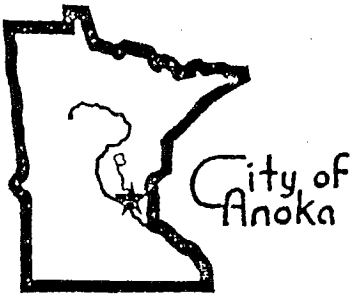
- REVISED -
Rec 7/28/72

O P E R A T I O N A N D M A I N T E N A N C E

RUM RIVER DAM

ANOKA, MINNESOTA

Barr Engineering Co.
6800 France Avenue South
Minneapolis, Minnesota



MEMORANDUM

Re: RUM RIVER DAM OPERATION

Date: DECEMBER 12, 1977

To: Robert Johnson, City Engineer **From:** Jerry Dulgar, City Manager

I have discussed the potential liability of the City as owners and operators of a Dam with the City Attorney. His opinion is that our potential liability is no greater when we have the gates open a minimal amount to control the river level, than they are when the gates are closed.

Therefore, I want you to leave the dam accessible to the people, unless the gates are wide open, or for a drawdown for repairs or something of that nature, or during an extremely high water period such as spring runoff.

Jerry Dulgar

OPERATION AND MAINTENANCE

RUM RIVER DAM

ANOKA, MINNESOTA

BARR ENGINEERING CO.
6800 France Avenue South
Minneapolis, Minnesota

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I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Douglas W Bark

Date May 16 1972 Reg. No. 3645

OPERATION AND MAINTENANCE

RUM RIVER DAM

ANOKA, MINNESOTA

General

The purpose of this manual is to provide general information and advive relating to the operation and maintenance of the Anoka Dam. It is intended to be used with the as-built drawings and construction specifications prepared by Barr Engineering Co., Minneapolis, Minnesota. Much of the information included in this manual was prepared during the preliminary and final design of the Anoka Dam.

Flashboard and Tainter Gate Operation

The manner of operation of the gates and flashboards will have a bearing on the pool levels during flood. The tainter gate must be opened and the flashboards removed if undesirably high flood levels are to be avoided.

If the boards are not removed prior to the spring flood, it can be expected that the flashboards will be lost on the average of once every three years. If the flashboards are not removed they will fail automatically at a stage of 848.5, due to a weak link connection. The boards will be lost downstream and it will be necessary to replace the flashboards with new materials. In addition, there may be occasional losses due to ice pressure during the winter. The loss of the flashboards due to floods can be minimized by removing them about two weeks prior to expected floods based on predicted flood discharges. Removal of flashboards according to the following procedure is recommended:

1. When the pool is below elevation 845.0, the tainter gate should be closed.

2. When the pool is at elevation 845.0, the tainter gate should be opened as necessary to hold the pool level at approximately elevation 845.0.

3. When the discharge exceeds about 2,800 cubic feet per second, the pool level will rise above elevation 845.0, even though the gate is wide open. When the pool level reaches elevation 847.0 and is still rising, the flashboards should be manually tripped. If they have not been removed they will automatically drop at approximately 848.5.

4. When the flashboards have been removed and the gate is wide open, there is no way to further increase the discharge capacity, and the river will rise as necessary to pass the flood flow. As the flood recedes, the gate should be left open until the pool reaches elevation 845.0. Thereafter, the gate should be gradually closed to hold the pool at about elevation 845.0.

5. By the time the flow recedes to about 5,700 cubic feet per second, the gate will be completely closed. The pool level will then continue to fall as the flow recedes, reaching elevation 842.5 at a flow of 1,000 cubic feet per second. At that point, the tainter gate can again be opened completely to permit reinstallation of the flashboards without water flowing over the dam.

6. When the flashboards are in place, the gate can be closed and normal operations resumed according to paragraphs 1 and 2 on the preceding page.

Flashboard Replacement

When the flashboards are replaced, it is important that they be replaced with the material and in the manner as specified in the as-built

plans and specifications. It is also important that the weak link wire be replaced with a wire that has been tested to fail between 900-1100 pounds tensile strength. The replacement of this weak link wire should be completed in accordance with the diagram included in the appendix or the as-built plans. Also, the trip rope should be replaced in the manner as shown on the as-built plans.

Tainter Gate Maintenance

There are several miscellaneous maintenance items which should be checked on an annual basis including:

1. The level of the 50 percent glycol solution in the gate heater should be checked in the fall before the heater is operated. Every three years the solution should be drained and replaced with a fresh solution. A drain is located under the fixed crest slab through the west pier of the tainter gate structure.

   The temperature setting for the gate heater thermostat can be adjusted if it appears that the gate heaters are not operating satisfactorily. In any case the thermostat should not be set above 42° F. without an investigation of the effects of the stresses caused by this temperature on the structure.

2. The gate pinion should be greased with a heavy duty axle grease.

3. The condition of the gate seals should be checked and noted.

4. There are several operational aspects of the gate hoist that should be checked over carefully. These are included in the manufacturer's maintenance manual.

5. Instructions for lubrication of the gate hoist are listed on the lubrication plate which is located on the gate hoist.

Structural Stability

The dam is an Amberson type structure with stilling basin on foundation slabs with the fixed crest portion 236 feet long. The tainter gate spillway is 20 feet wide and is an ogee type spillway with an 88 foot stilling basin. The west abutment is on pile footings and serves mainly for erosion control along the bank and downstream of the dam. The west abutment and tainter gate spillway both allow public access and use of the facilities.

There are two rows of steel sheeting under the dam, both serving as seepage cutoffs. The front row is new sheeting and a second row 19 feet downstream of the new sheeting was part of the old structure. To monitor the effectiveness of these seepage cutoffs a piezometric system was installed under the foundation slabs. Three tubes are located in every other buttress wall under the fixed crest slab as shown on Sheet 19 of the as-built plans. Piezometric readings should be taken at least once each year. The readings should be taken when there is maximum differential head or when the tailwater is low, elevation 832, or lower and the headwater at the top of the flashboards.

