EIS810147F

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION V
230 SOUTH DEARBORN ST
CHICAGO, ILLINOIS 60604

REPLY TO ATTENTION OF

5WEE

DEC 5 1980

TO ALL INTERESTED AGENCIES, PUBLIC GROUPS AND CITIZENS:

The Final Environmental Impact Statement (EIS) for Wastewater Treatment and Discharge Facilities for Madison, Wisconsin is submitted for your information and review. This EIS has been prepared in compliance with the National Environmental Policy Act of 1969, and the subsequent regulations prepared by the Council on Environmental Quality and this Agency.

Upon publication of a notice in the Federal Register, a 30-day period will commence during which this Agency will not take any administrative actions. After that date, we will issue a Record of Decision explaining what the final action taken by EPA will be and mitigative measures developed through the EIS process. Copies will be sent to all persons who received the Final EIS or who request a copy. For additional copies of this Final EIS please contact the EIS Section of the Water Division at the above address.

Sincerely yours,

John McGuire
Regional Administrator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION V

DATE DEC 11 1980

SUBJECT. Final EIS for Madison, Wisconsin

FROM Gene Wojcik
Chief, EIS Section

TO: Distribution List

The Final Environmental Impact Statement for Wastewater Treatment and Discharge Facilities for Madison, Wisconsin, is attached. The Notice of this Final EIS will appear in the Federal Register on Friday, December 19, 1980. The close of the waiting period will be Monday, January 19, 1981. After this time the Record of Decision will be issued. The EIS Section has additional copies of this document for distribution.

Attachment

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EPA-5-WI-DANE-MADISON-WWTP-80

FINAL ENVIRONMENTAL IMPACT STATEMENT

WASTEWATER TREATMENT AND DISCHARGE

MADISON METROPOLITAN SEWERAGE DISTRICT, DANE COUNTY, WISCONSIN

Prepared by the

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION V

CHICAGO, ILLINOIS

APPROVED BY:

John McGuire
REGIONAL ADMINISTRATOR
U.S. ENVIRONMENTAL PROTECTION AGENCY

October, 1980

FINAL ENVIRONMENTAL IMPACT STATEMENT

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DANE COUNTY, WISCONSIN

Prepared by

US ENVIRONMENTAL PROTECTION AGENCY,

REGION V

For further information, contact:

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ABSTRACT

A 201 Facilities Plan was prepared for the Madison Metropolitan Sewerage District's Nine Springs Wastewater Treatment Plant. It concluded that in addition to secondary treatment and sludge management expansions, advanced wastewater treatment (AWT) improvements needed to be added for a continued Badfish Creek discharge.

Concern about water quality impacts to Badfish Creek and controversy among downstream residents led to the preparation of this EIS. Secondary treatment and sludge management topics are not part of this EIS. The Final EIS concludes that an advanced secondary treatment (AST) system should be built at Madison and that the Badfish Creek discharge should be continued. The appropriate summer ammonia nitrogen effluent limit is 2.7 mg/l. The proposed AST treatment process consists of: single stage nitrification, flocculating clarifiers, ultraviolet light disinfection, adequate treatment unit size to accomodate peak flows and improved effluent pumping to Badfish Creek. User charges are considered affordable. Mitigating measures are recommended to monitor water quality and control construction erosion and sedimentation.

SUMMARY

Final Environmental Impact Statement
Wastewater Treatment and Discharge
Madison Metropolitan Sewerage District
Dane County, Wisconsin

A. FACILITIES PLAN PROPOSED ACTION

The 1976 Facilities Plan for the Madison area prepared by the Madison Metropolitan Sewerage District (MMSD) proposed increased secondary treatment capacity to 50 MGD at the Nine Springs Wastewater Treatment Plant (Fifth Addition), improved solids handling facilities (Sixth Addition), and advanced wastewater treatment capacity (Seventh Addition). In 1975 we allowed the Fifth Addition work to proceed without an EIS, since it was necessary for any alternative. The solids handling and disposal facilities were the subject of a separate EIS, completed in 1977. The wastewater treatment facilities for more advanced pollution control are the subject of this EIS.

The alternative chosen in the 1976 Facilities Plan was an advanced wastewater treatment system (tertiary), discharging to Badfish Creek through the existing effluent conveyance system. Rotating biological contactors provided nitrification to control ammonia, granular media filters were proposed for solids control, breakpoint chlorination and dechlorination were chosen for ammonia control and disinfection, and post-aeration and flow equalization ponds were indicated. The system had to meet the stringent permit limits (30-day) of 8.0 mg/l, each for biochemical oxygen demand (BOD) and suspended solids (SS), 7.0 mg/l of dissolved oxygen (DO), and 0.1 mg/l of total ammonia as nitrogen. Present worth costs of the project were estimated to be $47.2 million.

B. EIS ISSUES

1. Location of the discharge point.

2. Water quality impacts of a discharge to the Badfish Creek and its subsequent downstream impacts on the Yahara and Rock Rivers.

3. Public controversy on water quality issues and the need to thoroughly examine alternatives.

C. EIS PORPOSED ACTION

1. Draft EIS

Before the Draft EIS was issued, the stream classification of Badfish Creek was changed and divided into three segments. The following permit changes were made: DO 6.0 mg/l, total ammonia as nitrogen 1.0 mg/l (summer), 3.0 mg/l (winter).

The Draft EIS recommended the Badfish Creek discharge and a treatment process like the one selected in the Facilities Plan, except that breakpoint chlorination, dechlorination, and reaeration were omitted, while ozonation was substituted for disinfection and aeration. The present worth project costs were estimated to be $44.2-47.2 million.

2. Final EIS

After the Draft EIS was issued, additional facilities planning work was performed to address the technical questions arising from the Draft EIS and the new stream standards. The resulting document is the 1980 Facilities Plan Addendum.

The Final EIS incorporates the discharge location analysis from the Draft EIS, which recommended continuing the Badfish Creek location. The Wisconsin Pollutant Discharge Elimination System (WPDES) permit limits have been revised to BOD 19.0 mg/l, SS 20.0 mg/l, DO 5.0 mg/l and total ammonia as nitrogen 2.7 mg/l (summer) 8.0 mg/l (winter), as a result of additional studies and refined computor modeling using actual data.

The recommended alternative consists of single stage nitrification to limit ammonia, flocculating clarifiers for solids control, ultraviolet light for effluent disinfection, adequate treatment unit size to accommodate peak flows, and improved phased pumping facilities for effluent transport to Badfish Creek. Present worth costs are about $44.3 million. User charges are estimated to be $36 or less per year per household, plus municipal charges of about $16 per year. Portions of the project are eligible for 85% Federal funding as innovative systems, as opposed to the standard 75% funding for all other eligible capital costs.

D. PRINCIPAL ALTERNATIVES CONSIDERED

1. Draft EIS

a. No Action
b. Yahara River discharge
c. Split discharge between Badfish Creek and the Yahara River
d. Continued discharge to Badfish Creek

A preliminary analysis was made of the other alternatives examined in the Facilities Plan, including groundwater recharge, industrial or agricultural reuse, and discharge to other streams, including the Wisconsin River.

Additional analyses were made of treatment processes to achieve the necessary degree of treatment for the discharge alternatives.

2. Final EIS

The discharge location of Badfish Creek is assumed from the Draft EIS analysis. The Final EIS evaluation focuses on treatment levels and treatment process alternatives. Final treatment system alternatives are:

a. No Action

b. Single stage nitrification with standard efficiency diffusers, high head gravity filtration, and ozonation

c. Activated sludge and rotating biological contactors, high head gravity filtration, and ozonation

d. Single stage nitrification with high efficiency diffusers, high head gravity filtration, and ultraviolet disinfection

e. SURFACT process, flocculating clarifiers, and ozonation

f. Single stage nitrification with high efficiency diffusers, flocculating clarifiers, and ultraviolet disinfection

g. Air/oxygen single stage nitrification, flocculating clarifiers, and ozonation

E. MAJOR ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES

The water quality and potential beneficial uses of Badfish Creek will be improved substantially from existing conditions. Aquatic habitat conditions are expected to improve gradually as a result of the improved water quality. Maintaining discharge to Badfish Creek will continue diversion of water out of part of the Yahara River. As water use and sewage flow increase in the future, portions of the river could have a negligible flow at certain times. A lake level management program is being developed at the local level to help mitigate this problem. Temporary construction impacts, such as increases in noise and dust, minor traffic disruption, and erosion and sedimentation, will occur in the vicinity of Nine Springs Sewage Treatment Plant. Measures will be taken to minimize these impacts. Long-term water quality monitoring will be conducted. The manpower, material, energy resources and land used in the construction of the facilities will be unavailable for other uses. The user charges will be affordable for local residents.

