked basins.

Communities must also submit their local water management plans to VBWD for review and approval. VBWD will review the plan for consistency with this plan, including water level and floodplain management policies.

VBWD will review Environmental Assessment Worksheets (EAW), Environmental Impact Statements (EIS), Alternative Urban Areawide Reviews (AUAR), and other environmental assessments for their impact on water levels and floodplains of VBWD water resources.

Communities shall file with VBWD all ordinances, plans and development guides relating to land alteration, surface drainage, floodplain management and shoreland management.

VBWD will review community floodplain and shoreland management ordinances.

Determining Flood Elevations on Landlocked Basins

VBWD established rules and regulations regarding developments in the 1970s. Prior to 1981, development occurred primarily in higher, well-drained areas. As landlocked basins increasingly became part of developments, VBWD's suggested minimum building elevations were generally above the runout elevation. Later, pressure increased to develop more land, including land below the runout elevation of landlocked basins. VBWD developed a simplified method to calculate flood levels on landlocked basins (see discussion of standards in this section). VBWD requires the use of this simplified method unless a more detailed analysis is undertaken.

Requiring minimum building elevations to be above the 100-year flood elevation is effective only if the 100-year flood level is accurate and buildings are constructed above the 100-year flood level. For example, VBWD's Rules and Regulations require that building basements be located two feet above the 100-year flood level. However, VBWD has no control over building permits. As a result, some homes in VBWD were built below the 100-year flood level. To help prevent the construction of homes within the floodplain, VBWD sends copies of VBWD permits to the affected community's building official/building inspector.

There are alternatives for analyzing the 100-year flood level of landlocked basins. One method is a full watershed yield and groundwater model. Such a model requires the input of meteorological and watershed data, which is then used to determine the total amount of water produced by the watershed (yield). The data are also used to calibrate the model. Meteorological data can include temperature, relative humidity, precipitation, and wind velocity. Watershed data can include groundwater characteristics, storage volumes, watershed area, water area, soil types, well pumping and diversions. Although relatively accurate, this type of model is complex and time-consuming. The use of a full yield model is warranted when damages could be significant, the water body is large, etc. Since this is generally not the case for most of the landlocked basins in VBWD, other methods have been used.

Instead of a full yield model, VBWD developed a simplified model to determine Lake Jane flood levels as part of an earlier proposed project (prior to Project 1007). VBWD estimated seepage rates to/from Lake Jane using lake level records for the lake and nearby lakes. Annual runoff amounts and runoff distribution were determined based on other models and historical records. A single-event (annual) model was used. Runoff was routed on a monthly basis through the watershed. This method gave useful results that were more accurate than even simpler methods. However, even this simpler analysis required data collection, and was relatively complex and time-consuming.

Some examples of even simpler methods include:

- Back-to-back 100-year 24-hour rainfall events. This method is sometimes suggested because it is simple and does not require calculation of all the other parameters such as seepage to groundwater. However, this is not a valid way to analyze the problem since the probability of this event occurring is much less than 1 percent. (Note: the single 100-year 24-hour rainfall

event is not the correct event to use in determining the 100-year flood elevation since it is a longer-duration event which will be critical for a landlocked basin, assuming seepage is not excessive.)

- 30-day snowmelt event or a 30-day combined rainfall/runoff event. The problem with this method is that the critical event could be of much longer duration than 30 days, which is true in various locations of VBWD, where the critical event could be months or years long.

- MDNR's Ordinary High Water (OHW) elevation. The OHW is only an indication of past high water and is equivalent to approximately the 10- or 15-year flood level.

- No building below the runout elevation.

- VBWD's simplified method (see discussion of standards in this section).

VBWD's simplified method estimates the amount of runoff generated during the 100-year annual runoff event (i.e., annual runoff in the wettest of 100 years). Hence, it is a single-event model, but based on a longer-duration event than the simpler methods discussed earlier. To calculate runoff volume using the simplified method, the average annual inflow from all parts of the watershed is subtracted from the 100-year annual runoff to calculate the net annual inflow. The net annual inflow is the volume of water that must be stored above the normal water level. The water surface is included in these calculations. The 100-year annual inflow, average annual inflow, and net difference for different land cover are presented in Table 4.7-1.

Table 4.7-1 VBWD Simplified Method Runoff Volume for Calculating Flood Levels of Landlocked Depressions

Land Use	100-Year Annual Runoff Depth (inches)	Average Annual Runoff Depth (inches)	Differences; Net 100-Year Annual Depth (inches)
Impervious	32	16	16
Turfed	18	8	10
Water Surface	12	-6	18

A more conservative approach would be to neglect outflow and simply use the 100-year inflow from the watershed and assume that it has to be stored in the basin. This produces very high flood levels. However, water does leave the basin. Evaporation from the pond and land surfaces are included in the average annual runoff (inflow) values shown in Table 4.7-1. For a landlocked pond which normally contains water, the average infiltration equals the average inflow from the watershed.

As shown in Table 4.7-1, the runoff from water surfaces is negative because, in the Twin Cities metropolitan area, precipitation is less than average water surface evaporation on an annual basis. The resulting net runoff volume shown in Table 4.7-1 must be stored above the normal water level of

the landlocked water body. Thus, it is important to correctly determine the normal water level. This is true for any of the methods discussed. Since the water level can fluctuate greatly, it is difficult to determine the correct "normal" water elevation. It is especially difficult for water bodies for which there is little or no water level data. The normal water level of a landlocked basin is usually based on available water level records and topographic maps.

The VBWD simplified method is based on results of hydrologic models. For example, the 100-year runoff amounts for water and turfed areas are similar to results from the Big Marine Lake Flood Level study for years 1965 and 1975, which had 44.44 inches and 41.68 inches of precipitation, respectively. Big Marine Lake is located approximately 12 miles north of VBWD's north boundary. The VBWD's average runoff amounts are similar to the average yields determined in the Big Marine Lake, Minneapolis Chain of Lakes and the Lake Minnetonka watershed yield studies.

The VBWD simplified method results in flood elevations which are higher than the 100-year 10-day snowmelt event (assuming the basin does not overflow in the 100-year 10-day snowmelt event), but possibly lower than the runout elevation.

There are benefits to using the VBWD simplified method. Using this method, VBWD has some assurance that buildings will be constructed outside of floodplains without resorting to requiring that buildings be above the runout elevation. The VBWD simplified method is simple; only future land use data and stage/area/storage information is required to determine the 100-year flood elevation. Although data collection is not required, any information about historical water levels is useful.

There are problems with the VBWD simplified method. For example, dry depressions almost certainly experience seepage which is greater than what is built into the method. Method results are most reliable for basins which normally contain water. Separate calculations could account for additional seepage; however, computations need to take into account future silting in of the basins which decreases the seepage. Another drawback is that the VBWD simplified method uses only the one year event; the critical event could be of longer duration than one year. The VBWD simplified method results in large tributary watersheds; more upstream areas become tributary because of the high runoff volumes which are generated by the method. If some of these upstream watersheds contain dry depressions, it could add to any inaccuracy in the flood level determination. Another problem is high seepage areas, such as Fahlstrom Pond, where the observed flood level was 20 feet below the predicted flood level. High seepage areas contain water but exhibit excessive seepage; the VBWD simplified method does not take this additional seepage into account. Bank storage is not taken into account in the VBWD simplified method. It is possible that a basin's effective storage volume could be much greater at a particular elevation if bank storage was included in the storage volume computation.

