Operational Plan

Big Marine-Turtle Lake Controls
OPERATIONAL PLAN
BIG MARINE-TURTLE LAKE CONTROLS

I. EXISTING CONDITIONS

A. Current Lake Levels

1. Big Marine Lake is at elevation 941.4 at the weir and at about 941.6 above the constriction.

2. Turtle Lake is at elevation 940.2 with one stop log in place.

B. Remaining Constriction Spots

1. Approximately 30 feet above the Big Marine Weir, an 0.8 foot high ridge of ground prevents the free flow of water to the weir.

2. About 20 feet below the outlet of the County Road 4 culvert a ridge of cattail roots is retarding flow out of the culvert.

3. At the "narrrows" area, another segment of cattail roots is slowing the flow and causing a 0.2 foot change in water surface.

4. A high spot occurs just south of the "Grundhofer cut". This spot results in a change in water surface of approximately 0.2 feet.

5. A final constriction is caused by an old beaver dam located to the west of a private driveway about 2000 feet downstream of the Turtle Lake weir.

C. Proposed Corrections

1. Clean all restrictions below County Road 4.

2. Excavate approach channel above Big Marine Lake weir. This approach should be cut at 940.8 with a 10 foot bottom width.

II. FLOOD CONTROL AND DRAWDOWN OPERATIONS

A. After the removal of the current channel constrictions control of the discharge rate will be established at two points:

1. Big Marine Weir

2. Turtle Lake Weir
B. Discharge Rate Control

1. Big Marine Lake Weir

This weir has no provision for manipulation of flow rate. All discharge control has been designed into the weir length. No operational manipulation is contemplated beyond ice and floating bog control.

2. Turtle Lake

This weir has two - 7 foot stop log bays with a total depth of 1.5 feet. Five 0.3 foot deep stop logs are provided for each bay. For long term discharges, the rate should be controlled at 40-50 cfs maximum to prevent downstream flooding. During flood events, the stop logs should be removed or added according to the procedures shown on the attached table and graph. During extreme flood events, downstream flooding will occur regardless of the control exercised at Turtle Lake due to additional inflows from the Carnelian Creek Watershed.

III. Low Flow Controls

A. Target Elevations

Agreements made with the Minnesota Department of Natural Resources call for the water surface elevation on the south side of County Road 4 to be targeted at an elevation of 940.5. At this time it is not possible to accurately detail the number of stoplogs necessary at the Turtle Lake structure to raise the water surface at the south side of County Road 4 to the necessary levels.

B. Procedure

1. Currently, the water elevation south of County Road 4 is 941.4. The water surface at Turtle Lake is 940.3 with one full bay of stoplogs inserted. The estimated flow rate is approximately 30 cfs.

2. As the Big Marine Lake elevation is lowered to a point where the tail water at the weir is below the crest of the weir, the stoplogs at the Turtle Lake structure will be adjusted to provide the same depth of flow as at the Big Marine weir across the entire length of the structure.

3. When no flow is occurring over the Big Marine weir, one additional stoplog will be added to each bay of the Turtle Lake structure. If the water surface at the downstream end of Big Marine continues to drop after one week, additional stoplogs should be added to the Turtle Lake structure (one per bay). This process will be continued on a weekly basis until all stoplogs are in place at the Turtle Lake structure.
4. If the water surface below Big Marine is less than 2.5 inches below the crest of the weir, two stoplogs shall be removed (one per bay) from the Turtle Lake structure. The purpose is to maintain a free outflow over the Big Marine weir at all times.
<table>
<thead>
<tr>
<th>Lake Elevation</th>
<th>Depth over Weir Sill</th>
<th>Action to be Taken</th>
<th>Stop Log Situation Bay #1</th>
<th>Stop Log Situation Bay #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>939.0</td>
<td>0</td>
<td>None</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>940.0</td>
<td>1.0</td>
<td>Add 5 stop logs to Bay #1</td>
<td>5</td>
<td>0</td>
</tr>
<tr>
<td>940.5</td>
<td>1.5</td>
<td>Add 1 stop log to Bay #2</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>940.8</td>
<td>1.8</td>
<td>Add 1 stop log to Bay #2</td>
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<td>2</td>
</tr>
<tr>
<td>941.1</td>
<td>2.1</td>
<td>Add 2 stop logs to Bay #2</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td>941.4</td>
<td>2.4</td>
<td>Add 1 last stop log to Bay #2</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

The intent is to keep the root side of CO 4 at 940.5 and turtle lake as high as possible without exceeding a 2.4 depth of flow over the weir sill at Turtle Lake.

DRAFT

941.4
940.6
0.8
TURTLE LAKE CONTROL STRUCTURE
OPERATING CURVE

(FLOODING & DRAWDOWN CONDITIONS)

ALL LOGS IN PLACE
(5 PER BAY)

TOP OF WEIR BAYS

ADD 1 LOG IN BAY #2
ADD 2 LOGS IN BAY #2
ADD 1 LOG IN BAY #2
ADD 5 LOGS IN BAY #1

NO LOGS

MAX. DESIRABLE DISCHARGE RANGE

ELEVATION

DISCHARGE (CFS)