Permit Application Review

Applicant:	Sarah Schweiger; City of Minnetonka
Consultant:	Matt Blazer; Bolton & Menk, Inc.
Project:	Pipe Outlet and Lake-Level Control Structure
Location:	Shady Oak Lake: Minnetonka
Rule(s):	2, 3, 5 and 6
Reviewer:	BCO

General Background & Comments

The City of Minnetonka is proposing to construct a pipe outlet and lake-level control structure for Shady Oak Lake. Currently, Shady Oak Lake is land-locked, without a low-level pipe or surface outlet that establishes a normal or control elevation for the lake. Historically, landlocked lakes are subject to water surface elevations that fluctuate significantly, resulting in both internal and external impacts on vegetation and lake use. It is also difficult for land-use authorities to set structure-elevation minimums adjacent to land-locked waterbodies that sufficiently mitigate flood risk. In 2019, high water levels in the lake resulted in the beach being closed and concerns from lake shore property owners about high water conditions potentially causing property damage. The District has been monitoring the level of the lake monthly since 1963; the lake level has ranged during this time from 897.8 M.S.L. (January 1990) to 905.6 M.S.L. (May 2019). The Minnesota Department of Natural Resources (DNR) has established an ordinary high-water elevation (OHW) of 903.4 M.S.L. for the lake. Figure 1 shows the recorded lake levels from January 2000 to May 2021, in comparison with the OHW. As the figure shows, the lake level was generally below the OHW until recent years. Figure 2 shows the recorded lake levels for the past 5-years in comparison with the OHW of the lake and the proposed outlet elevation, which will be described further in the project discussion.

The project was reviewed under the NMCWD Rules, adopted as amended July 21, 2021.

To address high water levels in 2019, the city obtained a permit from the DNR allowing for emergency pumping to control and lower the lake level. Ultimately, 125 million gallons of lake water was pumped to the South Fork of Nine Mile Creek in 2019.

Rather than continuing with occasional pumping as needed, the city has elected to implement a permanent lake-level control by installing an outlet on Shady Oak Lake.

The outlet pipe from the lake will be installed on city park property to the intersection of Jorissen Road and Dominick Drive, and then follow within the city right-of-way along Jorissen until it discharges into a Public Waters Wetland on city property south of Jorissen between Butternut Circle and Maple Ridge Court. Nine Mile Creek runs through the wetland. This alignment was chosen to minimize tree impacts, facilitate maintenance accessibility, reduce

wetland impacts, and minimize impacts to private property. The conveyance ends in a 24-inch outfall that discharges to the wetland at the creek. The project includes:

- 1. a screen with 1 mm opening installed in the outlet structure to prevent the spread of Eurasian Milfoil, recently found in the lake.
- 2. a gate within the pipe outlet from the lake that automatically opens and closes in response to real-time water-level data gathered by gauges installed in the outlet from the lake and at the outfall, where it discharges to the wetland/creek. The gauges will be operated in accordance with the gate-operation plan developed by the city and included in the submittal. The water-level gauges will be connected to the city's supervisory control and data acquisition system, which allows remote monitoring and operation. These gauges will operate year-round, allowing control of water levels during late fall and spring freeze-thaw events.
- 3. a weir wall within the pipe outlet that will provide an overflow for storms greater than the 100-year event.

The XP-SWMM model used to analyze downstream impacts from a recommended and assumed outflow discharge from the lake was originally developed by the District, then updated in 2019-2020 by the City of Minnetonka as part of its city-wide Atlas 14 model updates. Using the modeling, the outlet-operation plan. The plan establishes when the gate will be opened and closed based on elevations in Shady Oak Lake and downstream Nine Mile Creek. The flow chart attached describes the proposed outlet control operation plan. The gate in the outlet control structure will typically remain closed. The gate will open once the lake has reached 904.7 M.S.L., which represents the approximate water level in Shady Oak Lake following a 2-year, 24-hour rainfall, assuming an initial water level at the OHW of 903.4. The gate will not open if the water level in Nine Mile Creek is greater than 896.5.

The gate will stay open until the water level in Shady Oak Lake is lowered to 903.4 or if the water level in Nine Mile Creek reaches 896.7 M.S.L. (slightly below the 10-year flood elevation in Nine Mile Creek). Closing the gate when the creek is at 896.7 M.S.L. will prevent increases in the existing high-water elevations in the creek for the 10- and 100-year, 24-hour rainfall events. No discharge from the proposed outlet is anticipated in a 2-year rainfall event, as model results indicate water levels in Shady Oak Lake will remain below 904.7 M.S.L. when the initial water level is 903.4 M.S.L. If the water level in Shady Oak is at 904.7 at the beginning of a 2-year rainfall event (which could result from back-to-back storm events or a prolonged wet period) the increase in high water level in the downstream creek would be 0.6 feet (approximately 7 inches).

