

File

Technical and Cost Specifications

**Improvements to
Clearwater River
Chain of Lakes
Restoration Project**



Wenck

**Prepared for
Clearwater River
Watershed District**

August 1993

Technical and Cost Specifications Improvements to Clearwater River Chain of Lakes Restoration Project

Prepared for:

CLEARWATER RIVER WATERSHED DISTRICT

P.O. Box 481

Annandale, Minnesota 55302

Prepared by:

WENCK ASSOCIATES, INC.

1800 Pioneer Creek Center

Maple Plain, Minnesota 55359

(612) 479-4200

Wenck File #0002-12

August 1993

I hereby certify that this 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.



Norman C. Wenck

8-16-93
Registration No. 8946

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1. Clearwater Lake - Impacted Areas

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- A. Letter of July 27, 1993 from Stanley J. Weinberger, Jr.,
to the Clearwater River Watershed District
- B. Memorandum of August 16, 1993 from Clearwater Lake Property Owners, Inc.
to the Clearwater River Watershed District

Section I

Purpose

On August 4, 1993, the Board of Managers of the Clearwater River Watershed District (CRWD) held a special meeting to consider improvements to the Clearwater River Chain of Lakes Restoration Project relating to Eurasian water milfoil control. The meeting followed procedures outlined by CRWD's attorney, Mr. Stanley J. Weinberger, Jr., in a letter dated July 27, 1993 (Appendix A). At the meeting the Board ordered the District Engineer to prepare Technical and Cost Specifications for the improvement. This document is intended to fulfill the requirements of Minnesota Statutes Section 103D.635, Subdivision 1, for an improvement to a project.

Section II

Introduction

Eurasian water milfoil (EWM) is a European aquatic plant that has been introduced accidentally to North America and is therefore an exotic species. EWM forms thick underwater stands of tangled stems and vast mats of vegetation at the water surface. In addition, EWM causes nuisance problems and interferes with boating, fishing, and swimming activities. If its growth and spread are left unchecked, EWM can have long-term deleterious effects on lake water quality.

Section III Lake Description

Clearwater Lake has a surface area of 3,182 acres, a maximum depth of 73 feet, an average depth of 18.5 feet, and an approximate shoreline length of 19 miles. Its primary inflow is from the Clearwater River, which flows through an upstream chain of smaller lakes, then through Clearwater Lake, and finally discharges downstream into the Mississippi River. In 1989, EWM was discovered in Clearwater Lake. Currently EWM impacts approximately 48 acres of the lake in near-shore areas and on sunken islands (Figure 1). It is anticipated that the impacted areas will grow by approximately 10 percent per year. It is therefore anticipated that 53 acres would be impacted by 1994 increasing to 78 acres by 1998.

Section IV

Water Quality Benefits

EWM can increase a lake's internal phosphorus loading substantially. The seasonal decay of EWM's huge biomass causes oxygen depletion, which in turn accelerates the release of phosphorus from the bottom sediments to the water column. EWM also upsets the fish community and may favor the growth of rough fish over game fish, thereby increasing the internal loading through bio-perturbation. Burton et al. (1979) estimated a reduction of phosphorus loading ranging from 0.15 to 1.20 grams per square meter per year for eutrophic lakes in the northern United States (such as the Clearwater Lake) as a result of removal of EWM and similar aquatic plants. This means that 70 to 830 pounds per year of phosphorus current and future internal loading can be reduced and eliminated as a result of treating the 53 to 78 acres of Clearwater Lake which are impacted by EWM.

Even more importantly, if left unchecked EWM could reasonably be expected to infest 300 to 600 acres of Clearwater Lake; the corresponding internal loading would be 400 to 6,400 pounds per year. Since the original Project loading goal for Clearwater Lake was a reduction to 5,400 pounds of phosphorus per year, the goal could be unreachable if EWM growth is left unchecked. Conversely, a program of EWM control will make it possible eventually to reach the Project goal for Clearwater Lake. In addition, reducing and eliminating EWM will improve the lake's recreational value (Cooke et al., 1986).

Section V

Technical Specifications

In order to prevent further spreading of EWM, eliminate existing EWM, reduce internal phosphorus loading, and improve lake water quality, the herbicide 2,4-D can be applied to the lake areas that are impacted by EWM. The application of 2,4-D is essentially an interim measure, even though it may successfully eliminate most of the now existing EWM stands. At present there is no known treatment or technique that is 100 percent effective at eliminating EWM. Therefore a five-year program is envisioned; at the end of that period, a program review will lead to either an extension or an appropriate modification of the EWM program.

