HEADWATERS CONTROL STRUCTURE MANAGEMENT POLICY AND OPERATING PROCEDURES

INTRODUCTION

The Headwaters Control Structure at Gray's Bay is the outlet of Lake Minnetonka to Minnehaha Creek. It is an adjustable structure that controls Lake Minnetonka levels and discharge to Minnehaha Creek. The structure was constructed by the Minnehaha Creek Watershed District in 1979.

Lake levels and discharge have been controlled at this location since 1897 when a fixed crest structure was constructed to maintain as nearly as practicable the lake level at a height of 928.635 NGVD, 1929 datum. This structure was a wooden weir which was subsequently repaired in 1932 and again in 1944.

Survey data of record in the 1960's and the 1970's show the actual crest elevation of the repaired weir varied in height along its length. This uneven crest elevation was apparently due to ice pressures and/or frost heaving. The survey data also show the lowest point on the weir crest was at an approximate elevation of 928.6 NGVD, 1929 datum.

In 1979, when the Headwaters Control Structure became operational, the fixed wooden weir was also reconstructed. The new weir is constructed of galvanized steel sheet piling material, at the same location, with an even crest at elevation 930.0 NGVD, 1929 datum.

As a result of a 1975 joint petition from the Minnehaha Creek Watershed District and the Lake Minnetonka Conservation District, the Minnesota Department of Natural Resources (DNR) conducted an Ordinary High Water investigation of Lake Minnetonka. After conducting necessary field work and analyzing physical and historical data and records, the DNR issued its report in January 1976. After holding public meetings the Commissioner of Natural Resources concluded the Ordinary High Water (OHW) level on Lake Minnetonka is at elevation 929.4 NGVD, 1929 datum.

SECTION I. MANAGEMENT POLICY

It is the policy of the District to operate the Headwater Control Structure to reduce flooding both on Minnehaha Creek and Lake Minnetonka. This is accomplished by controlling the discharge from Lake Minnetonka to Minnehaha Creek after ice-out (approximately April 15) until approximately mid-June. As a result, water is temporarily stored on the lake.

After approximately mid-June, water stored on Lake Minnetonka is released, to the greatest extent possible, at a controlled uniform rate during the summer and fall. Such controlled discharges continue until adequate storage capacity is provided on the lake for a normal spring snowmelt. After the open water season, discharges to the creek are prevented, whenever possible, to reduce ice constrictions in the creek channel.

SECTION II. MANAGEMENT GOALS

Numerous considerations must be taken into account when discharging water through the Headwaters Control Structure. The Board of Managers realize that sound judgment based upon operational experience is an essential part of the operating plan to insure intelligent use of the

water available to Lake Minnetonka and Minnehaha Creek. It is therefore the intent of the Board of Managers to use discretion when operating the structure.

The Management Goals are:

1. To reduce downstream flooding by controlling the discharge to Minnehaha Creek to a rate not exceeding the maximum carrying capacity of the creek whenever the Lake Minnetonka water level is within the physical limits of control.

2. To reduce flooding on the lake by stabilizing lake levels between the elevation of the low point on the previous fixed weir (928.6) and the Ordinary High Water level (OHW), elevation 929.4.

3. To reduce flooding, on the lake and downstream, by temporarily increasing or decreasing discharge rates to accommodate predictable and large volumes of runoff into Lake Minnetonka or downstream prior to the time such runoff occurs.

4. To provide discharges, during and/or following dry periods, comparable to discharges that occurred historically under similar lake level conditions such that the detrimental effects of creek flow stagnation are not aggravated as a result of operating procedures.

5. To enhance recreation, wildlife and aquatic life survival, and aesthetics, when feasible and consistent with the Management Policy, by augmentation of creek flow beyond the time discharges from Lake Minnetonka have historically ceased.

6. To improve or maintain conditions on the lake and the creek, over those which existed prior to construction of the Headwaters Control Structure.

SECTION III. OPERATING PROCEDURES

The Headwaters Control Structure is operated in accordance with this section to accomplish the Management Goals in Section II.

The operating procedure requires discharges to occur within the limitations of established discharge zones described as a function of the Lake Minnetonka level. The ranges of discharge defined by these zones are necessary realizing the numerous considerations which must be taken into account during operation of the structure. The discharge zones are based upon sound hydrologic principles and are designed to achieve, to the greatest extent possible, the Management Goals identified in Section II.