List of Tables

4.8 Erosion Prevention and Sediment Control

4.8.1 Importance	Erosion prevention and sediment control is a major responsibility of the VBWD. Addressing erosion and sedimentation problems is a high priority because erosion and sedimentation have a high potential to cause damage to infrastructure, property loss, and adverse ecological impacts (e.g., water quality, habitat). Erosion prevention and sediment control will remain a high priority as the watershed continues to urbanize, which increases the potential for erosion and sedimentation problems.
4.8.2 General Issues	Although erosion and sedimentation are natural processes, they are often accelerated by urbanization (especially construction and the removal of deep-rooted vegetation). The occurrence and severity of erosion and sedimentation are dependent on hydrology and the physical condition of the watershed (i.e., how much force does the water have to move sediment, and how resistant is that sediment to being moved). Hydrology is dependent on the weather, the topography of the landscape, the soils, the land cover, and other factors. Changes to any of these factors will influence the rate of erosion and sedimentation. While some of the factors are difficult to control, changes to land cover can be regulated and/or managed.
4.8.3 Mission	To manage and protect our water resources within the limits of VBWD jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Improving and protecting the quality of surface water and groundwater resources. Managing the quantity of water and minimizing the negative impact on the District from floods, high flows, and droughts by providing public works projects and other prudent measures. Understanding and responding to the effects of community growth and related activities on groundwater and surface water resources.
4.8.4 Policies to Accomplish Mission	ESC-A. 1. The VBWD will implement measures to prevent erosion and control sedimentation on all VBWD projects. 2. The VBWD will identify, inventory and monitor soil erosion and sedimentation problems. 3. The VBWD will implement soil protection, sedimentation controls, and/or other measures to address erosion and sedimentation problems that threaten VBWD water resources or public health, safety, and welfare. 4. The VBWD will collaborate with other units of government to identify and protect areas that are highly sensitive to erosion.

	ESC-B. 1. The VBWD will continue to administer a permit program regulating land use and development to prevent or minimize erosion and sedimentation impacts to VBWD water resources. 2. The VBWD will inspect (or request cities and townships to inspect) VBWD-permitted projects for compliance with VBWD Rules and Regulations (2013, as amended) and VBWD permit conditions. 3. Cities, townships and counties within VBWD will develop, adopt, administer, implement and enforce erosion prevention and sediment control ordinances, with assistance from VBWD, as requested. ESC-C. The VBWD will encourage the use of agricultural best management practices in the watershed.

4.8.5 Background and History Related to Erosion Prevention and Sediment Control

The VBWD has been involved in erosion prevention and sediment control since the 1970s, when the District established Rules and Regulations pertaining to developments. When the VBWD first began implementing its Rules and Regulations, the VBWD provided only recommendations to the cities regarding proposed developments. In the mid-1970s, the VBWD began its formal permit program. The VBWD Rules and Regulations have always addressed erosion prevention and sediment control. The VBWD Rules and Regulations (2013, as amended) require implementation of temporary and permanent erosion prevention and sediment control measures for developments and other projects (see Section 4.8.7.2). The VBWD's permit inspector routinely inspects VBWD-permitted projects. The VBWD permits about 30 projects annually. Of these, nearly all require erosion and sediment control inspection. The frequency of inspection depends upon the project size, the risk of failure, and the amount of activity. Information about VBWD-permitted projects is included in the VBWD annual report, which can be found on the VBWD website (www.vbwd.org).

In addition to requiring erosion and sediment control measures on private and public projects within the watershed, the VBWD has implemented projects to address significant erosion and sedimentation problems identified within the watershed. Some of these projects include:

- Eagle Point Lake Dam re-vegetation – The VBWD re-vegetated the earthen dam at the outlet of Eagle Point Lake to prevent erosion issues from developing on the dam and to improve habitat. The first phase of re-vegetating the earthen dam began in the fall of 2008 with a mowing of the site, spraying with herbicide to kill weeds, and installation of temporary erosion control blankets to prevent erosion through the winter. The VBWD re-applied herbicide in May 2009, seeded the site in June 2009 with a native prairie seed mix, and installed erosion control blanket following seeding. The VBWD monitored the site through

the summer and vegetation growth was slowed due to lower-than-normal rainfall throughout the summer months; the VBWD completed the project in 2009.

- Highway 36 sedimentation – Since 2006, the VBWD has been in communication with the Minnesota Department of Transportation (MnDOT) to address sediment accumulation in culverts passing beneath Highway 36. The culverts are within the jurisdiction of MnDOT. In 2011, the VBWD collaborated with MnDOT to implement additional stormwater treatment at this location as part of a MnDOT resurfacing project. The goal of additional treatment is to reduce sediment loading to the culverts. Sedimentation and a delta remain as a concern to Long Lake residents.

- Ravine stabilization adjacent to Long Lake, Goetschel Pond, and Goose Lake – The VBWD stabilized ravines near Goetschel Pond and Goose Lake beginning in fall 2008. Seeding was performed at these sites in 2008. Further native grass seeding was completed at the Goose Lake site in 2009. Trees and shrubs were planted at both the Goose Lake and Goetschel Pond ravine sites in 2009, since only a cover crop was seeded in 2008. The VBWD evaluated ravine erosion from Weber Pond upstream of Long Lake in 2007; project designs to stabilize the ravine were prepared in 2008; construction and planting of the Long Lake ravine stabilization was completed in early summer 2009.

- Kelle's Creek streambank stabilization study – The VBWD performed a survey of Kelle's Creek in 2013 to identify areas of significant erosion. After reviewing the survey results, the VBWD decided to continue monitoring the scarps and re-survey them in two years to estimate the rate of scarp erosion and the sediment loading to the creek.

- DeMontreville ravine stabilization – In 2009, the VBWD began stabilization of a ravine between Long Lake and Lake DeMontreville. The design consisted of bank grading, installation of a series of boulder riffle grade-controls, construction of a sedimentation basin at the downstream end, and revegetation. The VBWD completed construction in August 2010, after which trees and shrubs were planted. The VBWD continued to maintain the vegetation until 2013.

- The VBWD has undertaken additional erosion and sediment control efforts as part of its stream restoration projects (see Section 4.4 – Stream Management and Restoration).

Projects located within the VBWD may also be subject to additional erosion and sediment controls required by the appropriate city or township. The Metropolitan Council requires communities to have an erosion and sediment control ordinance (or stormwater ordinances that include provisions for erosion prevention and sediment control) in place prior to the Metropolitan Council's approval of that community's comprehensive plan.

4.8.5.1 NPDES Construction Stormwater Permit

In addition to meeting VBWD requirements and the requirements of other local units of government, proposers of projects disturbing one or more acres of land must obtain a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit from the Minnesota Pollution Control Agency (MPCA). Proposers of projects smaller than one acre that are a part of a larger common plan of development or sale that is one acre or more must also obtain permit coverage. The construction stormwater permit regulates discharges of stormwater affected by construction activity to waters of the state. The MPCA updated the construction stormwater permit in 2013. A key permit requirement is the development and implementation of a stormwater pollution prevention plan (SWPPP) with appropriate best management practices (BMPs). The project's plans and specifications must incorporate the SWPPP before applying for NPDES permit coverage. The SWPPP must be a combination of narrative and plan sheets that address foreseeable conditions, include a description of the construction activity, and address design requirements including temporary and permanent BMPs to control the discharge of stormwater, sediment, and/or other potential pollutants from the site. The SWPPP must address the following construction activity requirements (from Section IV of the construction stormwater permit):

- Temporary and permanent erosion prevention practices
- Sediment control practices
- Dewatering and basin draining
- Inspections and maintenance
- Pollution prevention management measures
- Final stabilization

A significant change in the 2013 update of the construction stormwater permit is the inclusion of a volume control requirement. For projects that replace vegetation or other pervious surfaces with one or more acres of cumulative impervious surface, the permittee must retain on-site a volume of stormwater equal to one inch of runoff over the new impervious surface. This is similar to the MPCA's Minimal Impact Design Standards (MIDS) performance goal adopted in the 2013 VBWD Rules and Regulations (see Section 4.1 – Water Quality and Appendix A-4.5). In situations where infiltration is prohibited, the construction stormwater permit requires stormwater treatment using wet ponds, filtration, regional ponding, or other equivalent methods (see Section 4.2 – Groundwater Management for more information regarding infiltration restrictions).