The readings should be recorded and compared to previous readings. The readings are taken by measuring from the edge of the piezometric tube to the water level in the tube then subtracting the value from 839.5 to determine the piezometric level. Piezometric levels in the upstream tube would be approximately elevation 838. Piezometric levels in the other two tubes would be approximately elevation 832. If piezometric levels are higher than these, an investigation should be conducted to determine the cause.

During construction it was noted that two of the steel sheet piling had torn interlocks at approximately elevation 818. The location is shown on Sheet 20 of the as-built plans. The damage occurred during driving possibly because of buried obstructions. It was decided that a polyvinyl sheet would be installed upstream of the dam at elevation 832.5 to provide additional seepage cutoff. The piezometric levels in the tubes downstream at this location could be slightly higher than the others and should be monitored more frequently.

Any future work in the area of this polyvinyl sheet should be done carefully to avoid puncturing or destroying the sheet.

Downstream Scour

After severe floods, the downstream pool should be checked to determine if any serious scour occurred. Sections should be taken after floods of 10,000 cfs or greater or at least every three years and compared with the latest previous soundings. If it appears that serious scour has occurred or that the existing riprap has been significantly disturbed, steps should be taken to replace the riprap or to otherwise remedy the problem. Contours drawn from soundings taken after final construction are shown on Sheet 1 of the as-built plans.

Inspections

A comprehensive inspection of the dam should be conducted every ten years. That inspection should include all of the following items:

1. Analysis of the record of piezometer readings.

2. Inspection of all concrete surfaces for deterioration or wear.

3. Underwater inspection of tainter gate spillway, stilling basin, upstream and downstream sheet piling.

4. Inspection of all painted surfaces including tainter gate and handrails.

5. A report of the condition of the structure and recommended maintenance.

APPENDIX

Flood Frequency

The Anoka Dam is located on the Rum River less than a mile from its confluence with the Mississippi River. The nearest U.S. Geological Survey gage is located at St. Francis upstream of Anoka.

The discharge of the Rum River has been gaged near St. Francis for a period of about thirty-two years. Utilizing the record of measured flows, adjusted for intervening drainage area, a discharge frequency curve for Anoka was prepared. The curve indicates the probable flood discharge which could be expected for various recurrence intervals. For instance, the curve indicates that a flood flow of 16,000 cubic feet per second can be expected to occur on the average of once in 150 years. The greatest flood in the period of record was 11,400 cubic feet per second. It occurred in 1965.

The dam is designed to handle all flood flows up to 16,000 cubic feet per second. Because of the tailwater conditions prevailing, the critical discharge for various parts of the dam are frequently at relatively low flood flows. Because the tailwater rises rather rapidly at high discharges, it is probable that flood flows even greater than 16,000 cubic feet per second can be passed without damage to the dam.

Hydraulics

Since the new dam essentially replaces the old wood structure hydraulically, the headwater and tailwater curves for the new structure are similar to those of the old structure. Four headwater curves and one tailwater curve are enclosed. The headwater curves show levels for discharges with flashboards inplace and for the fixed crest dam without flashboards. Both are also shown with the tainter gate open and with the tainter gate closed. Also shown on these headwater curves are stages for St. Francis. Since St. Francis has the nearest gage, flood warning information from the Environmental Sciences Service Administration is usually given in terms of expected stage at St. Francis. Using that information, expected stages at Anoka can be obtained from the headwater curves.

The enclosed tailwater curve shows the elevation of the water surface just downstream of the dam for various flows of the Rum River. This curve represents the existing tailwater condition which was not changed by construction of the new dam. The curve was computed on the assumption that the Mississippi River could be at a relatively low level at the time that the flood occurs in the Rum River. This is a conservative assumption because a higher level in the Mississippi would cause a similarly higher tailwater level in the Rum River at the downstream side of the dam. The higher tailwater, in turn, would reduce the stress on the dam.

MANUFACTURERS AND SUPPLIERS

Globe Lite on Steel Standard

Sterner Lighting
Winsted, Minnesota 55395

Buttress Lighting

Kim Lighting and Manufacturing Co., Inc.
1467 Lidcombe Ave.
El Monte, California

Gate Hoist

Murry Machinery, Inc.
P. O. Box 1167
Wausau, Wisconsin 54401

Tainter Gate

Maxson Corp.
500 Como Ave.
P. O. Box 3585
St. Paul, Minnesota 55103

Tainter Gate Seals

Rubber Specialties Inc. (supplier)
8117 Pleasant Ave. So.
Minneapolis, Minnesota

Huntington Rubber Mills (manufacturer)
Box 570
Portland, Oregon 97207

Paint on Handrails and Gate

Michel Sales Co. (supplier)
1400 Selby Ave.
St. Paul, Minnesota 55104

Koppers Co., Inc. (manufacturer)
612 Chatham Center
Pittsburg, Pennsylvania 15219