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Chapter I

INTRODUCTION

A. ISSUE-ORIENTED EIS

This Final Environmental Impact Statement (FEIS) for Wastewater Treatment and Discharge at Madison, Wisconsin is an issue-oriented document. It will cover the most important project issues in the greatest detail. New information will also be discussed in detail. Much of the past project planning and background data will be summarized or incorporated by reference. You can obtain assistance in locating these background documents from the U. S. Environmental Protection Agency, Region V and from the Wisconsin Department of Natural Resources. The Council on Environmental Quality encourages the issue-oriented format to decrease the length of EIS's and to reduce excessive paperwork.

B. PURPOSE AND NEED FOR ACTION

1. Project Background

The Madison Metropolitan Sewerage District (MMSD), which was organized under Wisconsin Statutes in 1930, is responsible for the transmission, treatment and discharge of wastewaters from the City of Madison, Wisconsin and its surrounding area. The MMSD presently serves a total of three cities, five villages and twenty-six other municipal customers located within ten townships. The District includes approximately 142 square miles and is located entirely within Dane County (see Figure 1-1).

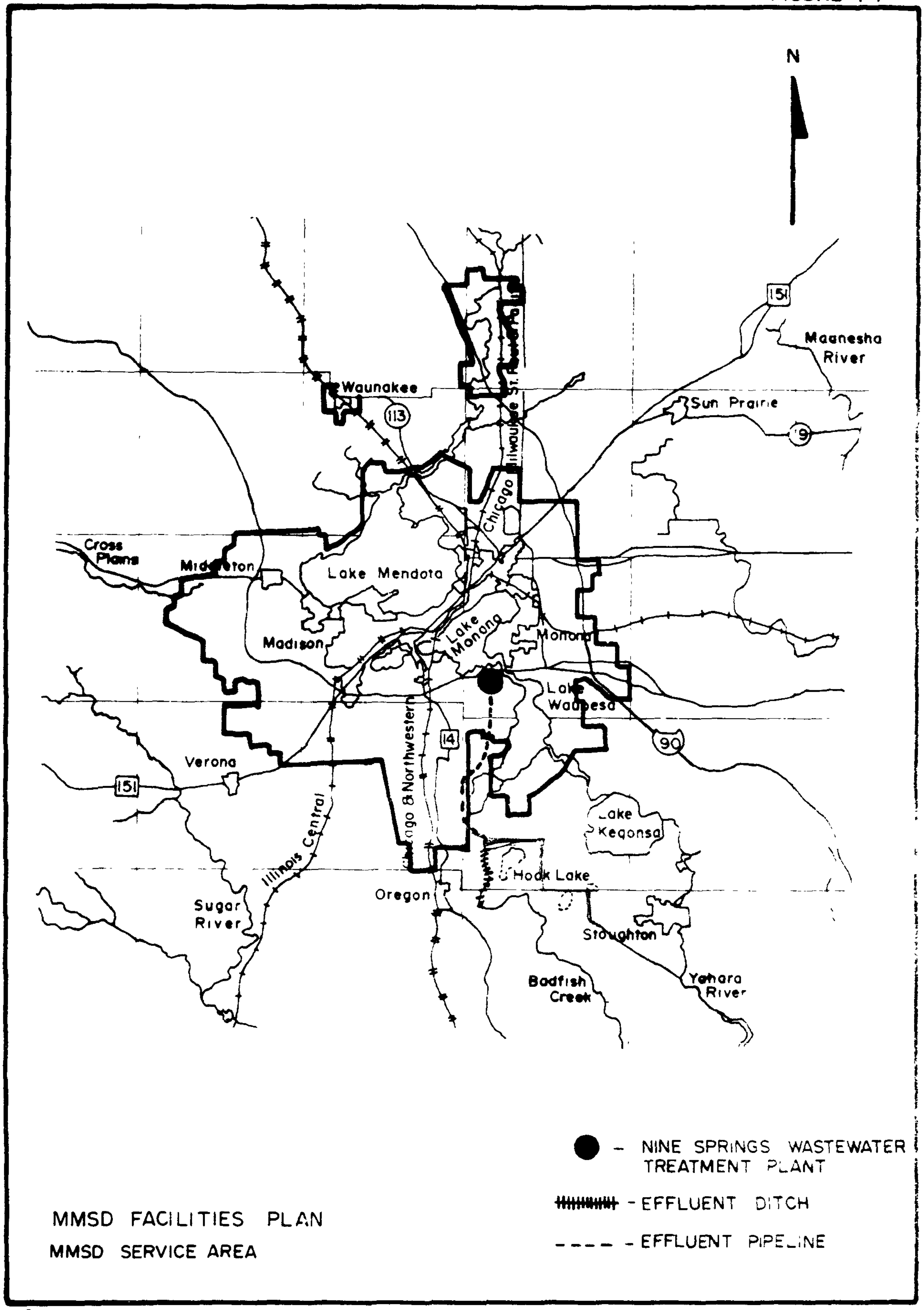
Madison area wastewater is treated at the Nine Springs Wastewater Treatment Plant. Current average daily flow is 35.5 MGD. A force main and effluent ditch convey the treated effluent to Badfish Creek, a stream within the Rock River basin. The present level of treatment is inadequate to meet the discharge permit requirements necessary to protect Badfish Creek.

2. History of Wastewater Treatment and Effluent Discharge in the Madison Area

Municipal treatment of wastewater in Madison was started in the late 1890's. The first treatment facility discharged to the Yahara River above Lake Monona. A succession of treatment plants, including the Burke treatment facility, were put into operation during the next twenty years, all of which also discharged above Lake Monona.

In 1928 the initial Nine Springs treatment facility was constructed to serve the southern and western portions of the city. The Nine Springs plant discharged to the Yahara River above Lake Waubesa, fourth in the chain of the five Madison Lakes. In 1930, the Madison Metropolitan Sewerage District formed. The Nine Springs plant has been modified a number of times to increase the capacity of the plant and to upgrade the treatment processes, the most recent being the 1977 Fifth Addition to increase secondary treatment capacity.

FIGURE 1-1



Source - Volume I of MMSD's Facilities Plan

O'BRIEN & GERE ENGINEERS INC

The Burke Plant, retired from full service in 1936, served as the treatment facility for the Truax Army Air Field from 1942 to 1946. The plant was used to handle bypassed flows during the construction of the eastside interceptor around Lake Monona from 1947 to 1950, at which time it was leased to the Oscar Mayer Company to be used for pretreatment of their meat packing wastes prior to discharge to the MMSD system. Recently, Oscar Mayer changed their pretreatment program, eliminating the use of the Burke Plant.

Concern expressed by a number of groups over the years regarding the condition of the Madison lakes indicated that some method of alleviating the pollutional loading to the lakes was desired. In 1943, the Wisconsin legislature passed a bill which essentially prohibited discharge of the effluent from the Nine Springs plant to the Madison lakes. Due to special restrictions concerning enforcement of the bill and various legal problems MMSD did not initiate plans to comply with the bill until early 1951. In response to Wisconsin Statute No. 144.05-1, which essentially prohibited future discharge of secondary effluent to the Madison lakes, MMSD retained the firms of Greeley and Hanson and Mead and Hunt Engineers to study other alternative discharge points. The study recommended discharge to either the Yahara River below Lake Kegonsa or to Badfish Creek, which flows southerly and easterly to join the Yahara River below the City of Stoughton. An addendum to that report recommended discharging to Badfish Creek.

Subsequently, in 1956, a group of six Rock County farmers who owned bordering Badfish Creek filed a suit (Sterns vs. Committee on Water Pollution) seeking to prevent diversion of the effluent. Their suit was not successful.

In December 1958, the entire Nine Springs effluent flow was diverted via a force main and effluent ditch to Badfish Creek, greatly increasing the normal flow in what had once been a rather small stream. From 1958, until the present time, the discharge of secondary effluent to Badfish Creek has been a continuing source of controversy between MMSD and Rock County. In 1961, the Fourth Addition to the Nine Springs plant was constructed, providing further treatment capacity for a total of 30 MGD.

In 1967, during Intrastate Water Quality Standards Hearings, portions of Badfish Creek were listed as exceptions to the commonly accepted standards for water quality designed to protect fish and aquatic life, despite protests from Rock County.