The construction stormwater permit requires additional BMPs for construction activities discharging to "Special Waters" and waterbodies impaired for the following (as identified on the MPCA's 303(d) Impaired Waters List, see Section 4.1 – Water Quality):

- Phosphorus (nutrient eutrophication biological indicators)

- Turbidity
- Dissolved oxygen
- Aquatic biota (aquatic plant bioassessment or aquatic macroinvertebrate bioassessment)

Valley Creek is a designated Special Water (trout stream), as is the St. Croix River (scenic or recreational river). For projects that discharge to Valley Creek and its tributaries, the SWPPP must conform to the special requirements for trout streams. For projects that discharge to the St. Croix River, the SWPPP must meet the special requirements for scenic or recreational rivers. For impaired waters, the additional requirements depend upon the status of the total maximum daily load (TMDL) implementation plan and associated waste load allocation (see Section 4.1 – Water Quality). The additional BMPs for projects draining to special waters and impaired waters are listed in Table 4.8-1.

Table 4.8-1 NPDES Construction Stormwater Permit Additional BMPs for Drainage to Special Waters

Additional BMP	Special Waters		Impaired Waters*
	Trout Streams	Scenic or Recreational Rivers	
Quicker stabilization of exposed soil areas	X	X	X
Temporary sedimentation basins for smaller areas	X	X	X
Post-construction volume control	X	X	X
Undisturbed buffer zones adjacent to special water	X	X	
Temperature Controls	X	X	

* For impaired waters with approved TMDLs that establish wasteload allocations, specific implementation activities identified by the TMDL may be required

More information about the construction stormwater permit is available at the MPCA's website: http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/index.html

4.8.6 Identified Erosion Prevention and Sediment Control Issues

In the development of its 2015 Watershed Management Plan, the VBWD sought input from several stakeholders regarding the significant concerns or topics facing the District. This information was provided by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Topics identified by the parties listed above were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. Erosion and sediment control was generally not considered a high priority by workshop attendees. Concerns regarding erosion are generally known, and the VBWD maintains regulatory controls to limit the environmental and economic impacts of erosion and sedimentation. With consideration of the results of the October 30, 2013 workshop, the VBWD Managers identified the following erosion and sediment control issues:

1. Managing the impact of erosion and sedimentation due to increased urbanization

2. Identifying and addressing erosion and sedimentation problem areas

Specific areas of erosion and sedimentation concerns located within the VBWD are discussed in Section 5 – Subwatershed Management Plans.

4.8.6.1 Managing the Impact of Erosion and Sedimentation due to Urbanization

Sediment is a major contributor to water pollution. Stormwater runoff from streets, parking lots, and other impervious surfaces carries suspended sediment consisting of fine particles of soil, dust, and dirt carried in moving water. Abundant amounts of suspended sediment are carried by stormwater runoff when erosion occurs.

Although erosion and sedimentation are natural processes, they are often accelerated by urbanization of the watershed, including construction and redevelopment. When a construction site is cleared and graded, the vegetation that intercepted rainfall and slowed down stormwater runoff rates (allowing more time for runoff to infiltrate into the soil) is removed. Also, natural depressions that provided temporary storage of rainfall are filled and graded, and soils are exposed and compacted, resulting in increased erosion, sedimentation and decreased infiltration. As a result, the rate and volume of stormwater runoff from the site increases (*Minnesota Urban Small Sites BMP Manual*, 2001). The increased stormwater runoff rates and volumes cause increased soil erosion, which releases significant amounts of sediment that may enter stormwater infrastructure and VBWD water resources. Sanding and deicing of roadways can also lead to the release of significant amounts of sediment (and other pollutants) to VBWD water resources.

Sediment deposition in detention ponds and wetlands also reduces the storage volume capacity, resulting in higher flood levels and/or reducing the amount of water quality treatment provided. Suspended sediment, carried in water, clouds lakes and streams and disturbs aquatic habitats.

Deposition of sediment carried by stormwater degrades water quality, smothers fish and wildlife habitat, and degrades aesthetics. Sediment also reduces the oxygen content of water and is a major source of phosphorus, which is frequently bound to the fine particles. Erosion also results in channelization of stormwater flow, increasing the rate of stormwater runoff, and further accelerating erosion.

Sediment deposition can also wholly or partially block culverts, manholes, storm sewers, etc., causing flooding and potential damage to infrastructure. As erosion and sedimentation increase due to urbanization, the VBWD's stormwater management systems (e.g., ponds, pipes) require more frequent maintenance, repair, and/or modification to ensure they will function as designed. Monitoring the stormwater system (including ponds) for sediment accumulation will be a critical task for the VBWD (see Section 4.5 – Stormwater Runoff Management). Effective prevention and control measures implemented before, during, and after construction can limit the detrimental environmental, social, and economic impacts of these processes.

In recognition of the impacts of accelerated erosion and sedimentation resulting from urbanization, the VBWD Rules and Regulations require erosion prevention and sediment control at construction sites.

4.8.6.2 Identifying and Addressing Erosion and Sedimentation Problem Areas

The VBWD is aware of existing erosion and sedimentation problem areas in the watershed, including Valley Creek, Raleigh Creek, Kelle's Creek, and Long Lake. Erosion and sedimentation concerns in these areas are described in greater detail in their respective subwatershed management plans (see Sections 5.11, 5.20, 5.37, and 5.5; also see Section 4.3 – Stream Management and Restoration). Gully erosion is prevalent along the bluffs adjacent to the St. Croix River in the Swede Hill Creek watershed (see Section 5.38).

Although the VBWD conducts inspections of VBWD-permitted projects, the VBWD may not be aware of problems at these sites until some time has passed. In addition, VBWD may not be aware of erosion and sedimentation problems at locations where a VBWD permit is not required. In both situations, it would be helpful if residents and/or city/township staff notified the VBWD of existing or potential erosion and sedimentation problems in the watershed.

4.8.7 Policy Details, Strategies, and Actions Related to Erosion Prevention and Sediment Control

4.8.7.1 EP & SC-A. General Policies

VBWD will implement soil protection and sedimentation controls on all VBWD projects to prevent impacts to stormwater infrastructure and water resources. The soil protection and sedimentation controls implemented will be consistent with the VBWD Rules and Regulations (2013, as amended). Proposers of projects requiring a VBWD permit must provide the VBWD with copies of NPDES

construction stormwater permits, if applicable, which include preparation of a Stormwater Pollution Prevention Plan (SWPPP – see Section 4.8.5.1).

The VBWD will identify, inventory, prioritize, and monitor erosion and sedimentation problems within the watershed, including those not associated with VBWD-permitted projects. The inventory will consider, and may include, areas of concern identified by the VBWD, local units of government, residents, or others. The VBWD will monitor these problem areas to determine if the sites are stable or if continued erosion/sedimentation is occurring. The VBWD will implement or require others to implement soil protection, sedimentation controls and/or other measures to correct erosion and sedimentation problems that threaten VBWD waterbodies or public health, safety, and welfare. VBWD will work with other units of government, as needed, to assign responsibility for implementing corrective actions.

4.8.7.2 EP & SC-B. Permit Review

The VBWD will administer and enforce its permit program regulating land use and development to prevent erosion and sedimentation impacts to stormwater infrastructure and VBWD waterbodies. The VBWD will continue to require owners and operators of VBWD-permitted project sites to minimize erosion resulting from land alteration by implementing temporary and permanent erosion prevention and sediment control measures. Submittals for VBWD-permitted projects must show how the project will meet the VBWD stormwater management requirements, including erosion prevention and sediment control. The VBWD Rules and Regulations (2013, as amended) cite the Metropolitan Council's *Minnesota Small Sites Best Management Practices Manual* (2001) as the minimum guidelines for erosion control measures. Erosion and sediment control standards are specified in Rule 3 of the VBWD Rules and Regulations (see Appendix A-4.5).

As part of the permit submittals, permit applicants must provide a copy of the Stormwater Pollution Prevention Plan (SWPPP), which conforms to:

- MPCA NPDES Construction Stormwater Permit requirements (see Section 4.8.5.1).
- Additional NPDES requirements for projects that discharge to "special waters," including Valley Creek (trout stream) and the St. Croix River (scenic or recreational river); these requirements are listed in Section 4.8.5.1.
- Any additional or more stringent VBWD requirements.