Gages

Standard Signs Inc.
3190 East 65th Street
Cleveland, Ohio 44127

MANUFACTURERS AND SUPPLIERS

Plaque

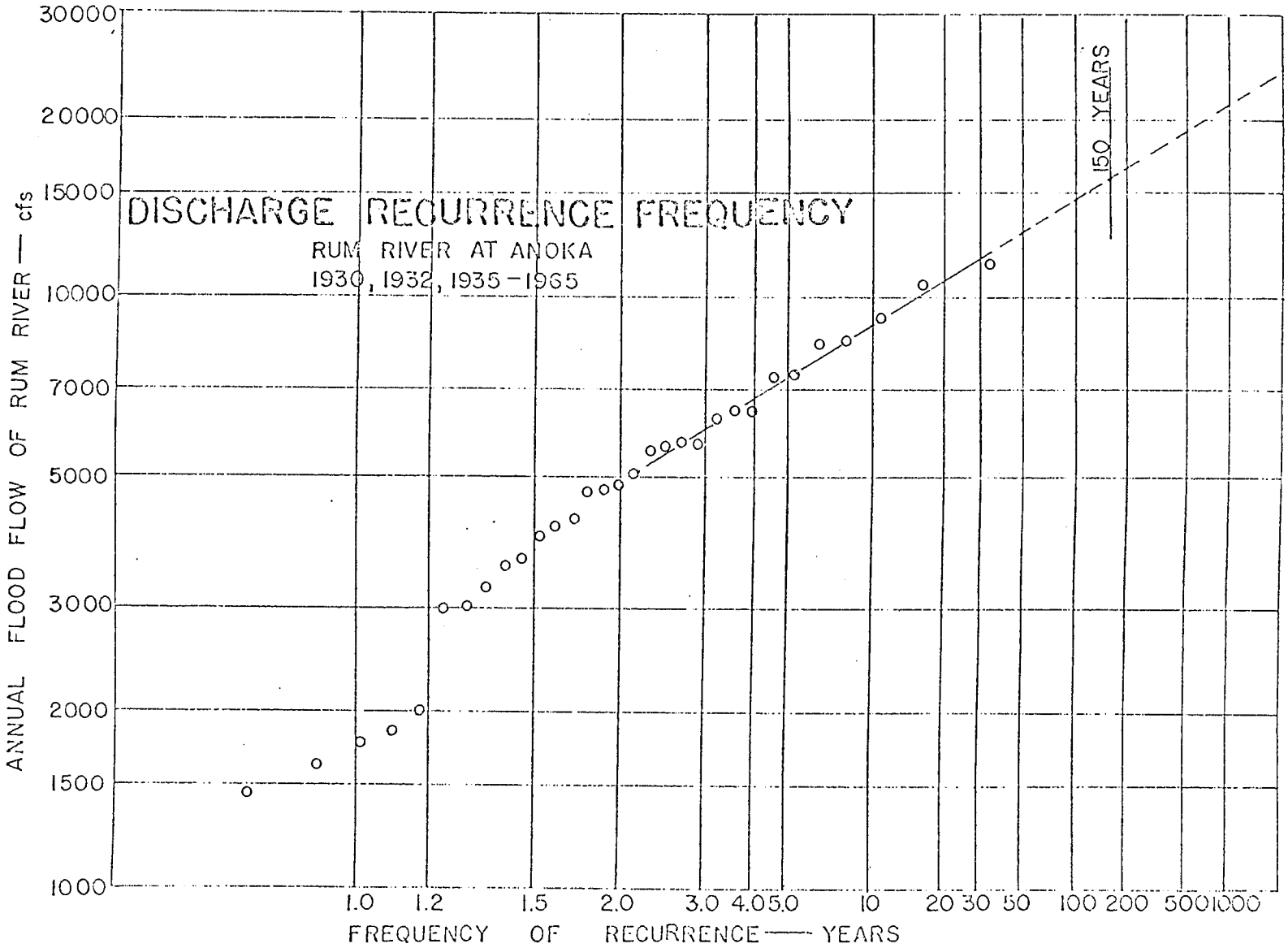
Wonderly Division of Concord
Industries Inc.
1243 Egan Industrial Blvd.
St. Paul, Minnesota 55118

Handrails

Standard Iron and Wire
2930 North 2nd St.
Minneapolis, Minn.

Foundation Drain Covers and Frames

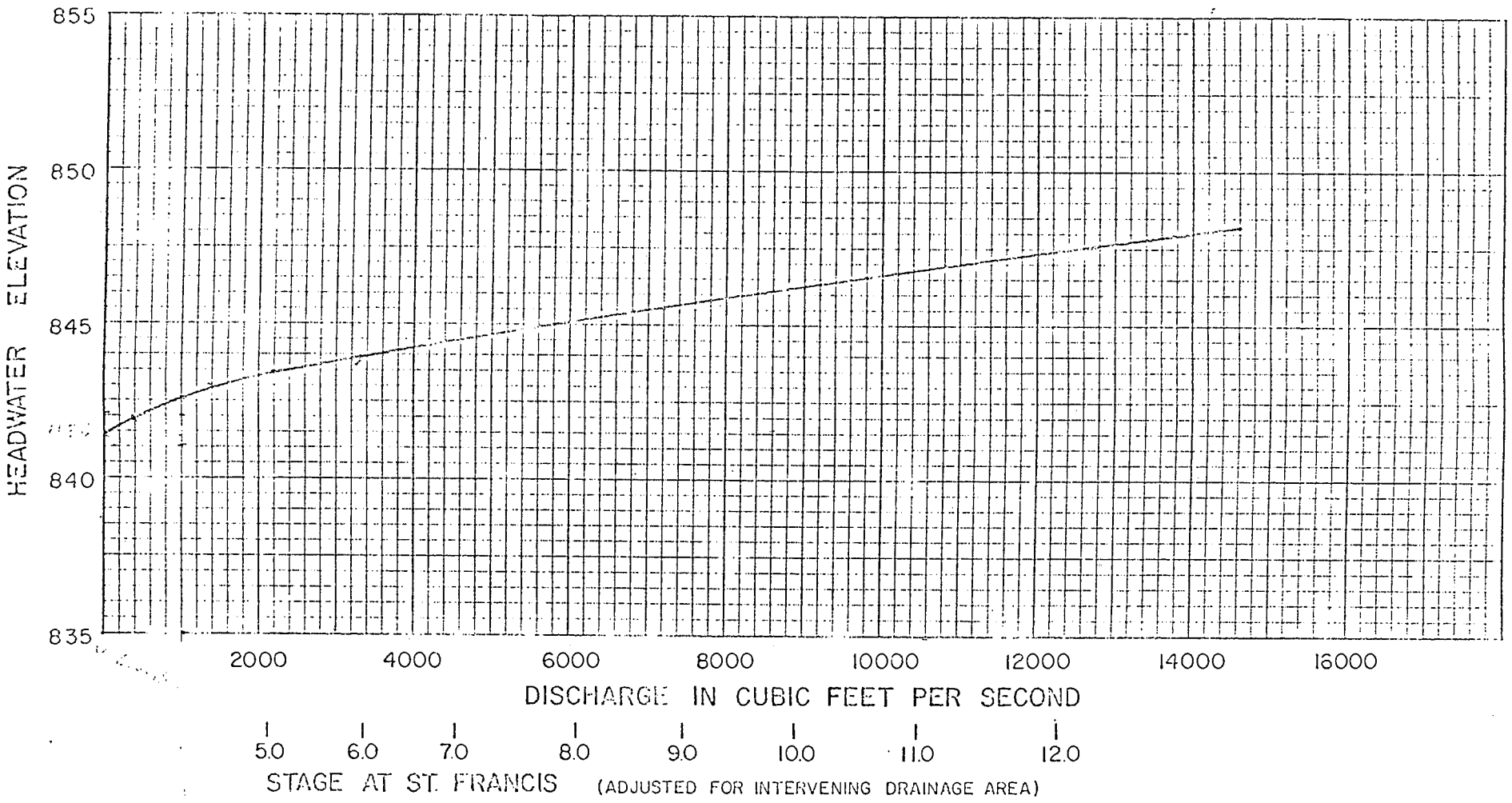
Neenah Foundry Company
Box 729
Neenah, Wisconsin 54956