The minimum sustained 2,4-D concentration required for controlling EWM has been determined experimentally to be 0.05 to 0.10 milligrams per liter (mg/l) (Westerdahl and Hall, 1983). However, application rates of 20 to 40 pounds per acre (Frank, 1972) and 100 pounds per acre (Kretsch, 1989) have been cited as typical. The lower range was equated to average in-lake concentrations of 1.8 to 3.6 mg/l, based on a depth of 4 feet (Frank, 1972). An average depth of 7 to 8 feet is probably typical of the higher rate, and this implies an average in-lake concentration of about 5 mg/l. The average depth for the Clearwater Lake is approximately 18.5 feet, and the average depth of the impacted areas is approximately 10 feet (Figure 1). Therefore, 125 pounds of 2,4-D could be applied for each of the impacted acres of lake surface twice a year (spring and fall). The Clearwater Lake Property Owners, Inc. has committed to providing the labor required for the chemical application (Appendix B).

Section VI

Cost Specifications

It is expected that the biannual 2,4-D treatment will cost approximately \$148,000 dollars for the years 1994 through 1998. The following table shows the estimated expense for the five-year program.

<u>Item</u>	<u>Estimated Expense</u>
Public Notice	\$ 1,000
Public hearing	\$ 1,000
Engineering	\$ 2,000
Legal/Administrative	\$ 2,000
Chemical (2,4-D) ^a	
1st year (1994)	\$ 22,200
1995	\$ 24,200
1996	\$ 26,600
1997	\$ 29,300
1998	\$ 32,200
Volunteer Expenses	\$ 2,500 ^b
Education Program	\$ 2,500
Evaluation Monitoring	<u>\$ 2,500</u>
Total	\$148,000

^a Based on application of chemical on 53 acres of lakes surface in 1994 and increasing to 78 acres in 1998 at a rate of 125 pounds per acre, and a chemical unit price of \$1.65 per pound. The chemical will be applied two times a year (in the spring and in the fall).

^b Equipment and maintenance cost is \$500 per year.

Section VII

Recommendations

It is recommended that Eurasian water milfoil (EWM), currently present in at least 48 acres of the Clearwater Lake and is expected to increase to 53 acres in 1994 and to 78 acres by 1998, be controlled by applying 2,4-D twice a year for the next five years, or until a better treatment or control practice is available.

An educational program which informs the lake users about EWM and trains them on the procedures to be followed when encountering it to prevent any further spreading is also recommended.

Finally, a yearly evaluation of the EWM population and its spreading, and the treatment procedure is recommended in order to successfully control the EWM problem.

Section VIII

Certification

The control of Eurasian water milfoil is a necessary improvement to the Clearwater River Chain of Lakes Restoration Project to attain the level of operating efficiency contemplated at the time of the original construction. Without such control the internal phosphorus loading in Clearwater Lake could increase beyond the Project's total (internal plus external) loading goal for the lake. To achieve control of the milfoil, application of the selective herbicide 2,4-D is the most practical and effective technique at present. The herbicide is to be applied biannually on 53 to 78 acres of the lake that is impacted by EWM, at a rate of 125 pounds per acre. The impacted areas are shown in Figure 1.

Section IX

References

- Burton, T.M., King, D.L., and Ervin, L.L. 1979. Aquatic plant harvesting as a lake restoration technique. In *Lake Restoration: Proceedings of a National Conference*, U.S. Environmental Protection Agency, EPA-440/S-79-001, 177-185.
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- Frank, P.A. 1972. Herbicidal Residues in Aquatic Environments. In *Fate of Organic Pesticides in the Aquatic Environment: A Symposium of the American Chem. Soc.*, Los Angeles, March 29-31. 1974.
- Kretsch, K., Nov. 27, 1989. Personal Communication with J. Erdmann. (Mr. Kretsch is President of lake Restoration, Hamel, Minnesota).
- Westerdahl, H.E., and Hall, J.F. 1983. Threshold 2,4-D Concentrations for Control of Eurasian Watermilfoil and Sage Pondweek. *Journ. Aquat. Plant Manage.* 21:22-5.