The attached exhibit shows the discharge zones and their corresponding allowable discharge rates. The lowest heavy line across the base of the graph at elevation 928.6 represents the minimum lake level elevation at which discharge can occur. This is similar to the effect of the previous fixed weir which had an approximate low point elevation of 928.6. When the lake level is above this elevation, a discharge will occur subject to the conditions outlined in this section. The discharge zones are defined by minimum required and/or maximum allowable discharge rates over a specific time period and lake level range. These zones are described in Section III.A below.

Between lake level elevations 928.6 and 930.0, discharge to Minnehaha Creek will vary. In general, discharge rates will increase as the lake level increases. However, this is not a direct or

linear relationship. The discharge is dependent not only upon lake level elevation, but the time of year, climatic conditions, the variable carrying capacity of the creek and other considerations.

The heavy horizontal line at elevation 930.0 represents a lake level above which high water will be reduced to the maximum practicable extent. Lake levels and discharge cannot be controlled by the structure at lake level elevations above 930.0. Under these circumstances, resulting discharge to Minnehaha Creek is comparable to that which occurred under similar conditions with the previous fixed weir.

During late fall, prior to ice-in and when the lake elevation is near 928.6, stop logs are installed and the discharge control gates are then raised out of the water to prevent ice damage. The control gates are typically raised on or about November 30, however they may remain in place longer, if weather conditions permit, to control discharge due to late fall precipitation. If the lake level rises after the gates are raised, additional stop logs are installed as necessary to prevent overflow discharges. Through the winter months, which are not shown on the attached exhibit, no discharge is allowed to the extent feasible and consistent with the Management Policy. The stop logs are removed in the spring as soon as ice conditions allow and the discharge control gates are again made operational. The control gates may remain closed during the early spring months, consistent with the Management Policy, to reduce the flooding impact downstream on the creek due to spring snowmelt.

A. Discharge Settings and Adjustments

The discharge settings and adjustments between lake level elevations 928.6 and 930.0 are described as zones of control in the following paragraphs.

Zone 1 - Maximum Creek Carrying Capacity.

To effectively respond to high lake levels, rapidly increasing lake levels and/or changing creek conditions the maximum allowable discharge rate is required whenever the lake level is within the elevation range of 929.6 to 930.0.

The maximum allowable discharge rate will vary. It is defined to be that rate of discharge when combined with direct runoff and other inflows to the creek downstream, that will achieve but not exceed the carrying capacity of the creek. The carrying capacity of the creek is considered to be the maximum flow that can occur without substantial overbank flow.

The control gates will be operated to maintain flow rates in the creek below the maximum creek carrying capacity to the extent feasible. Since the contributing flow rates to the creek is a complex variable consisting of inflow from the lake as well as other sources downstream, the creek flows cannot always be affected by the operation of the control gates.

The maximum allowable discharge rate will be maintained as necessary until the lake level has receded below elevation 929.6.

Zone 2 - No Discharge to Maximum Creek Carrying Capacity.

Discharges ranging from zero to the maximum allowable discharge rate are required in this zone. When the lake level is below 929.1, the maximum discharge shall be no higher than 30 cubic feet per second. As the lake level approaches elevation 929.6, up to the maximum allowable discharge can occur. Discharges may be less than 12 cfs when the lake elevation is between 928.6 and

929.1. This will avoid adding to normally high creek flows in May and account for summer evaporation.

In an extreme case, when high lake levels and subsequent unrestricted discharge and flooding are predictable due to spring snowmelt, the maximum allowable discharge rate will occur at lake levels below elevation 929.1 to reduce imminent high water conditions. This discharge will occur only when it can be documented with reasonable accuracy that the water content of the snow pack in the upper watershed could exceed available storage capacity on the lake. Maximum allowable discharge rates other than those specified herein may occur only after Minnesota DNR has authorized such action.

Zone 3 - 150 CFS to Maximum Creek Carrying Capacity.

In the late summer and fall, 150 cfs up to the maximum allowable discharge rate is required when the lake level is in Zone 3. This will increase the capacity to reduce an excessively high fall lake level and provide adequate storage capacity for spring snowmelt.

Zone 4 - 150 CFS Maximum.

A discharge rate ranging from approximately 20 cfs up to a maximum of 150 cfs is required provided the carrying capacity of Minnehaha Creek is not exceeded whenever the lake level is in this zone.