In 1971, Rock County and the Rock Valley Metropolitan Council financed a study of Badfish Creek by Harza Engineering. The results of that study indicated a need for advanced levels of waste treatment. Attempts by Rock County during 1971 to have Badfish Creek reclassified to meet fish and aquatic life standards were successful, except that the portion in Dane County was given a variance.

In 1972, MMSD issued a contract for the design of expanded secondary treatment facilities (Fifth Addition) at the Nine Springs treatment plant.

In February 1973, the Rock County Board formally requested that an environmental impact statement be prepared for the Fifth Addition to the treatment plant.

In July 1974, MMSD proposed the establishment of a Facilities Planning Advisory Committee to guide the conduct of a Facilities Planning Study. The proposal included representatives from Rock County on the Committee.

In September 1974, this Agency determined that the construction of the Fifth Addition could proceed without a formal environmental impact statement, however, a formal EIS would be required at the completion of the facilities Plan for proposals beyond the Fifth Addition.

At the same time, USEPA funded the construction of the Fifth Addition to provide secondary treatment for capacity of 50 MGD, including the abandonment of the old trickling filters. The capacity addition is necessary for any advanced waste treatment alternative and serves to improve treatment conditions during the interim planning period.

3. Facilities Planning and Related EIS

On December 31, 1974, MMSD was awarded a Step I Grant (Grant No. C550826-01-02) from USEPA to prepare a facilities plan which would meet the requirements of Wisconsin Pollutant Discharge Elimination System Permit No. WI-0025411. The facilities plan was to include documentation to determine the cost-effective construction of advanced waste treatment facilities and disposal of effluent, and handling and disposal of sludge from the treatment facilities.

In July 1975, the facilities planning effort was segmented into two portions, (1) advanced waste treatment and effluent discharge (Grant No. C550826-01) and (2) solids handling and disposal (Grant No. C550826-02). This segmentation was done because of the need to expedite the solids handling portion of the study.

In October 1976, a Draft EIS was filed with the Council on Environmental Quality on the solids handling and disposal portion of the facilities plan. A Final EIS on the organic solids reuse plan was made available to the public in June 1977. Design work has been completed and the sludge facilities are under construction. They are expected to be in operation in the spring of 1982.

Therefore, this Final EIS covers only the segment of MMSD's overall facilities planning effort concerned with advanced waste treatment and effluent discharge issues.

Facilities planning documents include:

1976 Facilities Plan and Environmental Assessment
8 volumes
Prepared for the Madison Metropolitan
Sewerage District by O'Brien and Geer Engineers
and CH2M Hill Engineers

1980 Draft Facilities Plan Update
2 Volumes of technical memoranda plus summary volume
Prepared for the Madison Metropolitan
Sewerage District by CH2M Hill Engineers

The 1976 Facilities Plan proposed an alternative which included:

- -- Assumption of 50 MGD secondary treatment capacity from Fifth Addition
- -- Rotating biological contactors for nitrification, a form of advanced wastewater treatment for ammonia control (treatment beyond the secondary level)
- -- Granular media filtration to control solids
- -- Breakpoint chlorination for nitrogen control and disinfection
- -- Dechlorination to protect stream life
- -- Holding ponds for flow equalization
- -- Post aeration to increase dissolved oxygen
- -- Improved effluent pumping system to Badfish Creek discharge location.

The alternatives examined in the 1976 Facilities Plan had to meet treatment levels established to provide for full fish and aquatic standards in the entire length of Badfish Creek. These discharge permit requirements were (30 day averages):

BOD_5	8.0 mg/l
Suspended Solids	8.0 mg/l
Dissolved Oxygen	7.0 mg/l
Total Ammonia as Nitrogen	0.1 mg/l
Chlorine Residual	0.1 mg/l
pH	6-9

Present worth project costs were estimated to be $47.2 million for this alternative for the 20-year planning period.

C. EIS ISSUES

Water quality impacts are a concern of the downstream users of Badfish Creek and the Yahara and Rock Rivers. Past effluent quality of the Madison effluent has been low, because of undersized and inadequate treatment facilities. This led to stream deterioration. The volume of effluent is also large compared to the natural flow of Badfish Creek. Flooding has been a problem in some areas. Water quality issues raised substantial public controversy over a period of years.

Questions were raised about examining alternative discharge locations and whether it was most appropriate to discharge to Badfish Creek. This included potential impacts to the Upper Yahara River if the effluent discharge were changed. Another concern was the economic bias towards continuing the Badfish Creek discharge that the existing discharge pipeline implies.

The Notice of Intent to prepare the EIS on this project was issued in September 1974.

D. DRAFT EIS

The Draft EIS issued in June 1978, examined a variety of discharge location alternatives:

1. No action

2. Wisconsin River

3. Koshkonong Nuclear Power Plant reuse, plus Rock River backup

4. Badfish Creek

5. Yahara River

6. Split discharge between Badfish Creek and Yahara River

7. Land application/groundwater recharge

The selected discharge alternative was Badfish Creek. A variety of treatment systems were examined for each discharge location.

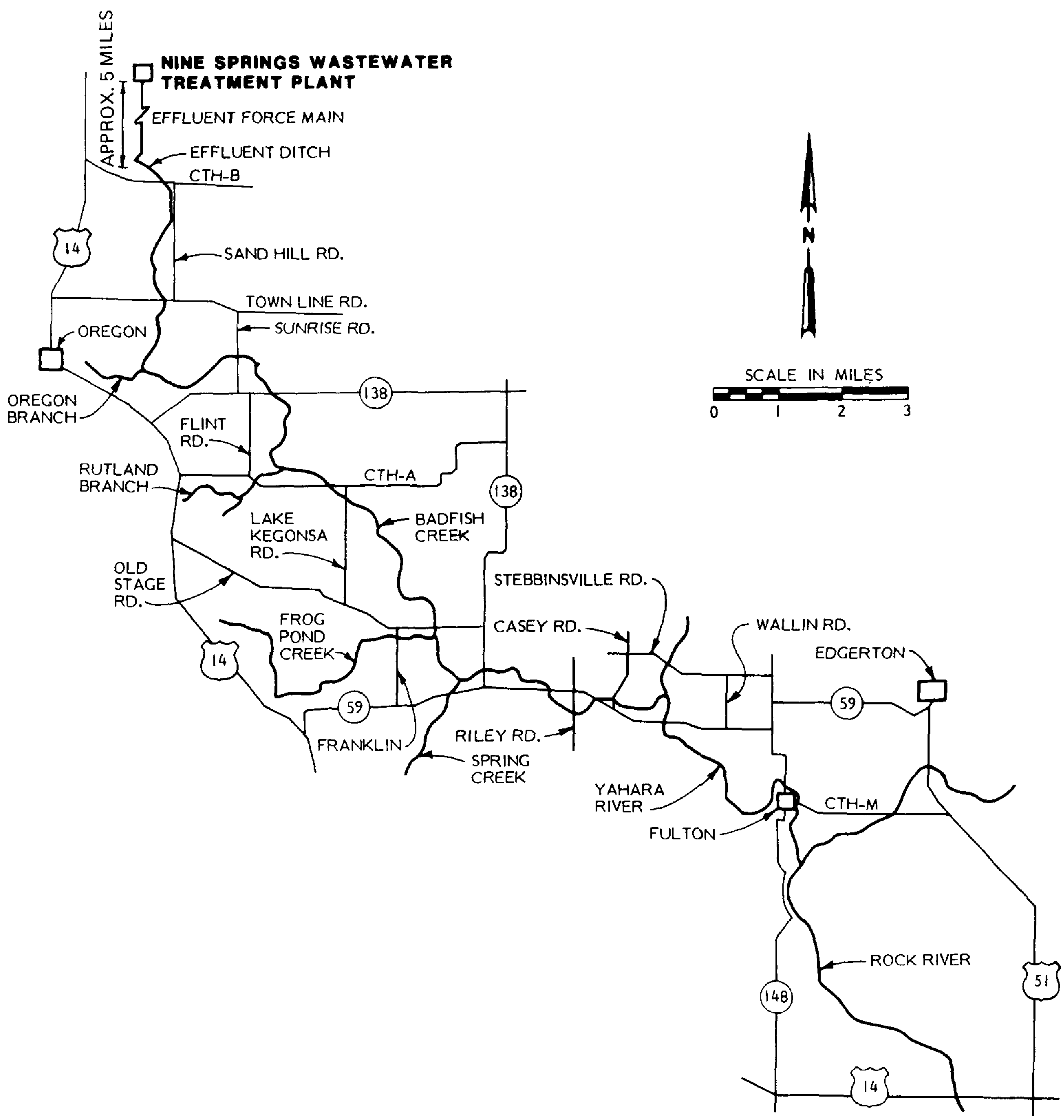
Between the time the Facilities Plan was written and the Draft EIS was issued, the stream classification of Badfish Creek was modified from full fish and aquatic life throughout its length to distinctions between three segments (see Figure 1-2):

-- Point of discharge to confluence with the Oregon Branch (about 3.6 miles) = effluent ditch

-- Oregon Branch to Highway "A" bridge (about 7 miles) = intermediate segment

-- Highway "A" bridge to confluence with the Yahara River (about 11 miles) = full fish and aquatic life standards.