See Section 4.8.5.1for more information about the NPDES construction stormwater permit and SWPPP, and Section 4.5 – Stormwater Runoff Management for more information about permit submittals.

The VBWD will continue to inspect its projects and VBWD-permitted projects to monitor compliance with and enforce VBWD Rules and Regulations (2013, as amended) and VBWD permit conditions. The frequency of inspection will depend upon the project size, the risk of failure, and the

level of activity at the project site. VBWD enforcement includes promptly notifying permittees of any erosion and sedimentation problems found on the site and requiring permittees to correct the problems. The VBWD will continue to collect a cash surety charge or another type of fee to ensure that VBWD-permitted projects are completed in accordance with permit conditions. If a permittee does not correct an identified problem within a reasonable amount of time, the VBWD will correct the problem and pay for the correction using the cash surety (or other collected fee. The VBWD will use other enforcement measures as necessary and as allowed by Minnesota law. The VBWD will communicate with applicable local units of government regarding project status before releasing permit escrow funds, cash sureties, etc.

The VBWD will assist cities, townships, and counties within VBWD in developing, adopting, implementing, and enforcing erosion prevention and sediment control ordinances, as requested. The ordinances must include the requirements and procedures for reviewing, approving and enforcing erosion prevention and sediment control plans and must address erosion and sediment control at individual building sites.

For those cities, townships, and counties that wish to allow VBWD to maintain its permitting authority, the ordinances need to address projects where the VBWD Rules and Regulations are not applicable.

4.8.7.3 EP & SC-C. Agricultural Practices

VBWD does not require a permit for usual agricultural activities. VBWD will encourage the use of agricultural best management practices and will collaborate with other agencies to implement such measures. A possible opportunity includes cooperation with the Minnesota Department of Agriculture (MDA) to encourage participation in the Agricultural Water Quality Certification Program. This is a voluntary program to accelerate adoption of on-farm conservation practices; certified producers will be considered compliant with water quality standards for a period of 10 years and will receive priority for technical assistance from the MDA.

List of Tables

4.9 Administration and Funding

4.9.1 Importance	For the VBWD to implement its mission and policies, clear administrative processes, and funding, are required.
4.9.2 General Issues	Minnesota Statues 103B and 103D list authorities given to watershed districts, which include, among others, the authority to: construct improvements, levy taxes, adopt rules to regulate water resources, acquire property, and incur debts, liabilities, and obligations. Minnesota Statutes also require watershed districts to develop watershed management plans. Minnesota Statutes give all watershed districts, including the VBWD, various methods of obtaining funds to implement their watershed management plans and to finance their basic operations. These options are discussed in Section 4.9.5. The jurisdiction of the VBWD overlaps that of cities, townships, counties, and the state. The issues facing the VBWD and the affected parties and governments within the VBWD are unique. Therefore, it is sometimes challenging to develop administrative procedures and funding methods that the affected parties see as fair. Managers are appointed by Washington County (four Managers) and Ramsey County (one Manager) to promote management that is above the politics of individual cities and townships.
4.9.3 Mission	To manage and protect our water resources within the limits of the VBWD's jurisdiction: lakes, ponds, creeks, streams, wetlands, drainages, and groundwater by: Promoting communication and collaboration with our residents, communities, and pertinent governmental units. Improving and protecting the quality of surface water and groundwater resources. Managing the quantity of water and minimizing the negative impact on the VBWD from floods, high flows, and droughts. Understanding and responding to the effects of community growth and related activities on groundwater and surface water resources. Preserving and enhancing the quantity and quality of wetlands. Educating and inspiring our residents, communities, governmental units, and other stakeholders to participate in the protection and improvement of water resources.
4.9.4 Policies to Accomplish Mission	AF-A. 1. The VBWD will update its watershed management plan every 10 years, consistent with Minnesota Statutes 103B and 103D, and Minnesota Rules 8410, as amended.

		2. The VBWD will require the submission of, and will review, the local water management plans of cities and townships within the VBWD; these plans must be consistent with the VBWD Plan, as required by Minnesota Statues 103B. 3. The VBWD will coordinate administrative roles with cities, townships, counties, or other agencies to increase efficiency, where opportunities allow. 4. The VBWD will update its legal boundary on an as-needed basis. 5. The VBWD will follow all applicable Minnesota Statutes and Rules, including those for notification and hearings on budgets and capital improvement projects. 6. The VBWD will cooperate/work with Washington and Ramsey Counties to provide project budget, funding, and other information to the counties at a time that meets their finance schedules. 7. The VBWD will inform Washington County by April 1 if VBWD's proposed funding request for the following year will be more than 80% higher than the current year's total levy.
	AF-B.	1. The VBWD will review all of the allowable options for funding administration, programs, studies, and projects each year, as the VBWD Managers set their annual budget. The VBWD will fund basic operations, projects, and maintenance using a variety of sources, as appropriate. 2. The VBWD will fund projects with consideration for the guidelines presented in Table 4.9-4, Table 4.9-5, and Table 4.9-6.
	AF-C.	1. The VBWD will continue to implement its permit review program and standards identified in its Rules and Regulations (2013, as amended). 2. The VBWD will defray the costs of its permit program through the charging and collection of application fees. 3. The VBWD will collect cash sureties and/or other financial securities to ensure VBWD-permitted projects are completed in accordance with VBWD requirements.

4.9.5 Background and History Related to Administration and Funding

Since its creation in November 1968, the VBWD has been governed by a Board of Managers with five members. VBWD has no central office and no full-time staff. All services, including engineering, legal, accounting, inspection, and secretarial services are provided by consultants.

The VBWD falls under the jurisdiction of Minnesota Statutes (MS) 103D and Minnesota Statutes 103B. Per MS 103B and MS 103D, watershed districts are required to prepare watershed management plans. The VBWD has produced four watershed management plans approved by the Board of Water and Soil Resources, or its predecessor (1970, 1987, 1995, and 2005). Between plan updates, the VBWD has amended its plan; amendments to the plan may be minor or major, as defined in Minnesota Rules 8410. Section 6 provides a more detailed discussion of the plan update and revision process.

MS 103B and MS 103D give watershed districts the authority to establish rules and regulate water resources. In1972, the VBWD adopted its first Rules and Regulations. The VBWD Rules and Regulations have been revised periodically since their creation, with the most recent revision occurring in 2013. The VBWD began implementing its permitting program in 1975. In the past, the VBWD has allowed cities and townships (e.g., Oakdale) to issue permits without a VBWD permit, as long as the permit requirements are at least or more stringent than those of the VBWD. The VBWD will continue to allow cities and townships to assume permitting roles provided that the cities and townships demonstrate that their permitting programs meet the VBWD requirement.

A more detailed history of the VBWD is included in Section 2.0 – Introduction.

4.9.5.1 Local Plan Review and Approval

Per Minnesota Rules 8410, cities and townships within watershed districts must update their local water management plans to be consistent with the watershed district plan. The VBWD is responsible for review and approval of local water management plans. The following table describes the status of local water management plans for VBWD cities and townships, as of the publication of this plan.