The outflow discharge from the lake will range between 10 to 17 c.f.s. depending upon the elevation of the lake. The installation and operation of the outlet in accordance with the plan will not lower the lake elevation below the established normal elevation of 903.4 M.S.L.

A 100-year frequency flood elevation of 906.7 M.S.L. for the lake has been calculated based on the established normal elevation. The city's submittal shows the low floor elevation of an existing structure in the northwest corner of the lake at 907.1 M.S.L., which means the outlet, operated as proposed by the city, will provide flood protection for the 100-year storm (not currently provided), in addition to maintaining 0.4 feet of freeboard. The surface overflow from the lake is 907.7 M.S.L. An application to the DNR has been submitted, #2021-1491, for the installation of the outlet as the lake's water control structure. The state has indicated that the outfall to the wetland/and associated work in DNR Public Waters Wetland #791W and the creek qualifies for authorization under DNR in General Permit #1997-6112.

Under subsection 2.3.3 of the District's Floodplain Management and Drainage Alterations Rule, the proposed discharge of additional surface water from the lake to the creek must not have an adverse impact on any upstream or downstream landowner(s) and must not adversely affect flood risk, basin or channel stability, groundwater hydrology, stream base-flow water quality or aquatic or riparian habitat.

Though the wetland south of Jorissen Road into which the outfall discharges falls under state jurisdiction, the DNR has waived jurisdiction over wetland impacts to Minnetonka, which is the Local Government Unit responsible for administering the Wetland Conservation Act in the city. The project proposes land-disturbing activities in the wetland associated with the construction of the outfall into the wetland. The city is pursuing a *de minimis* exemption for 156 square feet of permanent wetland impacts. The District wetland rule, section 3.4, requires a buffer around the entirety of wetlands disturbed by construction activities. Though the area to be maintained as buffer or restored with a wetland seed mixture (where there will land disturbance) will not meet applicable minimum or average widths, because the city will establish and/or maintain buffer to the extent of its property ownership, Rule 3 requirements applicable to the project are met. In accordance with Rule 3.4.5, buffer markers at the limits of the city property will be required. In addition, a written maintenance agreement is required.

The District's requirements for both stormwater management and erosion and sediment control apply to the project because more than 50 cubic yards of material will be disturbed and 5,000 square feet or more of surface area will be altered, Rule 5.2.1a and b, respectively. The bulk of the land-disturbing activities will be for utility work (installation of the outlet, conveyance and outfall) within a linear corridor (the Jorissen Road right-of-way). The linear portion of the project creates no new or fully reconstructed impervious surface (i.e., less than one acre of new impervious), so under section 4.2.4, no stormwater management is required. Within the city park property where the Shady Oak outlet will be installed, 0.02 acres of impervious area will be fully reconstructed for the city trail that will be disturbed by the work. The 0.02 acres of reconstructed trail is less than 10 feet in width and will be bordered on both sides by pervious area that is more than half the width of the trail, qualifying for the exemption in 4.2.2c. The project is exempt from the NMCWD Stormwater Management Rule.

The District's Waterbody Crossings and Structures Rule 6.0 applies to the project because of installation of the outlet in the bank of the lake and the outfall in the bank of the wetland/creek, Rule 6.2.

Exhibits

- 1. Completed Permit Application dated July 7, 2021.
- 2. Plans dated July 12, 2021, prepared by Bolton & Menk, Inc.
- 3. Permit Application Narrative dated July 12, 2021 prepared by Bolton & Menk, Inc.
- 4. XP-SWMM modeling received on July 12, 2021 prepared by Bolton & Menk, Inc.

- 5. E-mail correspondence from the DNR dated June 17, 2021 stating the construction of the lake outlet control structure will be authorized by the state and waiving jurisdiction over the outfall to the creek and associated work to NMCWD and DNR General Permit #1997-6112.
- Shady Oak Lake Outlet Wetland WCA Application dated June 6, 2021 prepared by Bolton & Menk, Inc.

2.0 Floodplain Management and Drainage Alterations

Minnetonka will undertake land-altering activities below the 100-year frequency flood elevation of both Shady Oak Lake and Nine Mile Creek for the installation of the outlet pipe from the lake. The installation of the outfall involves placement of riprap below the 100-year flood elevation of the wetland and creek (898 M.S.L.) to dissipate energy at the outfall. Because riprap installation is consistent with the standards in Rule 7.0,

(7.3.1 - the riprap is not for cosmetic purposes but for the dissipation of energy at the outlet of the pipe system.