Figure 1-2



Source: Summary of the Facilities Plan Update

The change in stream standards classification meant that a somewhat less highly treated effluent could be released to Badfish Creek than was assumed in the original Facilities Plan document. The new permit limits were (30 day average):

Dissolved Oxygen	6.0 mg/l
Total Ammonia as Nitrogen	1.0 mg/l (summer); 3.0 mg/l (winter)

BOD, suspended solids, chlorine residual and pH limits were unchanged by the reclassification.

The Draft EIS recommended a treatment alternative to meet the new effluent limits:

- -- Assumption of 50 MGD secondary treatment capacity from the Fifth Addition
- -- Assumption of solids handling capacity, based on previous sludge EIS
- -- Rotating biological contactors for nitrification for ammonia control (treatment beyond the secondary level)
- -- No breakpoint chlorination/no dechlorination
- -- Granular media filtration to control solids
- -- Ozonation for disinfection and to provide additional DO
- -- Holding ponds for flow equalization
- -- Improved effluent pumping system to the Badfish Creek

Present worth project costs were estimated to range between $44.2-$47.2 million.

E. PUBLIC PARTICIPATION

Events prior to the Draft EIS are summarized in Chapter 6 of the Environmental Assessment volume of the Facilities Plan.

A Facilities Planning Advisory Committee was formed in the fall of 1974. Representatives participated from MMSD, Dane County Regional Planning Commission, Rock County, Rock Valley Metropolitan Council, Wisconsin DNR, USEPA, and a citizen representative. This group provided assistance in developing the Facilities Plan for Madison and contributed to public participation.

The public hearing on the Draft EIS was held in two sessions on August 17, 1978, in Madison and Janesville, Wisconsin. Transcripts are available for reference at USEPA, Region V, Wisconsin DNR, Bureau of Environmental Impact in Madison, and at the Janesville Public Library. The issues are summarized in Chapter 6 of this document.

F. PROJECT HISTORY HIGHLIGHTS

First wastewater treatment in Madison	1890's
Original Nine Springs treatment facility built	1923
Discharge prohibited to Madison Lakes	1951
Discharge to Badfish Creek begun	1958
Fourth Addition to the Nine Springs plant	1951
Badfish Creek reclassified to meet fish and aquatic life standards	1971
Notice of Intent to prepare an EIS on sludge facilities and advanced treatment facilities	September 1974
Facilities Plan Document	August 1975
Badfish Creek reclassified into segments	October 1976
Draft EIS - sludge	October 1975
Final EIS - sludge	August 1977
Fifth Addition on line for additional secondary treatment capacity	November 1977
Draft EIS - wastewater treatment and discharge	June 1978
Public Hearing on Draft EIS for wastewater	August 17, 1978
Facilities Plan Update on technical issues	January 1980
Final WPDES Permit Issued	July 1980

G. RECORD OF DECISION

A Record of Decision on this Agency's final action and mitigative measures proposed project will be issued at least 30 days after the official filing date of this Final EIS. A copy will be sent to those persons who receive a copy of this Final EIS and to all others who request it.

CHAPTER 2

ALTERNATIVES

A. DESIGN FACTORS AND ASSUMPTIONS

1. Introduction

In this Chapter we will present alternatives for the treatment unit components. Detailed evaluation of the system alternatives and their environmental impacts will occur in Chapter 4. Changes which have occurred between the Draft and Final EIS will be highlighted in both chapters.

2. Flow Design Size and Water Conservation

Per capita flow projections have been derived from historical records dating back to 1954. These flow data show an average annual increase in the per capita flow rate of 0.8 gallons per capita per day. This historical increase has been incorporated into the 20-year projection of future flows to the wastewater treatment plant. Industrial flows have also been considered. The result is the 50 MGD design value for the year 2000. Details on flow are provided in Technical Memorandum I-B of the 1980 Facilities Plan Update and in the Draft EIS. The 50 MGD value was used in the 1977 Fifth Addition for secondary treatment capacity.

Madison has recently initiated a voluntary water conservation program which has resulted in decreased water use. Much of the decrease has been in such forms as reduced lawn watering, which will not affect sewage flows.

3. Wastewater Characteristics

The technical aspects of the Madison domestic and industrial influent have been discussed in Technical Memorandum 1-B of the 1980 Facilities Plan Update. The wastewater character is predominantly domestic, with slightly higher BOD and grease levels than in strictly domestic influent.

4. Sludge Treatment Facilities

Sludge issues have already been addressed in the 1977 Final EIS on solids handling facilities. The new improvements should begin operation in the spring of 1982.

5. Land Requirements

A 72-acre land parcel, immediately west of the Nine Springs Wastewater Treatment Plant, has been purchased by the MMSD. It will be used to provide expansion area and to maintain a 500-foot buffer zone between the facilities and a residential area.

B. WATER QUALITY STANDARDS AND DISCHARGE PERMIT

1. Water Quality Standards

The following water quality standards have been developed for Badfish Creek:

Table 2-I Water Quality Standards for Badfish Creek

Parameter	Value	Badfish Creek (1) Reach 1	Reach 2	Reach 3
DO(mg/l)	Minimum	1	3	5
Total Ammonia as Nitrogen	Summer	None	3 (2)	Not Specified (5)
	Winter	None	6 (2)	Not Specified
pH (units)	Range	6.0-9.0	6.0-9.0	6.0-9.0 (3)
Temperature (°F)	Maximum	None	None	89
Coliform (No./100 ml)	Geometric mean (4)	200	200	200
	Maximum	400	400	400

(1) Reach 1: Is the effluent channel, extending from the MSD outfall to channel's confluence with the Oregon Branch.

Reach 2: Is from the confluence of the effluent channel with the Oregon Branch, downstream to County Trunk Highway A.

Reach 3: Is from County Trunk Highway A, downstream to the confluence with the Yahara River (see Figure 1-2).

(2) Established in consideration of minimum dissolved oxygen requirement.

(3) No greater than 0.5 units outside natural conditions.

(4) More than 10 percent of samples in any given month shall not exceed this value.

(5) Ammonia values will be discussed in Section C of this chapter.

No substances which may be chronically toxic to fish and aquatic life are permitted in Reach 3. Table 2-2 contains water quality standards recommended from a number of sources for protection of fish and aquatic life from such chronic toxicity. In addition, the Wisconsin DNR Administrative Code states that all three classifications of the receiving stream should meet the following conditions at all times:

Table 2-2

Parameter	Recommended Maximum In-stream Concentrations	References
Color	10% Seasonal Change	1,3
Total Suspended Solids	25-400 mg/l	1
Total Phenols	1 ug/l	1, 3
PCB's	0.001 ug/l	3
Al	0.07 mg/l	2
Ag	0.003 mg/l	2
As	0.01 mg/l	1
B	6250 mg/l	2
Ba	5.0 mg/l	2
Be	1.1 mg/l	2
Cd	12.0 ug/l	3
Cr	0.10 mg/l	1, 3
Cu	0.01 mg/l	1
Fe	1.0 mg/l	3
K	50 mg/l	2
Pb	0.01 mg/l	1
Mn	1.0 mg/l	2
Hg	0.05 ug/l	3
Mb	54 mg/l	2
Ni	0.1 mg/l	1
Se	0.25 mg/l	2
Sn	1.2 mg/l	2
Va	4.8 mg/l	2
Zn	0.01 mg/l	1
Chlorides	400 mg/l	2
Fluorides	1.5 mg/l	2
Nitrites	50 mg/l	2
Sulfides	0.005 mg/l	1
Cyanides (free)	0.005 mg/l	1, 3
Total Combined Chlorine	0.05 mg/l	1

References:

1. National Academy of Sciences. Water Quality Criteria, 1972.
2. O'Brien and Gere, 1976 a; (From McKee, J. E. and Wolf, H. W. Water Quality Criteria, 1963.)
3. U. S. Environmental Protection Agency. Quality Criteria For Water, 1976.