Table 4.9-1 Status of Local Water Management Plans

Community	Status of Local Water Management Plan	VBWD Approved Date
Afton	Approved by VBWD	April 14, 2011
Baytown Township	Approved by VBWD	July 9, 2009
Grant	Approved by VBWD	January 14, 2010
Lake Elmo	Approved by VBWD	July 22, 2010
Mahtomedi	Approved by VBWD	August 14, 2014
Maplewood	Approved by VBWD	August 2009
North St. Paul	Approved by VBWD	November 13, 2008

Table 4.9-1 Status of Local Water Management Plans

Community	Status of Local Water Management Plan	VBWD Approved Date
Oak Park Heights	Approved by VBWD	May 29, 2009
Oakdale	Approved by VBWD	July 22, 2010
Pine Springs	Approved by VBWD	January 14, 2010
St. Mary's Point	Not approved by VBWD. The VBWD submitted comments on the plan in May 2008.	
West Lakeland Township	Not approved by VBWD. The VBWD submitted comments on the plan in March 2010.	
White Bear Lake	Not approved by VBWD. The VBWD has not received a copy of the City of White Bear Lake plan.	
Woodbury	Approved by VBWD	January 22, 2009

4.9.5.2 Past Funding of Major Projects

Prior to 1982, major watershed district projects had to be funded by special assessments levied against the properties that benefited from the project. The projects had to be initiated by a petition from the cities or townships. Several projects were petitioned for implementation in the VBWD and the VBWD proposed several times to levy large-scale special assessments to pay for them. Project 1005 (pumping of water from Lake Jane) is the only major project that the VBWD successfully implemented and funded in this manner. The VBWD paid for the pumping by levying special assessments on all properties that drained water to the project. Once the pump was installed, supplemental assessments were required to fund operation and maintenance of the pump. This method was cumbersome for several reasons, including:

- Notice had to be served on hundreds or thousands of properties and all parcel subdivisions had to be tracked.
- Increased tendency for public opposition to the project.
- Assessment formulas could become very complex in an attempt to take into account such factors as parcel size, imperviousness, state of development, etc.
- Every time a maintenance assessment was levied, the VBWD had to create a new assessment roll and certify it to the County.
- Property sales produced many inquiries regarding the status of unpaid assessments.

In 1982, a new state law (now MS 103B.241) allowed watershed districts to levy ad valorem taxes to pay for projects. An ad valorem tax levy is a tax that is collected over the entire taxing district and is based on property value, rather than benefits. A later amendment allowed watershed districts to levy different amounts by subwatersheds. The first use of this law was the financing of VBWD Project 1007 in 1986. The VBWD adopted a three-tier system to finance Project 1007:

1. **Special Assessments** – Properties that were directly benefited and would receive a market value increase from the project were required to pay special assessments in proportion to the direct benefit they received. This included lakeshore properties that received relief from flooding. The total amount of these assessments was about 5% of the cost of Project 1007.

2. **Higher Level Ad Valorem** – Properties located in subwatersheds that contributed runoff to the project paid a higher level of ad valorem tax. This included the properties that also paid special assessments. For Project 1007, this group also included properties in subwatersheds in Afton that did not contribute runoff to the project, based on the rationale that Project 1007 reduced anticipated future flood relief costs in Afton by diverting upstream water away from Afton. For Project 1007, about 20% of the construction costs were spread over these subwatersheds.

3. **Lower Level Ad Valorem** – Properties in areas of the VBWD that did not contribute water to the project paid a lower level of ad valorem tax. For Project 1007, about 75% of the construction costs were spread over the remainder of the VBWD watershed through an ad valorem tax.

This approach was successful and proved to be more flexible and more efficient than the use of special assessments alone.

4.9.5.3 Available Funding Sources – Watershed Districts

4.9.5.3.1 Funds

Watershed law (MS 103D.905) allows watershed districts to collect a limited ad valorem tax levy to finance their basic operations. Table 4.9-2 describes available types of funds that watershed districts may currently use to finance their operations and projects.

Table 4.9-2 Funds available to Watershed Management Organizations

Type of Fund	Purpose / Details	VBWD Fund Name/Use
Organizational Expense Fund	• Used to pay organizational expenses, including development of watershed management plan • Ad valorem levy; limited to the lesser of 0.016% of taxable value or $60,000 • Unexpended funds may be transferred to an administrative fund	• Not used by VBWD

Table 4.9-2 Funds available to Watershed Management Organizations

Type of Fund	Purpose / Details	VBWD Fund Name/Use
General Fund	• Used to pay administrative expenses: staff salaries, consultant fees, insurance, legal fees, office expenses • Can be used to fund projects of common good to the watershed • Ad valorem levy; limited to the lesser of 0.048% of taxable value or $250,000. • Additional levy allowed for projects initiated by petition (see Section 4.9.5.3.2)	• VBWD General/ Administrative Fund • VBWD Public Education Fund • Used annually since inception • Amount determined through annual budgeting process • Ad valorem levee limited to $250,000 in the VBWD
Survey and Data Acquisition Fund	• Designed to pay for making necessary surveys and acquiring data • To be established only if other funds are not available • Ad valorem levy; limited to 0.024% of taxable value; collected once per 5 years; maximum fund balance is $50,000	• Not currently used by VBWD • Used frequently in the past
Bond Fund	• Used for payment of the principal of, premium or administrative surcharge, if any, and interest on bonds/ notes issued by the district • Consists of the proceeds of special assessments, storm water charges, loan repayments, and ad valorem tax levies pledged for payment of bonds/ notes issued by the watershed district.	• Infrequent (used for Project 1007)

Construction or Implementation Fund	• Consists of the proceeds of:
	  • Watershed district bonds/notes
	  • Construction loans from state or federal agencies
	  • Special assessments, storm water charges, loan repayments, and ad valorem tax levies intended to supply funds for construction of projects
	• Used to accumulate funds for the construction of ditches, dikes, canals, channels, storm water facilities, sewage treatment facilities, wells, and other works, and related expenses.
		• VBWD Plan Implementation Fund, including:
		  • Water Quality Project Fund
		  • Monitoring Fund
		• VBWD Water Management and Maintenance Fund
		• Used annually as projects and programs require (referred to as the Plan Implementation Fund by the VBWD)

Maintenance Fund	• Used for normal or routine maintenance of projects (e.g., removing obstructions, sediment accumulation) • Ad valorem levy assessed to property previously assessed for benefits during construction or implementation. • No assessment allowed if the balance of the fund exceeds 20% of the construction or implementation cost	• VBWD Water Quantity Fund (formerly Emergency Fund) • Used periodically as projects require

Table 4.9-2 describes types of funds currently available to watershed districts. Watershed districts may subdivide these funds as appropriate to meet their operational needs. Table 4.9-2 includes the funds maintained by the VBWD according to the type of fund.

4.9.5.3.2 Projects

The laws regarding funding of projects and/or programs differ between watershed districts located in the Twin Cities metropolitan area and those located outside the metropolitan area. MS 103D applies to all watershed districts, while MS 103B applies only to watershed districts (and joint powers watershed management organizations) in the Twin Cities metropolitan area. Both MS 103D and MS 103B apply to VBWD. The method by which a project is initiated dictates the allowable funding methods. This section describes the different funding methods and project initiation methods. There are three types of project funding methods available to watershed districts:

1. Ad valorem taxes
2. Water Management District (Utility)
3. Special Assessments

Ad Valorem Taxes (Watershed District-Wide and Subwatershed)

In the Twin Cities metropolitan area, watershed districts have the authority to levy taxes to pay for projects identified in a BWSR-approved and watershed district-adopted watershed management plan (MS 103B. 241). This ad valorem tax is in addition to any other taxes authorized by law, and it may also be used to accumulate funds to finance improvements, as an alternative to issuing bonds. To use this funding method, the project, program, or activity must be adequately described in the watershed management plan, including the scope of the project, program or activity and the proposed funding mechanism. For implementation activities included in an approved watershed management plan, Minnesota law allows the watershed district to implement projects without a petition (MS 103B.231, Subd. 10 and MS 103D.605) and to apportion costs district-wide or by subwatershed unit, which may require the establishment of more than one tax district in the watershed (MS 103B.251). The cost apportionment must be prescribed in the watershed district's capital improvement program.

Watershed districts may also levy a tax over the entire watershed district to pay for the costs attributable to the basic water management features of projects initiated by petition of a municipality within the watershed district (MS 103D.905). The levy may not exceed 0.00798 percent of the watershed's taxable market value and the levy may extend for a period not to exceed 15 consecutive years. In VBWD, such a levy would generate approximately $270,000.