From May 15 through July 15, discharge will vary from a minimum of approximately 20 cfs to a maximum of 100 cfs if the lake level is at or below the OHW (929.4) and will range up to a maximum of 150 cfs if the lake level is above the OHW.

From July 15 through November 30, a hydrologic computation will periodically be performed to determine what uniform rate of discharge will be necessary to accommodate the desired fall lake level of 928.6 based upon normal weather conditions. Discharge will be periodically adjusted to accommodate actual weather conditions encountered. Therefore, discharge during this period will, to the greatest extent weather conditions allow, occur at uniform rates between approximately 20 cfs and 150 cfs.

This zone is considered to be desirable for operation of the structure. When operation is governed by this zone, optimum conditions exist for achieving the Management Goals identified in Section II.

Zone 5 - Base Flow Discharge.

Base flow discharge is required whenever the lake level elevation is within this zone. The purpose of base flow discharge is to reduce the detrimental effects of creek flow stagnation during dry periods. The base flow discharge zone is designed to assure that a volume of water will be discharged that is approximately equal to the volume discharged by the previous fixed weir considering similar low lake levels.

The previous fixed crest weir discharged water at a rate of 12 cfs when the lake level elevation was at approximately 929.06. Therefore, when lake levels are within this zone, base flow discharges will occur subject to the condition below:

1. To the extent that discharge measurement accuracy allows, base flow discharges will occur at a rate of approximately 12 cfs.

It is expected that during most open water seasons the lake level will exceed the limits of this zone. Under these conditions, discharges will equal or exceed the specified base flow discharge rate.

Zone 6 - No Discharge.

Whenever the lake level elevation is below 928.6, which was the lowest elevation on the previous fixed weir crest, no discharge is allowed during the open water season.

Zone 7 - Unrestricted Discharge.

Whenever the lake level exceeds elevation 930.0, which is the crest elevation of the reconstructed fixed weir, unrestricted discharge will occur. Resulting discharge will be comparable to that which would have occurred over the previous fixed weir.

When the lake level recedes to elevation 930.0 or below, discharge will again be limited to the carrying capacity of the creek.

B. Data Collection and Discharge Adjustment Procedures

Field data shall be collected and discharge adjustments at the Headwaters Control Structure shall be performed in accordance with this section to implement the policy identified in Section I. MANAGEMENT POLICY.

B.1 Voluntary Creek Water Level Data from Downstream Municipalities

The District requests each of the five creekside municipalities to record Minnehaha Creek water elevations and areas of overbank flow *during periods of high water*. Monitoring and reporting shall be on a voluntary basis, but the Municipalities are encouraged to monitor one to three times weekly *during periods of high water and when the Municipalities may request that the District alter operations*. This creek data will be used to guide the District to adjust the control structure to achieve the MANAGEMENT GOALS. Information obtained shall be forwarded to the District Technician.

Monitoring locations and frequency are as follows:

Monitoring Locations:

City	Location
Minnetonka	I-494 culverts C.S.A.H. No. 5
Hopkins	C.S.A.H. No. 20
St. Louis Park	W. 34th Street Excelsior Boulevard
Edina	Millpond at Browndale

	W. 56th Street
Minneapolis	Upton Avenue Logan Avenue (upstream side) Chicago Avenue 39th Avenue (upstream side) Longfellow Pond

Suggested Frequency (Voluntary):

One to three times weekly *during periods of high water*. Creek elevations should be reported to the District Technician with any City request for changes to operation of the Headwaters Control Structure.

B.2 Lake and Creek Data Collected by the District Engineer

The District Engineer shall collect the following data:

Data	**Frequency**
Lake Minnetonka level	Weekly (Minimum) during open water season.
Minnehaha Creek flows at all Section II.B.1 (based on rating curves).	As specified in critical reaches identified in Section III.B.1
Information on the carrying capacity of Minnehaha Creek at critical locations. (For determination of maximum carrying capacity of creek.)	

The District Engineer shall develop rating curves at three (3) locations along Minnehaha Creek, one (1) of which shall be for the Browndale Avenue Dam.

(Other data is collected as part of the District's long-term hydrologic data program.)

B.3 Analysis and Reporting of Data

The Engineer shall analyze all data collected by the cities and his office on a weekly basis. A verbal summary report of that data shall be transmitted to one or more Managers each week.