Source: Facilities Plan Update
Technical Memorandum 2-D

WATER QUALITY STANDARDS
FOR FISH AND AQUATIC LIFE

- o Substances that will cause objectionable deposits on the shore or in the bed of a body of water shall not be present in such amounts as to interfere with the public rights in waters of the State;
- o Floating or submerged debris, oil, scum, or other materials shall not be present in such amounts as to interfere with public rights in waters of the State;
- o Materials producing color, odor, taste, or unsightliness shall not be present in such amounts as to interfere with public rights in waters of the State;
- o Substances in concentrations or combinations which are toxic or harmful to humans shall not be present in amounts found to be of public health significance, nor shall substances be present in amounts which are acutely harmful to animal, plant, or aquatic life.

The classification of the three reaches of Badfish Creek have been changed since the original Facilities Plan was prepared in 1976. Formerly, all three reaches were classified to maintain full fish and aquatic life. Now, Reach 1 is classified as an effluent ditch, Reach 2 as an intermediate zone, and Reach 3 remains at full fish and aquatic life standards. Figure 1-2 presents a map of the stream segment locations. Technical Memorandum 2-A of the Facilities Plan Addendum discusses water quality standards in more detail.

2. Discharge Permit

The discharge permit limitations reflect the degree of treatment necessary to achieve the designated water quality standards. Additional clarification and verification of the computer model occured after the Draft EIS was issued. Additional data were substituted for some of the earlier assumptions used in the model. This, plus changes in the ammonia limits (discussed below), led to an increase in the allowable levels of BOD and SS and a slight decrease in the minimum DO level. The revisions to key values are shown in Table 2-30.

C. AMMONIA ISSUES

1. Background

Ammonia occurs in a variety of forms:

Total ammonia: Consists of both the unionized and ionized forms. This is the form included in the NPDES/WPDES discharge permit.

Unionized ammonia: The form of ammonia toxic to aquatic life. It may be expressed either as ammonia or as nitrogen. The relationship of the two expressions is, 0.05 mg/l of unionized ammonia as nitrogen equals 0.062 mg/l of ammonia.

Ionized ammonia: The form of ammonia expressed as ammonium ion and ammonium ion measured as nitrogen. The relationship of the two expressions is 1.0 mg/l of ammonium ion as nitrogen equals 1.22 mg/l of ammonium ion.

The total ammonia in solution in wastewater will include varying proportions of

Table 2-3

Revisions to WPDES Permit Limits for Nine Springs Wastewater Treatment Plant.

	7 Day Average	30 Day Average
BOD_5 (mg/l)	20	19
SS (mg/l)	23	20
Total ammonia as nitrogen		
(summer - mg/l)	3.2	2.7
(winter - mg/l)	6.0	--

Note: These permit modifications were finalized October 1, 1980.

ionized and unionized ammonia. The relative quantities of each will depend on the pH and temperature of the wastewater. Figure 2-1 shows this relationship. Increasing the temperature and/or increasing the pH will increase the proportion of unionized ammonia present.

TKN: Total Kjeldahl Nitrogen is all the ammonia nitrogen, and organic nitrogen in a sample of wastewater. Past test results have shown the MMSD effluent to contain an almost constant level of 3.0 mg/l of organic nitrogen. Therefore, for any value of TKN, the total ammonia nitrogen can be found by subtracting 3.0 mg/l.

The chemical symbols (NH_3, etc.) for the various ammonia forms are not used consistantly and can be confusing. In this EIS, therefore, the names will be written out.

In addition to controlling the toxic unionized portion, it is desirable to limit total ammonia levels. Ammonia exerts an oxygen demand, reducing the DO concentration and can also be an aquatic plant nutrient, promoting undesirable excess plant growth, see Technical Memorandum 2-B.

2. Draft EIS Values

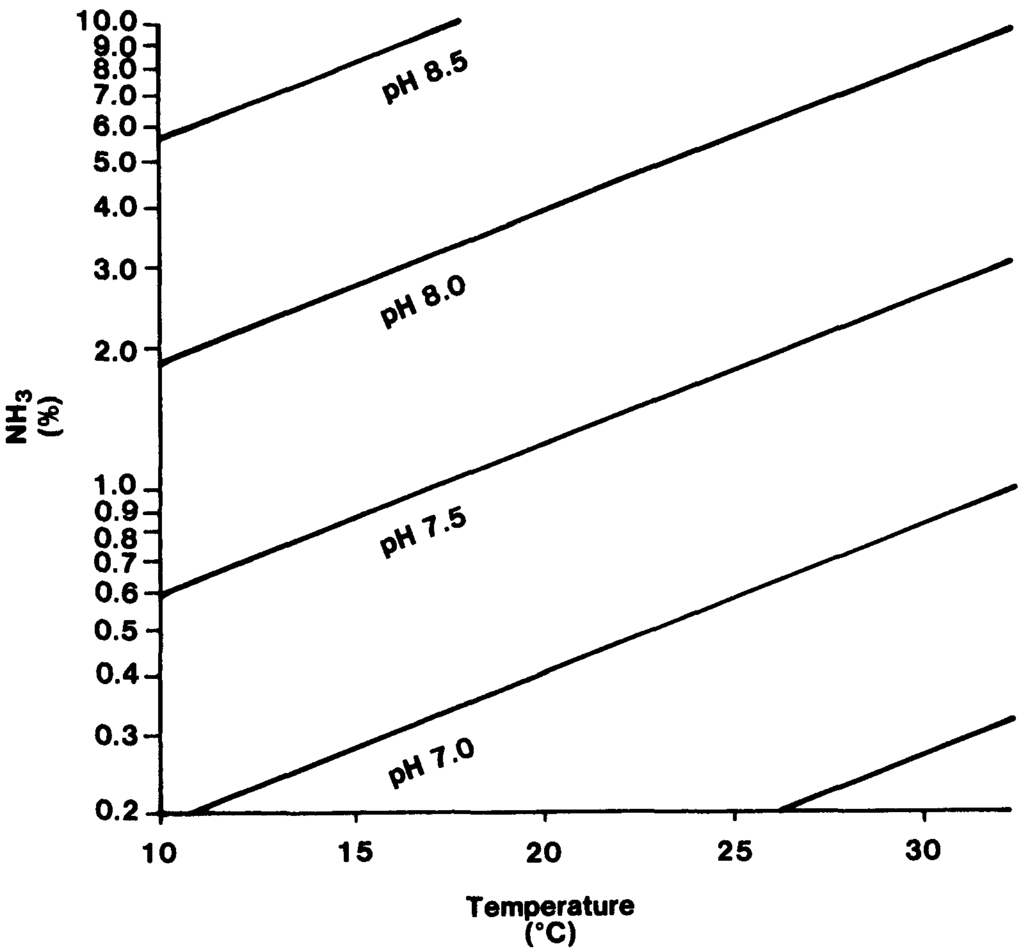
The total ammonia limits for effluent in the Draft EIS were based on not exceeding 0.02 mg/l of unionized ammonia nitrogen in the reaches of Badfish Creek below Highway A. The 0.02 mg/l criteria was developed to protect fish life. The effluent limit of total ammonia to achieve this in-stream value was determined to be 1.0 mg/l (summer) and 3.0 mg/l (winter), as a monthly average. The effluent values assumed a DO of 6.0 mg/l, minimum.

A number of questions were raised at the time of the Draft EIS about selecting appropriate ammonia levels specifically for Badfish Creek. The in-stream limit of 0.02 mg/l of unionized ammonia was based on EPA's 1972 "Blue Book" Water Quality Criteria, (subsequently revised in 1976, "Red Book"). Those values are based on nationwide studies and tend to be fairly conservative. A value designed to meet the conditions of Badfish Creek under its new classification into three reaches was suggested. Another change since the initial Facilities Plan studies was the operation of the Fifth Addition of the Nine Springs Plant. This addition expanded the secondary treatment facilities, with an improvement in the water quality of Badfish Creek, see Chapter 3. Since the 1976 Facilities Plan, the water quality model used by the WDNR to determine effluent limits has undergone refinements and is utilizing fewer assumptions not based on actual data.

3. Studies Conducted

The Madison Metropolitan Sewerage District and the University of Wisconsin conducted a series of bioassay tests to test the lethality of the Nine Springs effluent on rainbow trout and bluegill sunfish. The 96-hour lethality value to 50% of the population (96-hour LC) was found to be 1.09 mg/l of unionized ammonia. An extensive literature review accompanied the bioassay studies, see Table 2-4. From literature values and test results, a new stream water

RELATIONSHIP OF AMMONIA CONCENTRATION, pH, AND TEMPERATURE



Source: Facilities Plan Update
Technical Memorandum 2-B

quality standard of 0.05 mg/l of unionized ammonia as nitrogen (7-day average) was established for Badfish Creek. This standard has been accepted both by WDNR and USEPA as valid for Badfish Creek. Technical Memorandum 2-C of the Facilities Plan Addendum describes this work in detail.