Figure



CLEARWATER RIVER CHAIN OF LAKES RESTORATION

Clearwater Lake - Impacted Areas

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Wenck

Wenck Associates, Inc. 1800 Pioneer Creek Ctr.
Environmental Engineers Maple Plain, MN 55359

AUG 1993

Figure 1

Appendix A

**Letter of July 27, 1993 from Stanley J. Weinberger, Jr.,
to the Clearwater River Watershed District**

*Hall, Byers, Hanson,
Steif & Weinberger, P.A.*

Attorneys at Law

Lee W. Hanson
Paul W. Steif
Stanley J. Weinberger, Jr.
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Steven B. Kutscheid
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Doraine A. Mund
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July 27, 1993

JUL 29 1993
Metropolitan Federal Bank Plaza 1010 West St. Germain
Suite 600 St. Cloud, MN 56301
(612) 252-4414 • FAX (612) 252-4482
WENCK ASSOCIATES, INC.

CLEARWATER RIVER WATERSHED DISTRICT
PO BOX 481
ANNANDALE MN 55302

ATTN: Doris Wynia, Secretary

RE: Clearwater River Watershed District ("CRWD") -
Clearwater River Chain of Lakes Restoration Project
("Project")
Our File No. 7289

Dear Doris:

In the past couple of years, eurasian milfoil ("milfoil") has been discovered in Clearwater Lake and now threatens to spread rapidly within that lake and possibly to other lakes within the Clearwater River Chain of Lakes (the "Chain"). Current experience indicates that milfoil grows and spreads rapidly with few known natural impediments. Residents on Clearwater Lake have petitioned the CRWD requesting that it take steps to control the spread of milfoil in Clearwater Lake and the Board of Managers for the CRWD have asked whether such activities can be undertaken as part of the Project.

The CRWD was formed for the primary purpose of improving water quality in the lakes of the CRWD, including those lakes which make up the Chain. The CRWD undertook the Project to increase the water quality of the lakes in the Chain through the removal of phosphorus which enters the Chain from a variety of sources. The Project has recently been completed and is successful in removing large quantities of phosphorus from the waters of the Chain. While this is a significant step and has had an immediate positive impact on water quality, monitoring results have shown that there continues to be phosphorus entering the lakes.

Phosphorus enters the waters of the Chain through two sources. The first source is external, this being phosphorus which runs into the water from surrounding land. The Tri-County Conservation Project and the Wetland Projects were designed into the Project to reduce or remove phosphorus entering the water from this source. The other

mc7289sw07263.ltr

Of Counsel:
George Byers
Bradley J. Sleeper

*Civil Trial Specialist
**Real Property Specialist
Certified by
the Minnesota
State Bar Association

source of phosphorus is internal, that being phosphorus which is trapped in lake bottom sediments and is released into the water through activities within the lake. The Rough Fish Harvesting Project and the Aeration Projects were designed into the Project to reduce the release of internal phosphorus in the water. Both sources contribute phosphorus to the waters of the Chain and both were addressed to achieve the phosphorus reduction required by the Project.

Clearwater Lake is at the downstream end of the Chain. While none of the specific components of the Project were located in Clearwater Lake, it was the recipient of the benefits of the Project and the properties abutting Clearwater Lake were assessed. It was believed that the removal of phosphorus from waters entering Clearwater Lake from the upper lakes in the Chain would maintain and gradually improve its water quality. While some internal sources of phosphorus exist in Clearwater Lake, they are not currently as great as in the upstream lakes and treatment, because of the size of Clearwater Lake, would be difficult and costly.

Milfoil is a dense, rapidly growing aquatic plant which is becoming an increasing problem for Minnesota lakes. While it is a nuisance which impairs the recreational use of a lake, it also has serious long-term effect on water quality. If left unchecked, milfoil will upset the fish community favoring the growth of rough fish over game fish. Rough fish are a major cause of phosphorus release from bottom sediment and their increase would increase the level of phosphorus released into Clearwater Lake. In addition, milfoil, because of its a rapid growth rate, uses oxygen at a greater rate, thereby lowering the oxygen levels in the water at certain times of the year. This will allow release of phosphorus into the water at the same time that the death and decay of milfoil in the lake is increasing the amount of internal phosphorus in lake sediment.