BARR ENGINEERING CO.
CONSULTING HYDRAULIC ENGINEERS

ANOKA DAM

STAGE DISCHARGE FIXED CREST



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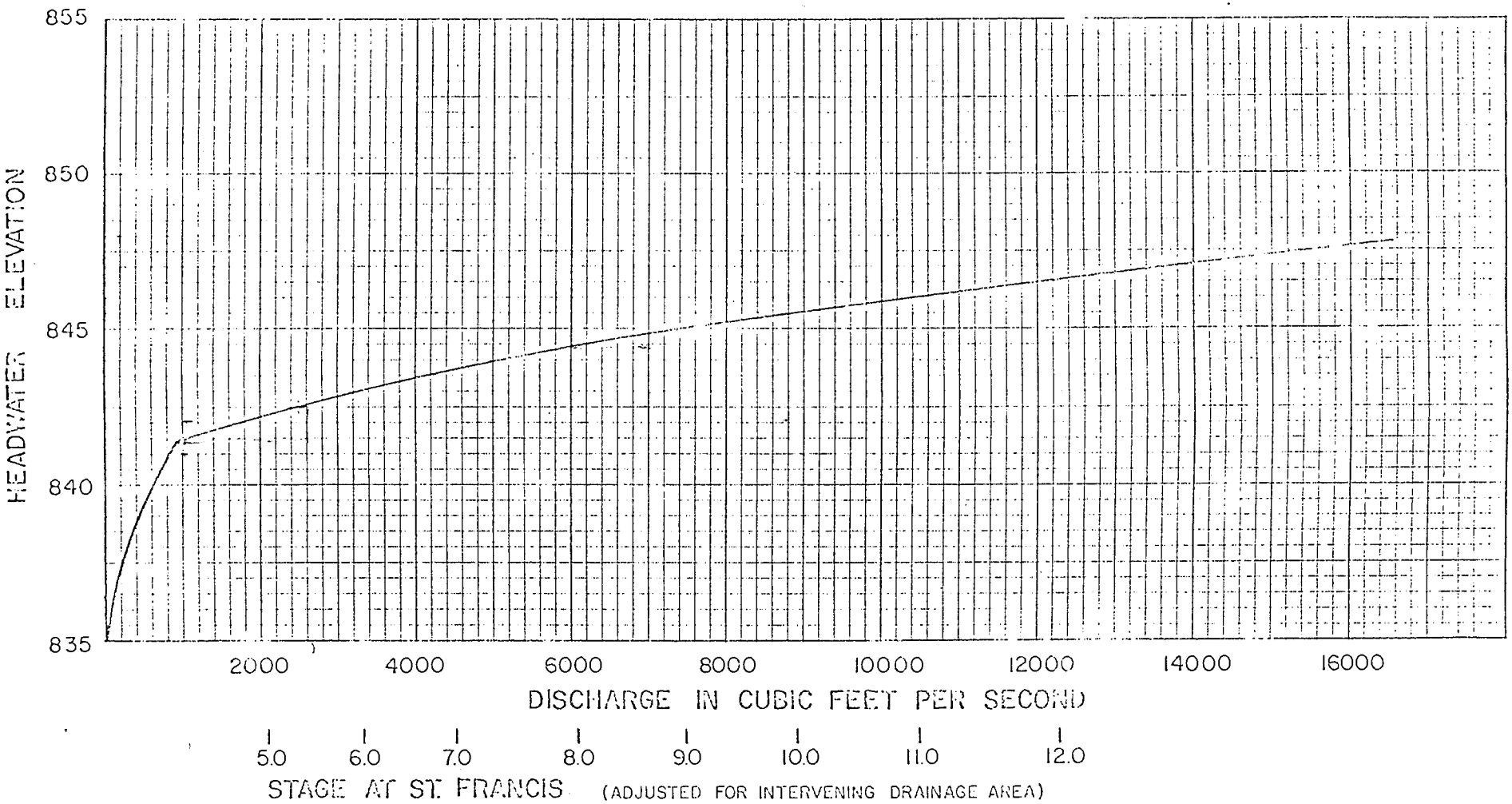
ANOKA DAM