Watershed districts may use a portion of their General Fund (see Table 4.9-2) for construction and maintenance of projects of common benefit to the watershed district. The upper limit of this fund is currently $250,000 annually. Since this fund is normally used for the general administrative expenses of a watershed district, and the size of the fund is limited, large projects cannot be funded from this source.

Watershed districts in the Twin Cities metropolitan area may collect an ad valorem levy within the watershed district or subwatershed unit for the purpose of creating a maintenance fund (MS 103B.251, see Table 4.9-2). The maintenance fund is to be used for normal and routine maintenance of an improvement for which the county provided at least some of the monies. This levy is in addition to any other watershed district taxes.

Water Management District (Utility)

Similar to stormwater utilities for cities, watershed districts may establish a water management district (or more than one district) to collect revenues and pay for projects initiated through MS 103B.231, MS 103D.601, 605, 611 or 730. To use this funding method, the law requires that the watershed district prepare an amendment to its watershed management plan. The amendment must describe the area to be included in the water management district, the amount to be charged, the methods used to determine the charges, and the length of time the water management district will remain in force (MS 103D.729). The VBWD has not established a water management district.

Special Assessments

State law allows watershed districts to pay for projects by special assessment of benefited properties, but they must have a BWSR-approved plan before they can initiate projects (MS 103D.701). Projects that are to be paid for by special assessment must be initiated by either a project petition (MS 103D.701), or unanimous resolution of the managers (MS 103D.701), or by resolution of a majority of the managers (MS 103D.601). Further information regarding special assessments and project initiation can be found in the statutes.

Grant and Loan Programs

The VBWD can apply for grants and loans to offset project costs.. These grant and loan programs change frequently, including grant/loan amounts, priorities, availability of new grants/loans, and termination of programs.

4.9.5.3.3 Emergency Projects

Watershed districts may declare an emergency and order work to be done without a contract if the Managers find that conditions exist that present a clear and imminent danger to the health or welfare of the people of the district (MS 103D.615 and MS 103B.252). MS 103D.615 allows the cost of work undertaken without a contract to be assessed against benefitted properties, or by an ad valorem levy applied to the entire district if there is a common benefit and the cost is not more than 25 percent of the most recent ad valorem levy. MS 103B.252 is similar to MS 103D.615, except it does not contain levy limits and is silent regarding funding of emergency work.

4.9.5.4 State Funding Sources

In addition to the funding sources described in Section, the VBWD could obtain funding from various state sources, such as grant and loan programs. The following paragraphs list various state-funded sources, grouped according to the state agency that administers the various funding programs.

The **Board of Water and Soil Resources** (BWSR) administers several grant programs, including the Clean Water Fund (CWF) program; cities and WMOs are eligible for CWF grants.

The **Minnesota Pollution Control Agency** (MPCA) administers the Clean Water Partnership (CWP) grant and loan program, EPA funded Section 319 programs (including a TMDL implementation grant program), the Surface Water Assessment Grant program, Phosphorus Reduction Grant program, and the Clean Water State Revolving Fund program.

The **Minnesota Department of Natural Resources** (MDNR) administers many grant programs that could be appropriate for the cities or WMOs, including the Flood Hazard Mitigation Grant Assistance program, the Parks and Trails Legacy Grant program, trail grants programs, aquatic invasive species prevention grants and other aquatic plant management grant programs, shoreland habitat restoration grant program, and dam safety program. Funding for many of these programs changes after each legislative session.

Other state funding programs include the Legislative-Citizen Commission on Minnesota Resources' (LCCMR) funds for non-urgent demonstration and research projects, the Minnesota Department of Employment and Economic Development's (DEED) Contaminant Cleanup Development Grant Program, the Minnesota Department of Transportation (MnDOT) State Aid Funds, and ISTEA funds.

4.9.5.5 Federal Funding Sources

The VBWD may also receive funding from various federal sources, a few of which are discussed in the following paragraphs.

The **U.S. Environmental Protection Agency** (EPA) has discretionary funds available through each division and program area of the EPA and administers the Clean Lakes Program (CLP) established by Section 314 of the Clean Water Act; the CLP is similar to the MPCA's Clean Water Partnership program. The EPA also administers the 604b Grant Program that targets water quality improvements in urban areas, and the Environmental Education Grant that finances local environmental education initiatives.

The **U.S. Army Corps of Engineers** administers the Planning Assistance to States (Section 22) program, the Project Cooperation Agreement (PCA) program, also known as the LCA (Local Cooperation Agreement) program for construction of flood control projects, the Section 14 bank protection program, the Flood Plain Management Services Program, and the Aquatic Plant Control Program and provides many GIS products through its GIS Center.

The **U.S. Fish and Wildlife Service** administers the North American Wetlands Conservation Fund, as part of the North American Wetlands Conservation Act (WCA), and the Partners for Wildlife Grant Program.

The **Natural Resource Conservation Service** (NRCS) has funds available for technical assistance on various surface water projects, operations and maintenance, inspections and repairs. The NRCS also administers the Environmental Quality Incentives Program (EQIP), which was established through the 1996 Farm Bill Program.

The **Federal Emergency Management Agency** (FEMA) has funds available to restore areas (including water resources) damaged or destroyed by a disaster.

4.9.6 Identified Administration and Funding Issues

The VBWD faces several issues related to administration and funding, including existing issues carried over from the 2005 Plan as well as emerging issues. This section discusses the administration and funding concerns identified by:

- The VBWD Managers
- Individuals attending the October 30, 2013 issue identification workshop
- Individuals providing input via VBWD website and board meetings
- Regulatory agencies and other stakeholders via written responses to the VBWD's Plan notification
- Cities and townships responding to a VBWD survey

Issues identified by the parties listed above were presented and discussed at an October 30, 2013, issue identification and prioritization workshop. The VBWD Managers considered the results of that workshop and identified and organized the following major administration and funding topics:

1. Eliminating redundancy with city, county, and other agency roles
2. Equitably funding projects and programs using appropriate methods
3. Demonstrating accountability as spenders of public resources

Administration and funding concerns that pertain to particular waterbodies or drainage areas are discussed in Section 5 – Subwatershed Management Plans.

4.9.6.1 Eliminating Redundancy between the VBWD and other Entities

The VBWD is one of several units of government that are directly or indirectly responsible for managing water resources – including water quality and water quantity (also see Table 4.1-2). Other entities with water resource management responsibilities include, but are not limited to:

- VBWD cities and townships
- Washington Conservation District and Ramsey Conservation District

- Minnesota Department of Natural Resources
- Minnesota Pollution Control Agency
- Minnesota Board of Water and Soil Resources (BWSR)
- Minnesota Department of Health
- Minnesota Department of Agriculture
- Washington County and Ramsey County

Overlapping permitting and stormwater management responsibilities may allow for specialization of resources and expertise, but can also create the potential for redundant or less efficient processes. For example, some cities have expressed concern that the VBWD permitting program (and associated inspections) is redundant to the National Pollutant Discharge Elimination System (NPDES) general construction permit. Communication between the VBWD and other units of government, especially its cities and townships, is necessary to identify areas where efficiency may be increased as well as areas where additional effort is needed to prevent concerns from going unaddressed.

Review and approval of local water management plans is one method by which the VBWD, cities, and townships can "edge-match" their respective responsibilities. Local water management plans outline the responsibilities of the city or township and include an implementation program related to the management of water resources. In its 2009 review of the VBWD, BWSR noted that the VBWD had not approved several local water management plans (see Section 4.9.5.1). Timely completion of local water management plans by cities and townships, and the subsequent review by the VBWD, will improve cooperation between the VBWD and its cities and townships and reduce the potential for redundancy.

4.9.6.2 Equitably Funding Projects and Programs Using Appropriate Methods

A basic funding issue for the VBWD is how to balance the funding of projects that address a larger common good versus projects that address a more local common good. The VBWD is responsible for managing all of the water resources within the watershed, and these waters may impact downstream water resources, such as the St. Croix River. The VBWD may need to implement some projects for private water resources to provide a positive benefit for a downstream public resource.