Minnesota Statutes Section 103D.631, subd. 1, charges the Board of Managers for the CRWD with the responsibility of repairing and maintaining is projects ". . . in a condition so that they will accomplish the purposes for which they were constructed." Minnesota Statutes Section 103D.635, subd. 1, charges the Board of Managers to undertake ". . . work necessary to restore or improve the project to the desired level of operating efficiency" In order to

Clearwater River Watershed District
July 27, 1993
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undertake these alterations and improvements, Minnesota Statutes Section 103D. 635, subd. 1, requires that the Board of Managers request technical and costs specifications from its engineers and receive a certification from the engineers that the project ". . . must be altered or improved to attain the level of operating efficiency contemplated at the time of original construction."

It appears that the uncontrolled growth of milfoil will increase internal quantity of phosphorus in Clearwater Lake. This would negate the positive effects of the upstream components of the Project by reducing the quality of water after entering Clearwater Lake. It also appears that once this internal loading of phosphorus has occurred, it will not be possible in a cost effective manner to treat or remove it.

Based upon my understanding of the effect of uncontrolled milfoil growth in the Chain, as explained by the CRWD engineers and outlined above, it is my opinion that the CRWD could proceed under Minnesota Statutes Section 103D.635, subd. 1, to undertake an improvement of the Project and assess the costs of the improvement against the benefitted properties. The Board of Managers must receive technical and cost specifications from its engineers with the necessary certifications. It must also follow the notice and public hearing requirements specified in Minnesota Statutes Section 103D. 635, subd. 2 and 3.

I trust this letter answers the questions raised by the CRWD Board of Managers concerning whether it can proceed to take steps to improve the Project. If you have any further questions concerning this opinion or the procedures to be followed to undertake an improvement of the Project, please feel free to contact me at your convenience.

Sincerely,

FOR THE FIRM



Stanley J. Weinberger, Jr.
SJW JR/sev
cc: Board of Managers
Norm Wenck
Beverly Brouillard

Appendix B

**Memorandum of August 16, 1993 from
Clearwater Lake Property Owners, Inc.
to the Clearwater River Watershed District**

~~August 4, 1993~~

August 16, 1993 (Revision 1)

TO: Clearwater River Watershed District (CRWD)

FROM: Clearwater Lake Property Owners, Inc.

SUBJECT: Eurasian Water Milfoil Control

Request for Funding

REF: CLPO's Previously submitted Petition for funding by assessment

RECEIVED BY
AUG 18 1993
WENCK ASSOCIATES, INC.

Gentlemen,

The purpose of this letter is to supply additional information on treatment and control of EWM on Clearwater Lake and we ask that it become a part of our REF: petition.

We believe that it is reasonable to assume the quality and useability of the water in Clearwater Lake is associated not only with its clarity but also with the amount of floating and emergent vegetation. There are at least 25 patches of EWM located on both shoreline bars and sunken islands. It is not reasonable to assume that all boaters will avoid these patches, marked or unmarked. Our goal is to keep EWM from emerging so that it is not fragmented or spread. This has to be a yearly effort until an alternative form of control is put in place.

We ask you review the following pertinent facts pertaining to our request for funding:

1. The funding requested will be used exclusively for the purchase of chemicals approved by the DNR, and maintenance of the equipment to apply the chemical.
2. All labor and administrative costs are either voluntary or will be absorbed by the CLPO.
3. Certification costs for our licensed applicators, as well as any permit fees will be paid for by the CLPO.
4. The permit issued by the DNR to the CLPO (copy attached for 1993) is very restrictive as to the chemical to be applied and the areas of application. It is based on the DNR's most current information regarding control and eradication of EWM on Clearwater Lake. Type of chemical and application rates may vary as conditions change. Any changes will be controlled and approved by an amendment to the permit by the DNR.

5. Estimate of yearly costs:

- ° 48.35 acres of EWM currently identified.
- ° Riverdale 2-4-D is the chemical currently authorized by the DNR.
- ° Maximum application rate approved by the DNR is 140#/surface acre. Current application rate is 125#/surface acre.
- ° Two treatments per year are authorized (spring and fall).
- ° It is anticipated that new growths of EWM will be identified in the future. In addition, chemical type may vary and chemical cost may increase. To allow for these increases over a five year period, we have assumed a 10% growth factor in EWM in each of the five years:

1993 - 48.35 acres of identified EWM				
1994 -	53.19	"	"	"
1995 -	58.50	"	"	"
1996 -	64.35	"	"	"
1997 -	70.79	"	"	"
1998 -	77.87	"	"	"