STAGE DISCHARGE FIXED CREST AND TAINTER GATE



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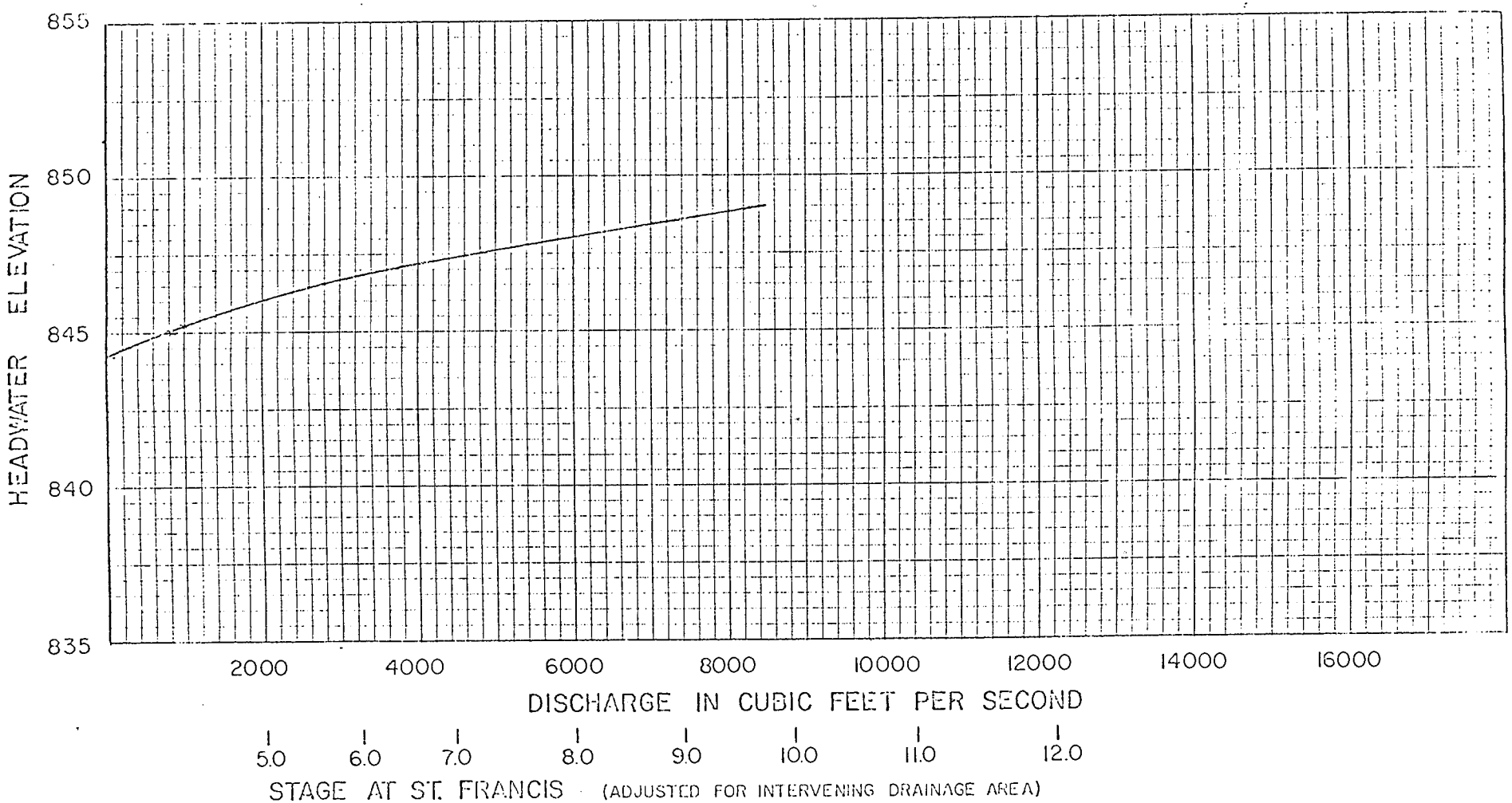
ANOKA DAM

STAGE DISCHARGE FIXED CREST WITH FLASHBOARDS INPLACE



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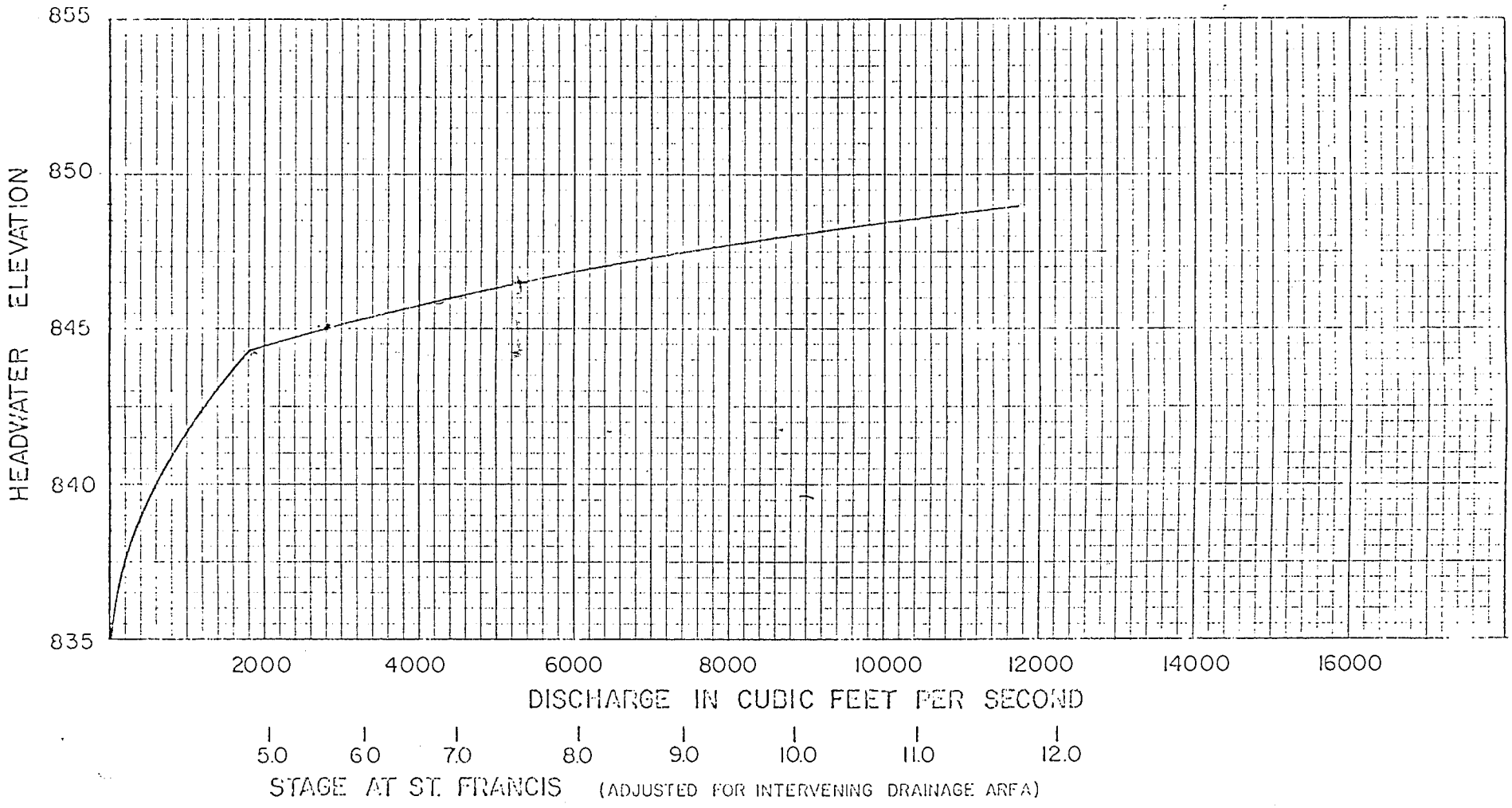
ANOKA DAM