Additional modeling work was performed to determine effluent limits to meet the new 0.05 mg/l standard and to reflect the improved condition of Badfish Creek. The values were to be achieved in the third reach of Badfish Creek (full fish and aquatic life), taking into account the changes which would occur in the upper two reaches. Technical Memorandum 3A presents a full discussion of the modeling effort.

Stream surveys used in the modeling:

-- Water quality data
1975 (1 set)
1976 (2 sets)
1978 (2 sets)
1979 (1 set)

-- Diurnal water quality surveys (24-hour)
October 1978 - (see Technical Memorandum 3-B)
May 1979 - (see Technical Memorandum 3-C)

The mathematical water quality model used from this analysis, "Auto-Qual," simulated the one-dimensional steady-state distribution of conductivity, dissolved oxygen, carbonaceous oxygen demand, and nitrogenous oxygen mixing and transport, first order reaction terms for deoxygenation, nitrification, settling, and reaeration, and sediment oxygen demand. Rate coefficients were adjusted to reflect inhibition of biological activity at low concentrations of dissolved oxygen. This is the same model used in the 1976 Facilities Plan modeling.

The Badfish Creek model was validated against the six independent sets of water quality survey data obtained under a variety of hydraulic, environmental, and loading conditions. A consistent set of model coefficients were used for all simulations, which attested to the versatility and reliability of the model to simulate varied conditions.

After thorough validation, the model was used to evaluate water quality at critical conditions in response to various levels of effluent quality. Simulations were conducted for 1990, representing a time when the biology and chemistry of the stream are expected to be in balance with the reduced effluent loadings. Model coefficients in these simulations were properly adjusted to reflect the projected improved water quality and wastewater effluent. Adjustments were based on theoretical considerations, past research and special laboratory and field studies. Simulations were also conducted for 1985 to conservatively reflect possible short-term conditions while the stream environment is responding to improved effluent quality. In these simulations, model coefficients were not adjusted to reflect the improved effluent water quality.

Table 2-4

LESS THAN 24 HR LC50 (NH_3 in mg/l)

Item	LC50	Species	Source	Time (hr)
1	1.34	Gambusia	Hemens; 1966	17.0
2	1.15	Brown Trout	Penaz; 1965	9 6
3	1.02	Rainbow Trout	Lloyd, Herbert; 1960	8.3
4	0.79	Rainbow Trout	Smart; 1976	2.0
5	0.61	Rainbow Trout	Smart; 1976	5 0

24 Hour LC50 (NH_3 in mg/l)

Item	LC50	Species	Source
6	2.91	Channel Catfish	Robinette; 1976
7	0.70	Rainbow Trout	Ball; 1967
8	0.50	Rainbow Trout	Ball; 1967
9	0.47	Rainbow Trout	Lloyd, Orr; 1969
10	0.36	Rainbow Trout	Herbert, Shurben; 1963
11	0 28	Atlantic Salmon	Herbert, Shurben, 1965

48 Hour LC50 (NH_3 in mg/l)

Item	LC50	Species	Source
12	3.55	Channel Catfish	Sparks; 1975
13	2.79	Blugill	Sparks; 1975
14	2.04	Flathead Minnows	Sparks; 1975
15	0.73	Rainbow Trout	Brown; 1968
16	0.73	Rainbow Trout	Herbert, Shurben; 1963
17	0.57	Rainbow Trout	Herbert, Shurben; 1964
18	0.56	Rainbow Trout	Herbert, Van Dyke; 1964
19	0 50	Rainbow Trout	Ball; 1967

96 Hour LC50 (NH_3 in mg/l)

Item	LC50	Species	Source
20	8.98	Bluegill Sunfish	McKee, Wolf; 1963
21	8.50	Flathead Minnows	McKee Wolf; 1963
22	7.29	Bluegill Sunfish	McKee, Wolf; 1963
23	3.76	Channel Catfish	Colt, Tchobanoglous; 1976
24	3.64	Channel Catfish	Roseboom, Richey; 1977
25	2.43	Channel Catfish	Colt, Tchobanoglous; 1976
26	1.82	Channel Catfish	Roseboom, Richey; 1977
27	1.58	Bluegill Sunfish	Roseboom, Richey; 1977
28	1 51	Guppy Fry	Rubin, Elmaraghy; 1977
29	1 46	Bass	Roseboom, Richey, 1977
30	1.34	Striped Bass	Hazel, et al; 1971
31	1.16	Bluegill	Ruffier; 1978
32	1.06	Bluegill	Ruffier; 1978
33	1.05	Bluegill	Ruffier; 1978
34	1.02	Stickleback	Hazel, et al; 1971
35	0.97	Bluegill	Roseboom, Richey; 1977
36	0.94	Bluegill	Ruffier; 1977
37	0.92	Striped Bass	Hazel, et al; 1971
38	0.87	Stickleback	Hazel, et al; 1971
39	0.87	Bass	Roseboom, Richey; 1977
40	0.80	Cutthroat Trout Fry	Thurston, et al, 1978
41	0.59	Bluegill	Roseboom, Richey; 1977
42	0.55	Coho Salmon	Buckley; 1978
43	0.52	Cutthroat Trout Fry	Thurston, et al; 1978
44	0.49	Bluegill	Roseboom, Richey; 1977
45	0.39	Rainbow Trout Fry	Willingham, et al, 1978

THRESHOLD LC50 (NH_3 in mg/l)

Item	LC50	Species	Source
46	1 82	Rainbow Trout	Merkins, Downing; 1957
47	0.50	Bream	Ball; 1967
48	0 50	Carp	Vamos, Tasnadi; 1967
49	0.50	Rainbow Trout	Herbert, Shurben; 1963
50	0.49	Rudd	Wat Poll Res 1971; 1972
51	0.49	Rainbow Trout	Lloyd, Herbert, 1960
52	0 44	Rudd	Ball, 1967
53	0 42	Roach	Ball; 1967
54	0.40	Trout Spawn	Wuhrmann, Woker; 1948
55	0.40	Rainbow Trout	Lloyd, Herbert; 1960
56	0.35	Perch	Ball; 1967
57	0.30	Trout Spawn	Wuhrmann, Woker; 1948
58	0.24	Rudd	Wat Poll Res 1971; 1972
59	0 19	Rainbow Trout Spawn	Danecker; 1964

Source: Facilities Plan Update
Technical Memorandum 2-B

AMMONIA TOXICITY TO FISH

Results of the water quality modeling for a critical instream temperature of 22 C, pH of 8.0, and a 7-day, 10-year low flow, demonstrate the following:

-- If no modifications are made to the existing channel aeration capacity, then a daily pollutant limitation of 20 mg/l total BOD and 7 mg/l TKN must be attained to satisfy the dissolved oxygen limitation in the third reach of Badfish Creek. (Note: aeration modification options will be discussed in Section F-5 of this chapter.) If the first cascade aerators are replaced with U-tube aeration, then daily pollutant limitations of 20 mg/l total BOD and 9 mg/l TKN must be attained to meet the dissolved oxygen water quality standard.

-- If the existing cascade aerators are removed and ozonation is used as the means of effluent disinfection, then daily pollutant limitations of 20 mg/l total BOD and 11 mg/l TKN must be attained to meet the dissolved oxygen water quality standard.

-- Conservative model simulations for 1985 suggested that limited dissolved oxygen violations may occur in the short term under critical conditions. This may occur immediately after improved treatment, but prior to a time when the stream biology and chemistry have adjusted to the improved water quality and effluent. However, it is anticipated that the stream biology will quickly establish a new balance with the reduced effluent loadings, so such occurences will be short-lived.

-- Model simulations also indicated that weeds must be controlled to prevent dramatic diurnal variations in dissolved oxygen, which may cause water quality violations. The District currently harvests weeds from Badfish Creek on a periodic basis.

Modeling results and operating data from the Fifth Addition of the Nine Springs Plant were used to determine daily, weekly and monthly effluent limitations. The 30-day limit for total ammonia is 2.7 mg/l in the summer and 8.0 mg/l in the winter. These values will achieve the 0.05 mg/l unionized ammonia nitrogen value instream limit.