B.4 Implementation of Recommended Action

Upon verbal approval by one or more Managers, the Engineer shall implement the recommended discharge adjustment as directed and in accordance with Section III. OPERATION PROCEDURES.

B.5 Frequency of Discharge Adjustment

Discharge adjustment frequency will be limited to the extent practical, to a weekly basis. More frequent adjustments may be required if a substantial increase or decrease in the rate of discharge is necessary. In this case, the overall adjustment will, to the extent possible, be implemented in increments to avoid abrupt water level fluctuations on Minnehaha Creek as a result of discharge

adjustments at the control structure. Emergency discharge adjustments may be implemented under the conditions specified in Paragraphs B.6 or B.7 below.

B.6 Emergency Adjustment

The Engineer shall have the authority to change the discharge between regular adjustments where immediate change is necessary to reduce or avoid significant risk to safety or damage to property which would likely result if the change is not made. The Engineer shall promptly communicate all such emergency adjustments to the Managers and to all affected municipalities.

If sudden conditions produce high creek flows and it is feasible to store water on the lake for 12 to 48 hours, gates will be closed to allow creek flows to abate. The Engineer shall develop a monitoring program to assist him in promptly reacting to extreme rainfall events.

B.7 High Water Conditions on Minnehaha Creek

When high water conditions are reported or predicted on Minnehaha Creek, the Engineer for the District shall promptly investigate the reported or predicted high water condition and determine whether adjustment can be made in the discharge through the control structure that would reduce the high water condition. If adjustments can be made that are consistent with the MANAGEMENT POLICY, the Engineer shall promptly make such adjustments as are appropriate to reduce downstream high water conditions as soon as possible. (Paragraph B.7 adopted September, 1980).

B.8 Operational Responsibility

The District may enter into a contract with another governmental agency to provide operating personnel. Employees of the contracting agency will handle minor maintenance and repairs when required and will make regular trips to the site as directed by the District's Engineer.

The control structure shall be operated by the District in accordance with the limitations set forth in the Headwaters Control Structure Management Policy and Operating Procedures, and Minnesota DNR Permit No. 76-6240.

B.9 Monthly Summary of Data

During the open water season, the District's Engineer shall prepare a monthly summary of all data received and analyzed by his office, including adjustments made in the discharge rate during the prior month. This summary shall be distributed to the Managers, the Minnesota Department of Natural Resources, the creekside and lakeside municipalities, the Board of County Commissioners of Hennepin and Carver Counties and shall be available to interested persons.

SECTION IV. TERMS OF AND AMENDMENTS TO THE MANAGEMENT POLICY AND OPERATING PROCEDURES

1. **Term.** This document defines the Management Policy and Operating Procedures for the Headwaters Control Structure at Gray's Bay for the period of March 1, 1995 and thereafter. Any amendments to this document shall be made pursuant to Section IV.2 below.
2. **Review of Management Policy and Operating Procedures.** On or before January 1, 1998, the District shall submit to the Minnesota Department of Natural Resources any

amendments to the existing Management Policy and Operating Procedures deemed necessary by the District for the three (3) year period commencing March 1, 1998. Thirty (30) days prior to any submittal to the Department, the District shall provide the municipalities within the watershed, a copy of the proposed amendments such that sufficient opportunity to submit comments to the Department is allowed. Within sixty (60) days, the Department shall advise the District in writing of the acceptance, rejection, modification or additions to the proposal.

Any public hearing that may be held on proposed amendments to the Management Policy and Operating Procedures shall be governed by Minnesota Statutes 105.44. If a hearing is held, the existing operational procedures shall remain in full force and effect until a final administrative decision is reached. Following the final administrative hearing decision, or if no hearing is held, the amendments, if any, shall be incorporated into the foregoing Management Policy and Operating Procedures for the following three (3) year term commencing March 1, 1998 and be distributed to affected municipalities and agencies.

This review procedure shall be repeated every three (3) years.

(A) LOWEST ELEVATION ON OLD GRAY'S BAY DAM - 928.6
(B) ORDINARY HIGH WATER LEVEL (O.H.W.) - 929.4
(C) TOP OF SPILLWAY - 930.0
(D) RECORD HIGH WATER - 930.5
(E) PROJECTED REGIONAL FLOOD - 931.5

NOTE: APPROX. ICE-OUT DATE - APRIL 15

APPROX. ICE-IN DATE - NOVEMBER 30