STAGE DISCHARGE FIXED CREST WITH FLASHBOARDS AND TAINTER GATE



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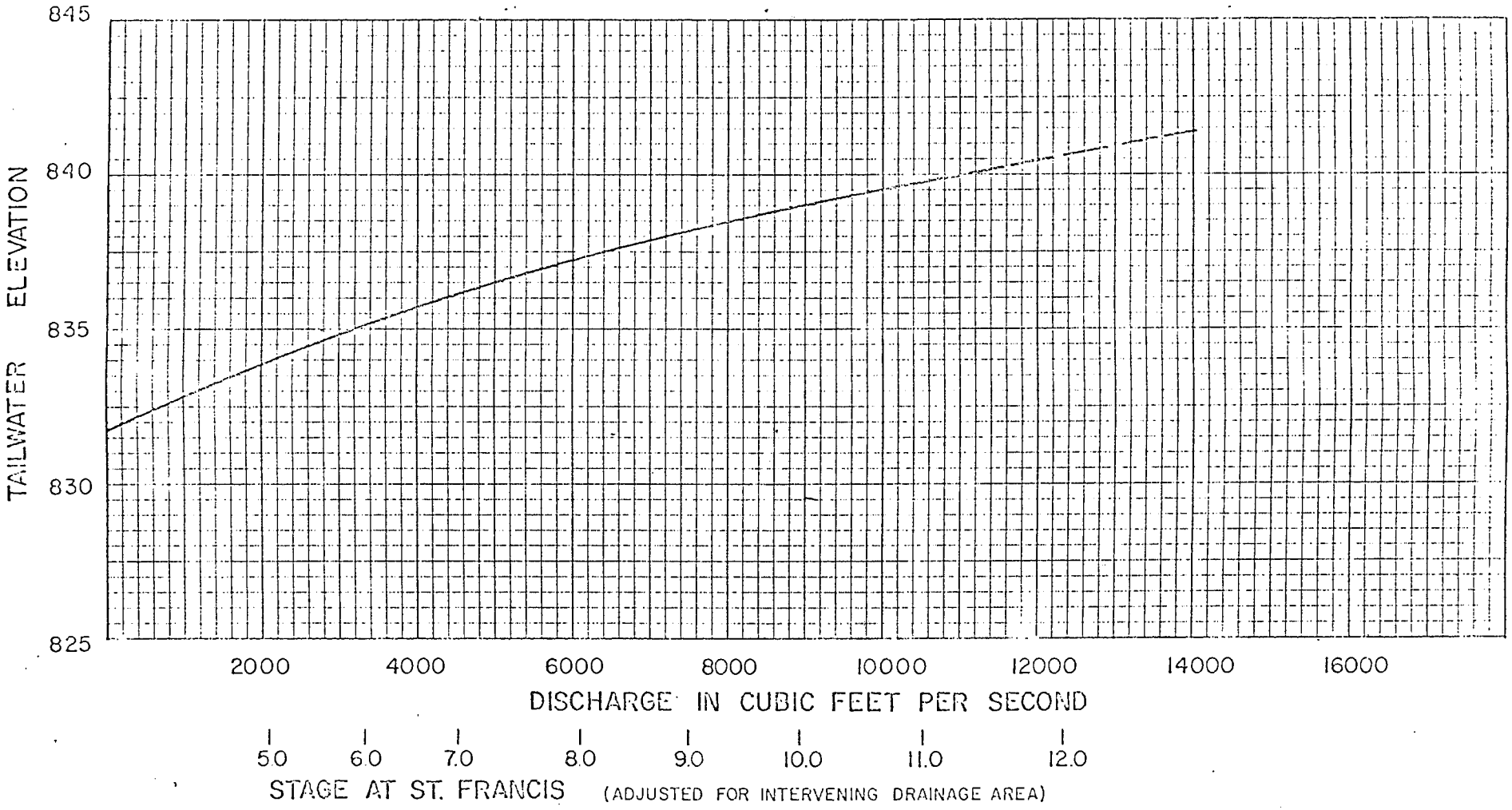
ANOKA DAM