4. Summary of Ammonia Conclusions Used for the Final EIS

		30-day average
Instream: (reach 3)	DO mg/l	5.0
	Unionized Ammonia as Nitrogen mg/l	0.05
	pH	6-9
Effluent:	BOD mg/l	19.0
	TSS mg/l	20.0
	DO mg/l	5.0
	Total Ammonia mg/l as nitrogen	2.7 (summer) 8.0 (winter)
	pH	6-8

D. OVERVIEW OF PREVIOUS ALTERNATIVES

1. Facilities Plan

In 1976 the Facilities Plan examined 23 discharge sites, including surface alternatives, groundwater recharge, and industrial or agricultural effluent reuse, see Section 7 of the Summary Plan in the Draft EIS. These were narrowed down in the preliminary selection to: proposed Koshkonong Nuclear Power Plant (reuse), Badfish Creek, Badfish Creek and Yahara River, and Wisconsin River. Section 3-B of the Draft EIS indicated our reservations about several aspects of this screening. The final screening of the Facilities Plan chose the Badfish Creek alternative as the most cost-effective. System alternatives were examined which would produce the necessary effluent quality for Badfish Creek, as described in Chapter 9 of V. 2 of the Draft EIS. The selected system has been outlined in Section B-3 of Chapter I.

2. Draft EIS

The alternatives examined in the Draft EIS were based on our analysis of the Facilities Plan's final group of alternatives. They were:

"No Action" Alternative

Continued discharge to Badfish Creek with no new or upgraded facilities beyond those constructed as part of the Fifth Addition and as part of the Organic Solids Reuse Plan (Sixth Addition).

Alternative #1

Discharge to the Yahara River with effluent meeting the highly nitrified (low ammonia) level defined as "Effluent II" in MMSD's Facilities Plan.

Alternative #2

Split discharge to Badfish Creek and the Yahara River with effluent meeting the highly nitrified level defined as "Effluent II" in MMSD's Facilities Plan.

Alternative #3

Continued discharge to Badfish Creek with effluent meeting Wisconsin Department of Natural Resources proposed limitations for discharge to Badfish Creek, 6.0 mg/l D.O., total ammonia as nitrogen 1.0 mg/l (summer) 3.0 mg/l (winter).

Each of the system alternatives and its wastewater treatment component alternatives was evaluated for costs, ability to meet receiving stream water quality requirements, environmental impacts, reliability and flexibility. The array of treatment component alternatives differed slightly from the Facilities Plan because somewhat less ammonia removal was required for a Badfish Creek discharge after the stream reclassification in the fall of 1976. Chapter 3 of the Draft EIS presents the final alternatives analysis in detail. Alternative 3, Badfish Creek, was selected. The preferred treatment system consisted of rotating biological contactors, granular media filtration, ozonation and holding ponds for flow equalization. The discharge location analysis from the Draft EIS is incorporated into this Final EIS. A Badfish Creek discharge will be used for each alternative.

E. ADDITIONAL INFORMATION BETWEEN THE DRAFT AND FINAL EIS

Additional facilities planning work was performed after the Draft EIS was released. Part of this developed more treatment component alternatives for the Badfish Creek discharge. These studies reflect the changes in stream classification and operating data from pilot studies on certain units. These studies are presented in the technical memoranda of the 1980 Facilities Plan Update. They will be a basis of our alternatives analysis, below.

F. ALTERNATIVE COMPONENTS - FINAL EIS

1. Innovative-Alternative Incentive

The 1977 Clean Water Act amendments contain new provisions, initiated in October 1978, to encourage the use of new types of sewage treatment technology. It defines certain technologies as being innovative or alternative (I/A). Special emphasis is placed on ideas that: reclaim or reuse water, recycle wastewater nutrients, eliminate surface discharge, conserve or recover energy, or lower total costs. Qualifying I/A portions of a project may receive 85% Federal funding for capital costs rather than the usual 75%. In addition, if an I/A alternative fails to meet design goals within the first two years of operation, the Federal Government will pay 100% of the cost of replacing or correcting the failed system. Components which may be potentially classified as I/A will be indicated as such in the following discussions.

2. Ammonia Removal (Nitrification)

The technical reasons for the level of ammonia removal required for a Badfish Creek discharge have been discussed in Section C. More detailed information on the various systems and the nitrification process is presented in Technical Memorandum 4-C of the Facilities Plan Update.

The following alternatives will be examined:

- -- single stage nitrification using standard efficiency diffusers.
- -- activated sludge followed by air drive rotating biological contactors.
- -- SURFACT process
- -- air/oxygen single-stage nitrification

Additional alternatives were previously examined in the 1976 Facilities Plan:

-- Single-stage activated sludge
-- Two-stage activated sludge
-- Rotating biological contactors
-- Zimpro-Biophysical system
-- Activated bio-filter

These alternatives assumed the need for a slightly higher degree of effluent quality. Elements of many of them are used in the current set of alternatives.

The alternatives under discussion in this Final EIS assume the expanded secondary treatment capacity now on-line at the Nine Springs treatment plant.

a. Single-stage nitrification with standard efficiency diffusers.

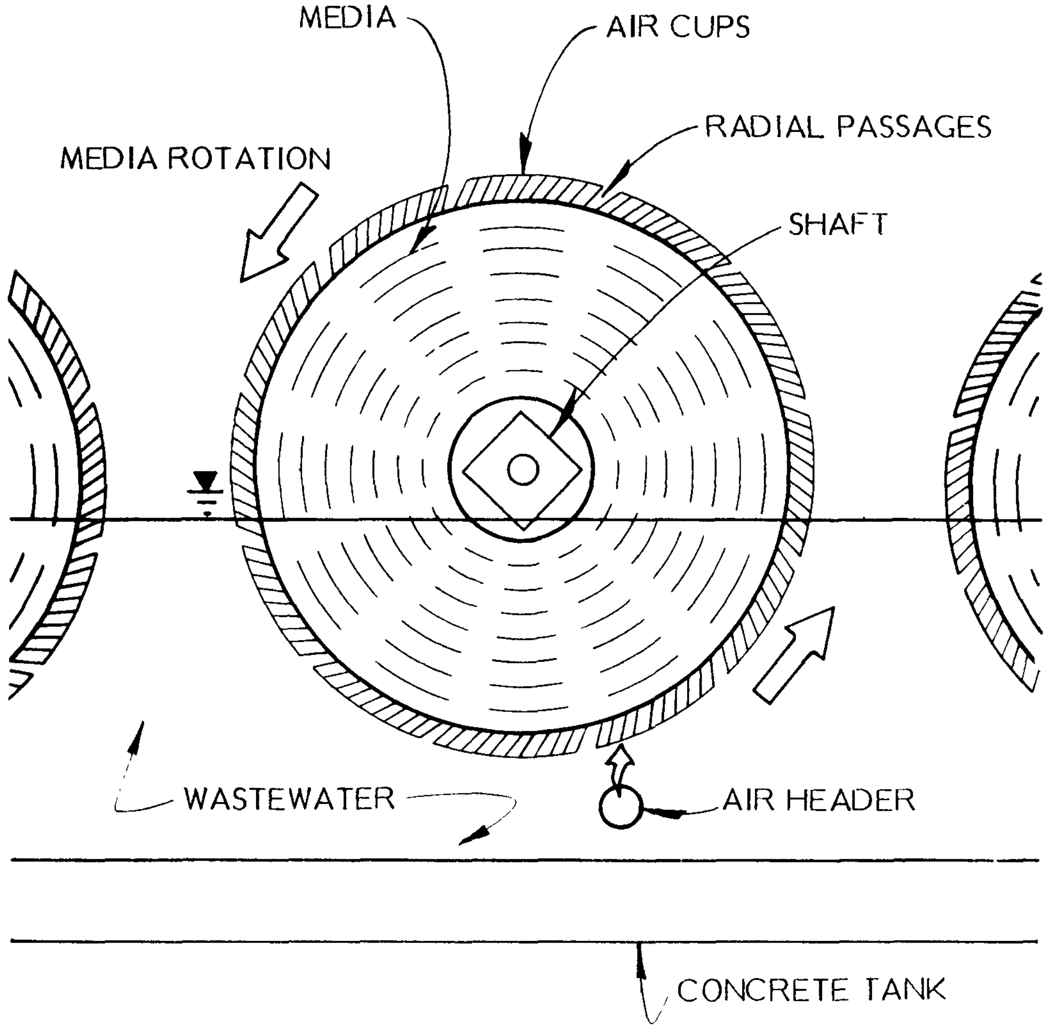
Single-stage nitrification is a suspended growth biological treatment system. It relies on several nitrifying bacteria to oxidize ammonia in the wastewater first to nitrite and then to nitrate. The system, as an adaptation of the activated sludge process, must be designed and managed with enough solids retention time to allow the bacterial population to reproduce. This ensures the maintenance of an adequate ongoing bacterial population which is necessary for effective ammonia removal. Solids retention at Nine Springs would be promoted by increasing the aeration volume and by increasing the mixed liquor suspended solids concentration. Although this is an adaptation of the existing activated sludge process, treatment capacity would have to be doubled to use it on a long-term basis.