Another issue is whether VBWD can achieve fair funding of projects while minimizing the complexity of funding methods; overly complicated funding formulas can create roadblocks for implementing projects (too time-consuming and/or costly to determine funding). A possible solution is setting up subwatershed taxing districts to fairly allocate project costs, a method VBWD has used in the past (Project 1007). In situations where the VBWD wishes to fund projects through either a subwatershed taxing district or through Minnesota Statutes 103B.251 (certifying to county for payment), Washington County has expressed concern about the impact these funding mechanisms

could have on the county's cash flow. To address this, Washington County has requested that the VBWD notify the county of these funding situations earlier than required by statute.

To ensure equitable funding, the VBWD legal boundary should match the hydrologic boundary as closely as possible. Since the legal boundary must follow property boundaries or other legally definable boundaries (e.g., roads), and a single property cannot be divided into more than one watershed district, there can be significant differences between the legal boundary and the hydrologic boundary. This is especially true in undeveloped or less developed areas, where individual properties are larger. As development occurs and properties are split into smaller pieces, the legal boundary may need to be updated to more closely match the hydrologic boundary. The VBWD legal boundary has been revised a number of times (see Section 2) to more closely resemble the hydrologic boundary. The boundary between VBWD and South Washington Watershed District will continue to change as urbanization continues in that part of the watershed. Changing the legal boundary of a watershed district requires development of a new legal description for the affected watershed districts, which must be approved by BWSR. In such cases, the VBWD must weigh the need for revising its boundary against the resources that go into making the change.

Since the inception of its permit program, the VBWD has revised its permit application/inspection fees to more closely match the VBWD's costs for permit review, inspection, enforcement, and administration. The VBWD may waive fees and sureties for small projects, as determined by the Managers. In accordance with state law (MS 103D.345), the VBWD waives fees and sureties for Minnesota Department of Transportation (MnDOT) projects. In addition, the VBWD waives fees for other governmental units on a case by case basis. The expenses for reviewing, inspecting, enforcing and administering permits with waived fees and sureties are charged against VBWD's General Fund. The VBWD will need to periodically assess its permit fees relative to review expenses.

4.9.6.3 Demonstrating Accountability as Spenders of Public Resources

The VBWD is funded by public dollars through taxes or assessments levied on property owners in the watershed, fees, and grants from government agencies (which are also ultimately taxpayer-funded). The VBWD has a duty to its taxpayers to spend its funds in a responsible manner that considers the relative benefits, per dollar, of its actions. The benefits of effective water resource management are extremely difficult to quantify in dollars (e.g., increased wildlife habitat or recreational use). Despite this, the VBWD will continue to evaluate the relative cost/benefit using best professional judgment and drawing on resources including consultants, advisory committees, and other cooperating entities.

To maintain public interest and support (see Section 4.3 – Education and Public Involvement), the VBWD will continue to demonstrate that it is cost-conscious and is a responsible spender of public dollars. This will include annual reporting of expenditures and budgeting, and periodic review of program costs and available funding methods.

The VBWD has no full-time staff; all services (e.g., engineering, accounting) are provided by consultants. There may be opportunities to reduce overall operational costs by maintaining staff (e.g., an administrator) to perform selected services, rather than contracting those services out.

4.9.7 Policy Details, Strategies, and Actions Related to Administration and Funding

4.9.7.1 AF-A. General Administration and Funding

The VBWD will continue to update its watershed management plan at 10-year intervals, performing minor and major plan updates in the interim, as required. VBWD will update its legal boundary on an as-needed basis. Prior to beginning the process of updating the legal boundary, the VBWD will consider whether the benefits of a legal boundary update are worth the cost of performing the update.

The VBWD requires cities and townships to complete and submit local water management plans for review and approval. Local watershed management plans must be consistent with the policies and standards presented in the VBWD watershed management plan. As part of local plan review, the VBWD will evaluate gaps or overlap of responsibilities between the VBWD and cities and townships. The VBWD will consider coordination between cities, townships and other entities to reduce administrative or other redundancies, if appropriate.

The VBWD will follow all applicable Minnesota Statutes and Rules, including those for notification and hearings on budgets and capital improvement projects.

The VBWD will cooperate/work with Washington and Ramsey Counties to provide project budget, funding, and other information to the counties at a time that meets their finance schedules. If VBWD's proposed funding request through Washington County will be more than 80% higher than the current year's total levy, the VBWD will inform Washington County by April 1 of the current year.

4.9.7.2 AF-B. Funding of Basic Operations, Projects, and Maintenance

Each year, as the VBWD Managers set their budget for the following year, the VBWD will review all of their allowable options for funding administration, programs, studies, projects, and maintenance. Planned funding sources are described in this section and summarized in Table 4.9-2. The VBWD may reconsider the funding sources for various VBWD activities, if such changes are warranted. The VBWD will evaluate the relative cost of hiring staff versus the cost of hiring consultants to perform engineering, administrative, secretarial, and other tasks.

4.9.7.2.1 Funding of Basic Operations

The VBWD will use its administrative fund (called "General Fund" in Minnesota statutes) to pay for basic operations (see Table 4.9-2). The administrative fund consists of the proceeds of an ad valorem tax levy over the entire watershed. Basic operations include salaries, manager per diem and expenses, studies, office expenses, special projects, legal fees, and engineering fees. The engineering fees

include the costs for responding to information requests, reviewing non-escrow projects that require a VBWD permit, reviewing and preparing correspondence for the managers, attending managers' meetings, attending meetings on behalf of the managers, assisting with lake level surveys, monitoring lake water quality, monitoring groundwater levels, completing special projects as authorized by the managers, and administering the Wetland Conservation Act.

The VBWD will fund applicable basic operations (e.g., lake level surveys, water quality monitoring) using the Survey and Data Acquisition Fund only if other funds are not available to VBWD. Such a fund would consist of the proceeds of an additional ad valorem tax levy over the entire VBWD.

The VBWD will fund future updates of the VBWD Watershed Management Plan through its watershed management and maintenance fund, which consists of the proceeds of an additional ad valorem tax levy over the entire watershed (Table 4.9-2).

The VBWD will use its annual budget process to determine and justify the levy amount for its administrative budget.

4.9.7.2.2 Funding of Projects

The VBWD's funding of projects will vary, depending on the type of project. The VBWD will also seek grants, partnerships, etc. to reduce the VBWD's share of project costs. Table 4.9-3 illustrates the estimated impact on residential property taxes for various (project) levy amounts. VBWD will use this table (or a similar table) to help guide their funding decisions. Historically, the taxable market value of the property within the VBWD has usually increased faster than the inflation rate, so the relative fiscal impact of VBWD tax levies on individual taxpayers has usually decreased over time.

Table 4.9-3 Estimated Tax Impact for Various Levy Amounts

Estimated Ad Valorem Levy	Residential Property Taxable Market Value			
	$150,000	**$250,000**	**$400,000**	**$750,000**
$75,000	$0.28	$0.52	$0.88	$1.79
$250,000	$6.55	$12.21	$20.70	$42.17
$500,000	$15.51	$28.89	$48.97	$99.78
$1,000,000	$33.44	$62.31	$105.60	$215.15
$2,000,000	$69.29	$129.09	$218.78	$445.74
$5,000,000	$176.85	$329.47	$558.40	$1,137.66

Note: The estimated impacts listed in this table are based on the 2014 tax rates, the estimated 2014 VBWD taxable value ($35,229,949), and the estimated 2014 VBWD fiscal disparity ($67,274).

4.9.7.2.2.1 Public Education and Public Information Projects

The VBWD will fund ongoing public education and public involvement efforts through their public education fund, which is part of the VBWD administrative fund (General Fund, see Table 4.9-2). The administrative fund consists of the proceeds of an ad valorem tax levy over the entire VBWD. The costs of public education and public involvement efforts associated with a specific VBWD project will be considered part of the project and funded accordingly.