TAILWATER LEVEL



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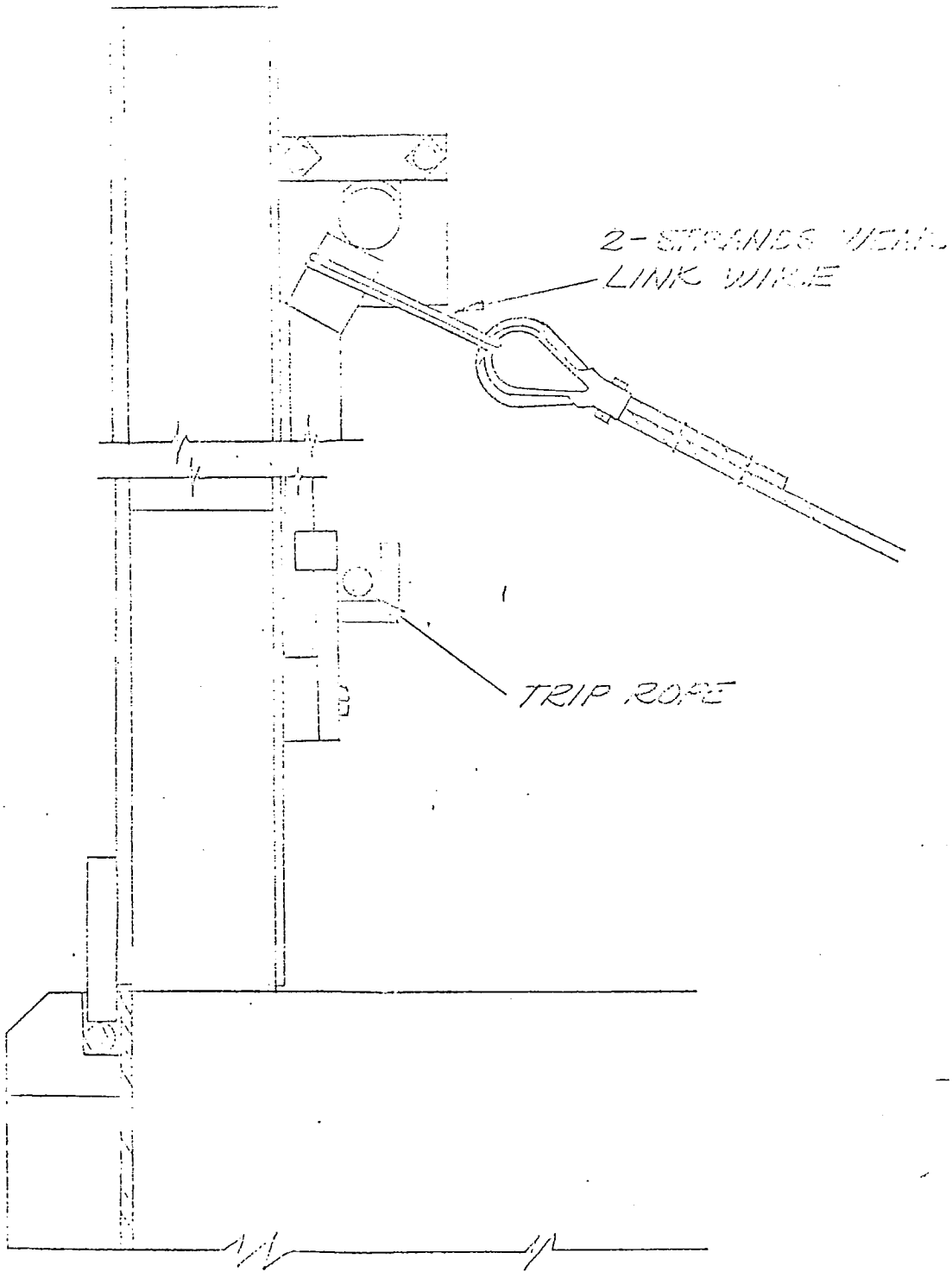
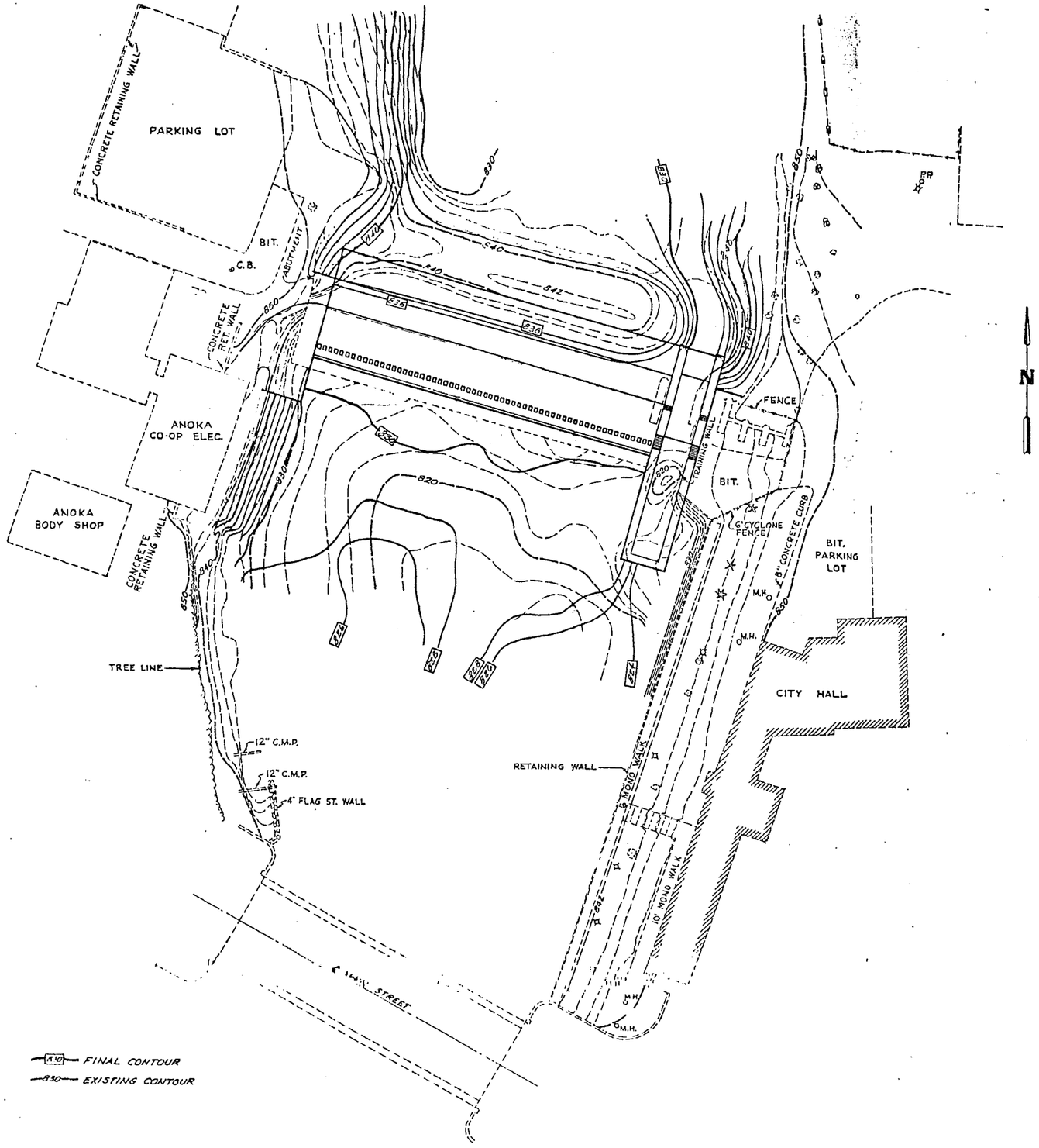