7.3.2- bioengineering alone is not sufficient to dissipate velocities, as high as 6 feet/second, at the system outfall.

7.3.3 - 10 cubic yards of Class III riprap, size less than 30-inches in diameter, (Rule 7.3.3a) and 6 inches of granular filter material (Rule 7.3.3c) is to be installed. The cross-section detail and plan view show the location and work proposed is to conform with the existing alignment of the wetland (Rule 7.3.3b). The work will remove approximately 156 square feet of wetland vegetation that is discussed in Rule 3 as a de minimis exemption for compliance with Rule 7.3.3d. The riprap is to be installed to the top of the pipe, elevation 898.9 M.S.L. – 0.9 feet above the 100-year flood elevation of the wetland. Rule 7.3.3e allows for the riprap to extend to no higher than two feet above the 100-year high water elevation.

The remaining sections of Rule 7.0 are not applicable to the project), the work in the wetland and creek is exempt from Rule 2.0 under 2.2.1a. The outlet installation involves work beyond the installation of riprap below the 100-year flood elevation, therefore under 2.2.1 analysis of compliance of the outlet installation with the criteria of Rule 2.0 is required.

The calculated Atlas 14 100-year frequency flood elevation of Shady Oak Lake is 906.7 M.S.L. – based on a normal level of the lake at 903.4 M.S.L. (the OHW).¹ The plans show the landaltering activities proposed below the 100-year frequency flood elevation will not result in net fill or net impacts within the floodplain of the lake. Proposed work below the 100-year frequency flood elevation of the lake includes installation of the outlet and placement of riprap. At the location of the proposed riprap, the area will be over excavated allowing the riprap and granular filter material to be placed at an elevation that matches existing grade. This work is being reviewed by the MDNR as part of MDNR Permit #2021-1491The area disturbed within the floodplain and above the water surface elevation of the lake will be regraded and seeded with a native seed mixture. No permanent floodplain impacts are proposed as part of this project.

Additional Rule 2 analysis:

¹ Minnetonka has not yet adopted the updated 100-year flood elevation.

2.3.1: The low floor elevation of all new and reconstructed structures must be constructed in accordance with the NMCWD Stormwater Rule, subsection 4.3.3

No new or reconstructed structures with low-floor elevations are proposed with the project.

2.3.2: Placement of fill below the 100-year flood elevation is prohibited unless fully compensatory flood storage is provided within the floodplain and:

- a. at the same elevation +/- 1 foot for fill in the floodplain; or
- b. at or below the same elevation for fill in the floodplain of a water basin or constructed stormwater facility.

The pipe inlet at the lake and riprap shown to be installed is to be submerged, below the proposed 903.4 M.S.L. normal elevation of the lake, does not affect the flood storage of the lake.

2.3.3. The District will issue a permit to alter surface flows only if it finds that the alteration is not reasonably likely to have a significant adverse impact on any upstream or downstream landowner and is not reasonably likely to have a significant adverse effect on flood risk, basin or channel stability, groundwater hydrology, stream base-flow, water quality or aquatic or riparian habitat.

As previously stated, the XP-SWMM model used to analyze downstream impacts from the lake's outflow discharge was originally developed by the District, then updated in 2019-2020 by the City of Minnetonka as part of its city-wide Atlas 14 model updates. The city has developed an outlet-control operation plan based on the modeling results, establishing when the gate will be opened and closed based on elevations in Shady Oak Lake and downstream Nine Mile Creek to minimize upstream and downstream impacts. The gate is to be closed at all times unless the lake reaches elevations similar to those observed within the last 2-3 years. The flow chart attached describes the proposed outlet-control operation plan. The gate will be open once the lake has reached a 2-year level of 904.7 M.S.L. (with a normal elevation for the lake established at the O.H.W) and the creek is at an elevation less than 896.5 and falling. Once open, the outflow discharge from the lake will range between 10 to 17 c.f.s. depending upon the elevation of the lake. If the water level in Nine Mile Creek exceeds 896.7 M.S.L., the gate will close, preventing increases in the existing high-water elevations in the creek for the 10- and 100-year, 24-hour rainfall events. No outflow from the proposed outlet is anticipated in a 2-year rainfall event, as model results indicate water levels in Shady Oak Lake will remain below 904.7 M.S.L. (the gate open elevation) with an initial water level of 903.4 M.S.L. (OHW). If the water level in Shady Oak is at 904.7 at the beginning of a 2-year rainfall event, a potential scenario resulting from back-to-back storm events or a prolonged wet period, the increase in high water level in the downstream creek would be 0.6 feet (approximately 7 inches).