4.9.7.2.2.2 Capital Projects

The VBWD will fund capital projects through a combination of methods and utilizing the VBWD plan implementation fund (see Table 4.9-2). Guidelines for funding water quality capital projects are presented in Table 4.9-4 for projects over $500,000. Similar guidelines for funding of non-water quality capital projects are presented in Table 4.9-5 for projects over $500,000. For projects of $500,000 or less, the VBWD intends to fund these projects using an ad valorem tax levy over the entire VBWD, most likely using the authority given in Minnesota Statutes 103B.241. For projects including the management of aquatic invasive plants (see Section 4.1 – Water Quality), the VBWD will consider funding methods applied on a lakeshore basis as shown in Table 4.9-6.

The VBWD will use the authority given in Minnesota Statutes 103B.251, if necessary (e.g., if bonding is required). If the VBWD uses the authority of Minnesota Statutes 103B.251, the VBWD will submit the certification for payment to the county prior to April 1 of the year preceding the year in which the funds are needed. Along with the certification for payment, the VBWD will also submit to the county the VBWD resolution ordering the project and certifying the cost to the county, and a copy of the engineer's report that details the project scope and the amount and timing of the needed funding. If the VBWD wishes to fund/partially fund a project using a subwatershed taxing district, the VBWD will submit by July 1 to the county auditor a list of parcels comprising the special taxing district.

Table 4.9-4 Funding Method Guidelines for Water Quality Projects over $500,000[1]

Funding Method	Water Body Classification & Public Use							
	High Priority Waterbodies			Medium Priority Waterbodies		Low Priority Waterbodies		Stormwater Ponds
	Public access & public swimming beach	Public access only	No public access	Public access	No public access	On Public Land	On Private Land	
Ad valorem – entire VBWD[2]	100%	75%	25%	75%	25%	75%	25%	25%
Ad valorem – subwatershed[3]		25%	50%	25%	50%	25%	25%	
Special Assessment[4]			25%		25%		50%	
Water Management District (Utility)[5]								75%
Grants	Actively seek	Seek	Possibly seek	Seek	Possibly seek	Seek	Possibly seek	Possibly seek

[1] The percentages listed in this table are only guidelines – the VBWD Board of Managers will use these guidelines to assist them in determining the appropriate funding of individual projects. The Board of Managers is open to various available funding methods.

[2] Using the authority given in Minnesota Statutes 103B.241, Subd. 1, or 103B.251, Subd. 5 & 6.

[3] Using the authority given in Minnesota Statutes 103B.251, Subd. 5 & 6.

[4] Using the authority given in Minnesota Statutes 103D.601 or 103D.701.

[5] Using the authority given in Minnesota Statutes 103D.729 and 103D.730 (requires amendment to VBWD Plan).

Table 4.9-5 Funding Method Guidelines for Other Projects over $500,000[1]

Funding Method	Project Type						
	Stream Management & Restoration		Stormwater Management	Water Level & Floodplain Management	Groundwater Management[2]	Wetland Management	Erosion Prevention & Sediment Control
	Perennial & Intermittent Streams With Public Access	Perennial & Intermittent Streams Without Public Access					
Ad valorem – entire VBWD[3]	50%	25%		70%	100%[2]	See Table 4.9-2.	Depends on water body See Table 4.9-2.
Ad valorem – subwatershed[4]	50%	50%		25%			
Special Assessment[5]		25%		5%			
Water Management District (Utility)[6]			100%				
Grants	Actively seek	Seek	Possibly Seek	Seek	Actively Seek	Seek	Seek

[1] The percentages listed in this table are only guidelines – the VBWD Board of Managers will use these guidelines to assist them in determining the appropriate funding of individual projects. The Board of Managers is open to various available funding methods.

[2] The VBWD will not fund more than 50% of the total project. The percentages listed apply to VBWD's portion of the project.

[3] Using the authority given in Minnesota Statutes 103B.241, Subd. 1, or 103B.251, Subd. 5 & 6.

[4] Using the authority given in Minnesota Statutes 103B.251, Subd. 5 & 6.

[5] Using the authority given in Minnesota Statutes 103D.601 or 103D.701.

[6] Using the authority given in Minnesota Statutes 103D.729 and 103D.730 (requires amendment to VBWD Plan).

Table 4.9-6 Funding Method Guidelines for Aquatic Invasive Plant Management Projects

Funding Method	Shoreline Length Utility Option	Shoreline Utility Option
	Percent of the Project[1]	**Percent of the Project[1]**
Ad valorem – entire VBWD[2]	• 100% of cost to set up Utility, and • $10,000 or 25% of the project cost whichever is less, and • Public land portion of the Utility (see below) • Remainder paid by Utility (see below)	• 100% of cost to set up Utility, and • $10,000 or 25% of the project cost whichever is less, and • Public land portion of the Utility (see below) • Remainder paid by Utility (see below)
Ad valorem – subwatershed[3]	Not used	Not used
Special Assessment[4]	Not used	Not used
Water Management District (Utility)[5]	Evenly split amongst shoreline landowners by percentage of the total shoreline when water at elevation on the Minnesota Department of Natural Resources' 2011 LiDAR elevation; for land under public ownership, VBWD will pay the amount via ad valorem (see above)	Evenly split amongst shoreline landowners with shoreline when water at elevation on the Minnesota Department of Natural Resources' 2011 LiDAR elevation; for land under public ownership, VBWD will pay the amount via ad valorem (see above)
Grants	Actively seek	Actively seek

[1] The percentages listed in this table are only guidelines – the VBWD Board of Managers will use these guidelines to assist them in determining the appropriate funding of individual projects. The Board of Managers is open to various available funding methods.

[2] Using the authority given in Minnesota Statutes 103B.241, Subd. 1, or 103B.251, Subd. 5 & 6.

[3] Using the authority given in Minnesota Statutes 103B.251, Subd. 5 & 6.

[4] Using the authority given in Minnesota Statutes 103D.601 or 103D.701.

[5] Using the authority given in Minnesota Statutes 103D.729 and 103D.730 (requires amendment to VBWD Plan).

4.9.7.2.3 Funding of Maintenance Activities

The VBWD intends to fund maintenance activities through an ad valorem tax levy over the entire watershed. At some point, the VBWD may choose to establish a water management district (utility), using the authorities given in Minnesota Statutes. If the VBWD wishes to set up a water management district (utility), the VBWD will submit by July 1 to the county auditor a list of parcels comprising the water management district. Along with the parcel list, the VBWD will also submit to the county the VBWD resolution establishing the water management district and the amount to be charged over the district. If the VBWD uses Minnesota Statutes 103B.251 to fund a capital project, VBWD may pay for the maintenance of such a project through an additional ad valorem tax levy, using the authority of Minnesota Statutes 103B.251. The VBWD will use Table 4.9-2 and Table 4.9-3 for guidance when determining the funding methods for maintenance activities.

4.9.7.3 AF-C. Administration and Funding of the VBWD Permit Program

The VBWD will continue to implement its permit review program. The VBWD will continue to charge an application fee to defray the costs of its permit program, including review, inspection, enforcement and administration costs. The VBWD will set the amount of the permit application fee annually. The application fee is collected in the form of an escrow deposit at the time of application, and each permit application fee is kept in an individual escrow account. Any permit-related costs incurred by the VBWD greater than the escrow deposit will be billed to the applicant. Any unused portion of the escrow deposit will be returned to the applicant. The permit application fee varies according to the size and type of project, and currently ranges upward from $500.

The VBWD will continue to collect a cash surety in addition to the permit application fee to ensure permitted projects are completed in accordance with VBWD requirements. The cash surety amount varies according to the size and type of project. Currently, the minimum cash surety is $5,000. The VBWD may waive the cash surety requirement in some instances. In addition to a surety of $2,000 per acre for land disturbance activity, the VBWD requires additional sureties for:

- Stormwater management facilities – the VBWD requires a cash surety equal to 125% of the estimated construction cost

- Wetland replacements – the VBWD requires a cash surety equal to 150% of the estimated construction cost of the replacement wetland

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