FLASH BOARD TRIP MECHANISM



LOCATION AND GRADING PLAN

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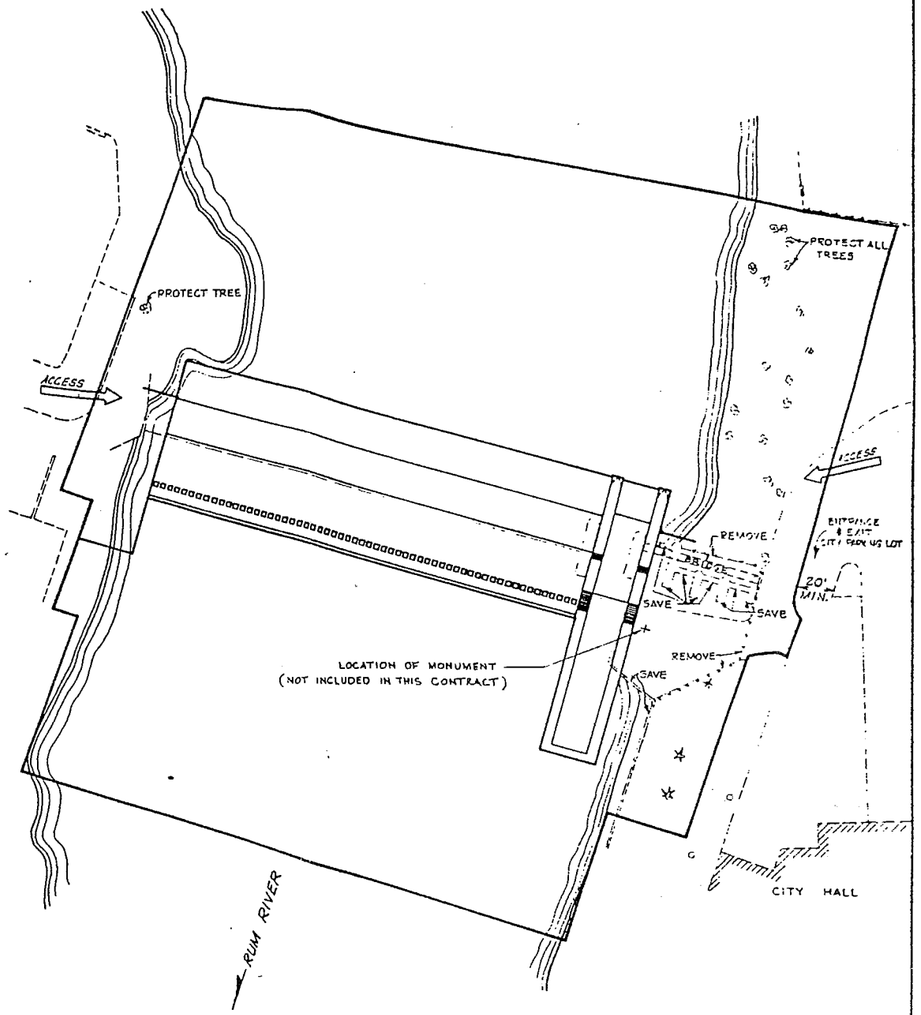

CONSTRUCTION LIMITS

I HEREBY CERTIFY THAT THIS DRAWING OR PLAN WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

Douglas W Barr

DATE 12-9-68

REG. NO. 3615

REVISIONS	SCALE: 1" = 40'
AS BUILT 10/30/70	DWN. BY: J. M.
	DATE: 11-8-68
	DWG. NO.: 23/2-40042

CITY OF ANOKA
ANOKA, MINNESOTA

BARR ENGINEERING CO.
CONSULTING HYDRAULIC ENGINEERS
MINNEAPOLIS, MINNESOTA

RUM RIVER DAM
LOCATION PLAN

SHEET NO. 1 OF 19 SHEETS