Total 1994-1998 - 324.70 acres of EWM

- ° Formula to determine the 5 year cost for Eurasian Water Milfoil control:

$$\frac{324.70}{\text{surface acres}} (x) \frac{125\#}{\text{application rate}} (x) \frac{2}{\text{treatments/year}} (x) \frac{\$1.65}{\text{chemical cost/lb.}}$$

$$(+)\ \frac{5(x)\ \$500=\$2,500}{\text{est. equip repair \& maintenance}} = \frac{\$136,439}{5\ \text{year cost}}$$

We would ask that the five year cost be divided equally over the years to establish an emergency fund up front:

$$\$136,439 \div 5 = \underline{\underline{\$27,288/\ \text{year}}}$$

As shown above, interim control is expensive. We believe the burden of this expense should be shared by all property owners on the lake as they are the immediate beneficiaries of a clean, well maintained lake. Property values of lakeshore property are in part determined by the perception of the lake quality in the future. An active control system is a strong part of that perception.

The U of M is presently developing a biological control (weevil) as an alternative to chemical control that will be available in the near term future. In the interim we feel everything possible with approved current technology should be done for EWM control in our lake.

We ask that funds be available for the treatment period starting in the spring of 1994.



PERMIT TO DESTROY OR CONTROL AQUATIC VEGETATION OR ORGANISMS

The Commissioner of Natural Resources, pursuant to authority vested by law, hereby grants this permit to the person whose name appears below, for the purpose specified, dates inclusive as shown, in the manner and under the conditions hereinafter set forth:

Permittee's Name JAMES R MONSON	Telephone Number (include Area Code) (612) 274-5851
Address (No. & Street, RFD, Box No., City, State, Zip Code) 10651 KIMBALL AVE NW, ANNANDALE MN 55302	
Type of Control: EURASIAN WATER MILFOIL	

EXCLUSIVE DATES OF PERMIT:	
FROM: MAY 7 , 19 93	TO: SEPTEMBER 1 , 19 93

THIS PERMIT APPLIES ONLY TO THE WATER AREA DESCRIBED AS FOLLOWS:

Name of Lake CLEARWATER	County WRIGHT	Township 121	Range 27	Section VARIOUS
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Extending _____ feet along shore and having a maximum width of _____ feet and/or to entire lake of _____ acres.
 Location of Treatment Area: **25 SURFACE ACRES LOCATED IN VARIOUS AREAS OF EURASIAN WATER MILFOIL GROWTH. AREAS OF TREATMENT TO BE CERTIFIED BY DNR PERSONNEL.**

Means and Methods to be used: **UP TO TWO (2) TREATMENTS AT EACH IDENTIFIED SITE TO BE APPLIED BY A LICENSED APPLICATOR. CHEMICAL TO BE USED IS RIVERDALE 2, 4-D**

THE PERMITTEE OR HIS AGENT SHALL GIVE NOTICE OF THE PROPOSED DATE OF THE TREATMENT TO THE FOLLOWING PERSONS WHICH SHALL BE RECEIVED BEFORE BEGINNING ANY WORK HEREUNDER. FAILURE TO GIVE NOTIFICATION PRIOR TO BEGINNING WORK SHALL BE GROUNDS FOR REVOCATION OF ANY PERMIT OR REFUSAL TO RENEW THE SAME.

Fisheries or Wildlife Supervisor	Address	Telephone Number
Conservation Officer JIM SMITH	Address	Telephone Number (612) 236-2210
Central Office DNR - ECOLOGICAL SERVICES	Address 500 LAFAYETTE ROAD, ST. PAUL, MINNESOTA 55155-4025	Telephone Number (612) 296-2835
Other: (Name) Ferry Ebinger	Address 1601 Minn Drive, Brainerd MN 56401	Telephone Number (218) 828-2535

The Minnesota Department of Natural Resources does not vouch for the effectiveness of any aquatic nuisance control method or operation nor does it stand as arbiter to determine whether or not any such method or operation has been satisfactory.

This permit is permissive only and no liability shall be incurred by the State or by any of its officers, agents, or employees by reason of the issuance of it or by reason of acts or operations of the permittee. The permittee shall be solely responsible for any damage or injury to persons, domestic or wild animals, waters, or property, real or personal of any kind, resulting from the permittee's acts or operations, and at all times the state of Minnesota, its officers, agents, and employees, shall be held harmless from any liability for such damage or injury.

Authorized Signature for Commissioner 	Date 5/17/93
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8-12, 13/1993

IDENTIFIED
FWM

EST 48.35 ACRES