Based on the modeling provided by the applicant and the operation plan described above, a discharge from the lake is not to occur that will result an increase in the pre-project elevation in the creek for the 10- and 100-year frequency storm events. The lake outflow restrictions will not have a significant adverse impact on upstream or downstream landowners and is not reasonably likely to have a significant adverse impact on downstream flood risks.

With the gate primarily being closed until the lake reaches a modeled 2-year elevation, the creek baseflow conditions will not be increase as a result of the project. The channel stability will not be affected by the project because the creek elevations and flow rates for the various storm events will not be increased.

The water quality of Shady Oak Lake is good; phosphorus and chlorophyll *a* concentrations are consistently well below the state standard for lakes in the North Central Hardwood Forest Ecoregion and Secchi depth clarity is consistently greater than the state standard. The District samples the water quality of the creek at station ECU3A, located upstream of T.H. 62 – downstream of the project location. The 2020 Stream Water Quality Monitoring Report indicates the creek water quality at this location typically complies with the state stream water-quality standards. Even though the parameters sampled are different between the stream and the lake, both comply with state standards. In addition, as previously stated, DNR is requiring a screen with 1 mm opening installed in the outlet structure to prevent the spread of Eurasian Milfoil, recently found in the lake. The water quality of the discharge from the lake will not result in a degradation of the water quality within the creek including a change in the creek water quality that would affect aquatic habitat. The project scope does not include activities or components that would result in a change in groundwater conditions within the area.

The outlet-control structure operation plan requires the gate to be closed when water levels in Shady Oak Lake are lowered to 903.4 M.S.L., minimizing the lowering of water levels below the OHW.

We agree with the results of the modeling and determine that if the outlet is operated in strict accordance with the operation plan, the requirements of Rule 2.3.3 are met. Because operation of the outlet in accordance with the plan is critical to compliance with NMCWD floodplain-management requirements, NMCWD review and approval of substantive changes to plan are critical.

2.3.4 No structure may be placed, constructed, or reconstructed and no surface may be paved within 50 feet of the centerline of any water course, except that this provision does not apply to:

a. Bridges, culverts, and other structures and associated impervious surface regulated under Rule 6.0;

b. Trails 10 feet wide or less, designed primarily for nonmotorized use.

The outlet pipe from the lake to the intersection of Dominick Drive and Jorissen Road is to be installed beneath the existing Shady Oak Beach Trail. The 10-foot trail will be replaced in its same location and width upon completion of the pipe installation, qualifying for the exemption in 2.3.4b.

3.0 Wetlands Management

As previously stated, Minnetonka is the Local Government Unit responsible for administering the Wetland Conservation Act in the city and is in this case charged with applying WCA requirements to activity potentially draining or filling the wetland at the outfall location south of Jorissen Road. The project proposes land-disturbing activities associated with the construction of the piped outfall into the wetland. The city is pursuing a *de minimis* WCA exemption, MN Rule 8420.0420, subpart 8, for the 156 square feet of permanent wetland impacts that will

result from the installation of the outfall pipe and riprap at the creek. The District wetland buffer rule, section 3.4, requires a buffer on around the entirety of wetlands disturbed by the activity. The City of Minnetonka is the property owner of the land where the pipe is to discharge. The city property is currently buffered to the extent of its ownership, Rule 3.4.4. The area disturbed is to be restored with a wetland seed mixture for maintaining the buffer. Rule 3 requirements applicable to the project are met.

In accordance with Rule 3.4.5, buffer markers are required at the limits of the city property south of Jorissen Road. In addition, a written agreement for compliance with the requirements of subsection 3.4.7 is required.

5.0 Erosion and Sediment Control

Silt fence, floatation silt curtain, storm drain inlet protection, hydromulch application, erosion control blanketing, and a stabilized rock construction entrance will be utilized for erosion prevention and sediment control measures within the project corridor. Sod and native seed mixtures will be implemented for final stabilization measures.

The project contact is Sarah Schweiger, City of Minnetonka.

6.0 Waterbody Crossings and Structures

The District's Waterbody Crossings and Structures Rule 6.0 applies to the project because the outfall and associated work will involve construction in the bank of the wetland/creek.

Rule 6.3.1 states construction, improvement, repair, or removal of a waterbody crossing in contact with the bed or bank of a waterbody:

a) Must retain adequate hydraulic capacity and assure no net increase in the flood stage of the pertinent waterbody:

This is addressed in the above discussion for Rule 2.3.3

b) Must retain adequate navigational capacity pursuant to any requirements of the waterbody's classification by the District:

The creek/wetland at the outfall of the conveyance system is not used for navigational purposes.

c) Must not be reasonably likely to significantly adversely affect water quality, change the existing flowline/gradient, or cause increased scour, erosion, or sedimentation:

This is addressed in the above discussion for Rule 2.3.3.

Riprap installed at the outfall of the proposed pipe system will dissipate energy from outflow velocities as to not have a significantly adverse effect on water quality from erosion or scouring at the discharge point of the pipe system to the creek.

- d) Must provide post-project wildlife passage along each bank and riparian area by means that:
 - 1. account for wildlife that are native to the area or may be present, and
 - 2. conform to any requirements imposed by NMCWD's classification of the waterbody.

The project will not permanently change conditions that will deter wildlife (deer, racoons, turtles) from using the area adjacent to the lake and/or at the outfall discharge

point south of Jorissen Road, and east of the creek. Construction activities may temporarily displace wildlife until completion of construction and the area is restored to pre-project conditions.

e) Must represent the "minimal impact" solution to a specific need with respect to all other reasonable alternatives:

An option for a gravity pipe system from the lake to the creek was investigated. A gravity system would discharge relatively small rates of runoff from the lake to the creek but would result in an increase in the flows observed in the creek.

The continuation of pumping water from the lake would require the construction of a permanent pumping station, permanent discharge pipe system from the lake to the creek and the on-going costs associated with operating and maintaining a pump system.

The benefit of an operated outlet as proposed is that no increase in the flow rates and elevations of the creek for the 2-, 10-, and 100-year frequency storm events is anticipated – as reflected in the modeling.

The city investigated four alignment options for the outlet location. It was determined an alignment from the lake along the Jorissen Road to the South Fork of the creek was the preferred option. This alignment was chosen based on tree impacts, maintenance accessibility, impacts to existing wetland, impacts to private property and constructability

Rule 6.3.2 with criteria involving projects with directional boring or horizontal drilling does not apply to the project.

No directional boring or horizontal drilling is proposed.

Rule 6.3.3 states, removal of structures or other waterway obstructions:

- a) Must maintain the original cross-section and bed conditions to the greatest extent practicable;
- b) Must achieve complete removal of the structure, including any footings or pilings that impede navigation; and
- c) Must not involve the removal of a water-level control device:

No structures will be removed from either of the affected waterbodies for the project. Rule 6.3.4 states, *No activity affecting the bed of a protected water may be conducted between April 1 and June 30 on public waterbodies:*

The work at the pipe system outfall to the wetland/creek will not be undertaken between March 15 and June 15 to minimize impacts on fish spawning and migration.

11.0 Fees

Because the property owner is a public entity, no fees are charged.

Rules 3.0, 4.0 and 5.0

12.0 Financial Assurances

Because the property owner is a public entity, the District's financial assurance requirements do not apply.

Sureties for the project are:

\$0

Findings

- 1. The proposed project includes the information necessary, plan sheets and erosion control plan for review. Rules 3, 4 and 5 are met.
- 2. For purposes of compliance with state Work in Waters rules (Minn. R. ch. 6115), the applicant is obtaining a project-specific permit from the Department of Natural Resources for the outlet installation. DNR has, however, waived jurisdiction over the work in the public waters wetland and Nine Mile Creek to NMCWD, such that the applicant may proceed with the installation of the outfall and associated stabilization under General Permit #1997-6112, so long as the city complies with the conditions of the general permit. The City of Minnetonka is the LGU administering WCA.

Recommendation

Approval, contingent upon:

- 1. General Conditions
- 2. Submittal of any relevant final WCA determination.
- 3. Submittal of the final set of plans and operation manual of the outlet control gate, if any changes are made prior to construction.

By accepting the permit, when issued, the applicant agrees to the following stipulations:

- 1. In accordance with Rule 3.4.5, buffer markers are required at the limits of the wetland on city property south of Jorissen Road, at the location of the pipe outfall to the creek.
- 2. A written agreement for compliance with the requirements of subsection 3.4.7 is required.
- 3. City staff must notify the NMCWD administrator any time the outlet gate is open and submit any substantive revisions to the outlet-control operations plan for review and approval of NMCWD.



April, 2021

Figure 1: Location Map













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VALVE OPERATION FLOW CHART