This method has been sucessfully demonstrated at the Nine Springs facility from November 1977 to March 1979. (see Appendix A of Technical Memorandum 4-C). Standard efficiency diffusers are a fully proven technology at other wastewater treatment plants.

Capital costs:	$ 10,510,000	
Operation and Maintenance costs:	$ 1,436,000	per year
of this	$ 893,000	is for electric power
Present worth cost:	$ 25,300,000	

b. Activated sludge followed by air drive rotating biological contactors (RBC)

The RBC process consists of a number of large diameter corrugated plastic media assemblies mounted on horizontal steel shafts. The media rotate in a concrete tank of wastewater. Bacteria grow on the media and feed upon organic matter in the wastewater (see Figure 2-2). The system encourages the growth of those groups which convert ammonia to nitrate. The bacterial population will be sloughed off the media to be suspended in the effluent. These suspended solids are removed in a subsequent treatment process. An air drive system alternative is suggested for turning the RBC's, if the system is to be used at Nine Springs. The air drive system has the advantages of increasing dissolved oxygen and reducing maintenance problems.



Source: Facilities Plan Update
Technical Memorandum 4-C

AIR-DRIVE RBC UNIT

While RBC's have been used for about 20 years for wastewater treatment, the air drive variation is more recent and has been used at facilities smaller than Madison. The process itself is well established.

Capital cost:	$13,220,000
O & M cost:	$ 1,454,000
of this	$ 889,000 is for electric power
Present worth cost:	$28,500,000

c. Single-stage nitrification using high efficiency diffusers

This alternative is similar to a, discussed above. It substitutes energy-saving high efficiency diffusers. This is a potentially innovative process because of its energy saving features. This system has been tested at the Nine Springs plant. Possible problems may occur with increased plugging of the fine bubble diffusers (high efficiency) compared to the standard coarse bubble diffusers.

Capital costs:	$11,210,000
O & M costs:	$ 934,000
of this	$ 489,000 is for electric power
Present worth costs:	$20,600,000

d. SURFACT process

The SURFACT process places RBC's in an air activated sludge tank, (see Figure 2-3). A fixed film of bacteria grows on the rotating media while suspended bacteria grow in the activated sludge. The biological activities of both populations of bacteria treat the wastewater to a high degree. The existing activated sludge tanks would be retrofitted with the RBC's.

One prototype facility is operating in Philadelphia. Its abilities for nitrification must be tested. This is a potentially innovative system to use for nitrification. Some energy savings may also be achievable with this system.

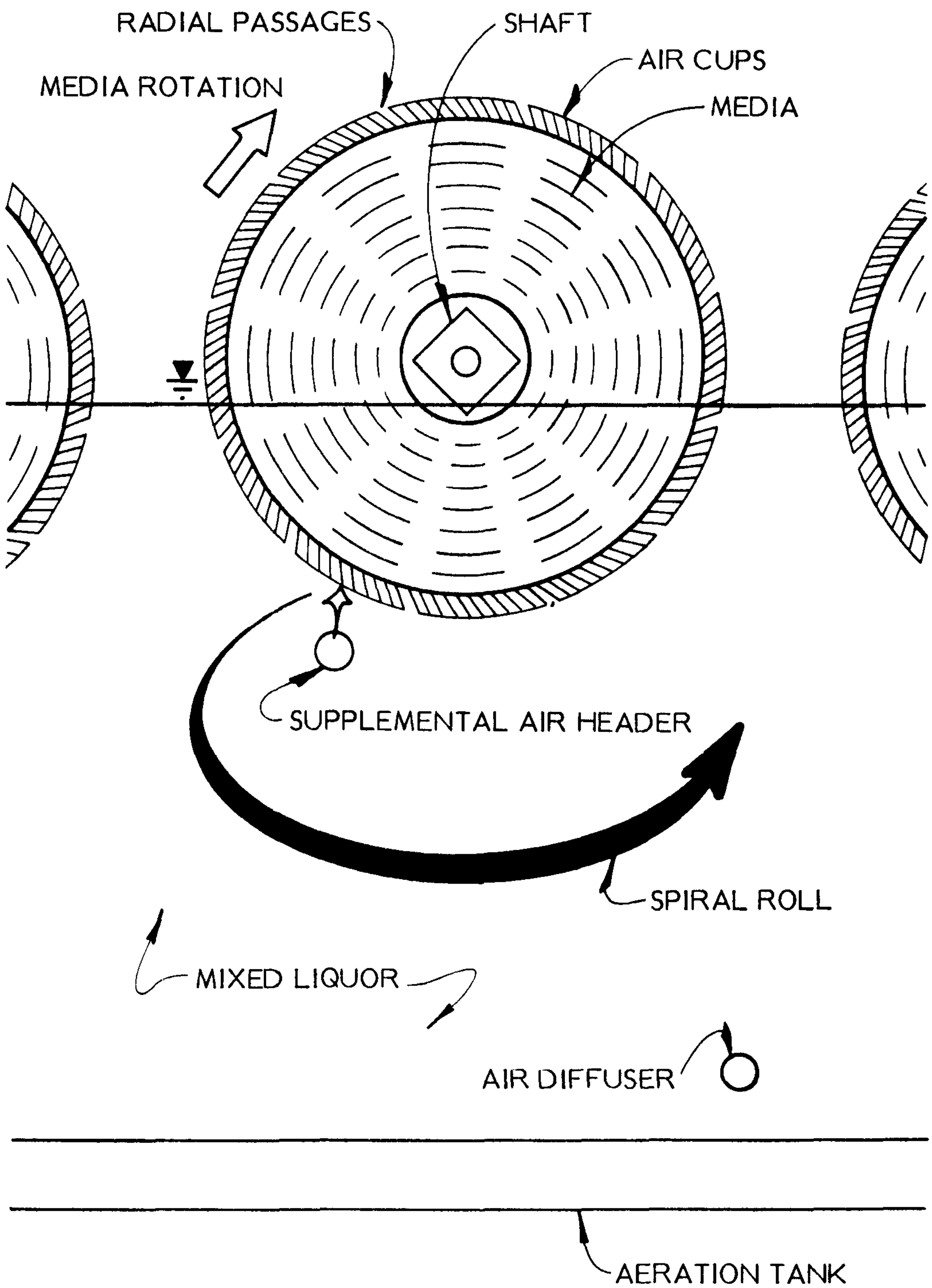
Capital costs:	$15,050,000
O & M costs:	$ 991,000
of this	$ 521,000 is for electric power
Present worth costs:	$25,300,000

e. Air/oxygen single-stage nitrification

This alternative modifies (c) by adding pure oxygen vent gas from an ozonation disinfection system (see alternatives under Section 3, below) in addition to using the high efficiency air diffusers.

Because this is a new approach to wastewater treatment, it is potentially innovative. Some energy and sizing savings may be realized. Enough oxygen would be generated by the ozonation system to be recycled and treat about 25 percent of the effluent. About 75 percent of the flow would be handled by the high efficiency air diffusers.

Figure 2-3



Source: Facilities Plan Update
Technical Memorandum 4-C

SURFACT PROCESS

Capital costs:	$12,630,000
O & M costs:	$ 938,000
of which	$ 487,000 is for electric power
Present worth costs:	$ 21,900

Implimenting this system would be dependent on selecting ozonation for disinfection.

3. Suspended Solids Reduction

A successful degree of suspended solids removal is required to achieve the 20.0 mg/l limit of the discharge permit. This level is less stringent than the 8.0 mg/l assumed necessary in the Draft EIS. Granular media filtration was selected in the Draft EIS. Microscreening and chemical treatment were also examined.

Because of the permit changes a new group of solids removal alternatives have been covered in the Facilities Plan Addendum, Technical Memorandum 4-D. They include:

- -- Granular media filtration by low head gravity filters
- -- Granular media filtration by highhead gravity filters (deep bed)
- -- Granular media filtration by pressure filters
- -- Advanced secondary settling

The Technical Memorandum provides more detailed information on these alternatives, to supplement our discussion in this Final EIS.

Filtration involves the transport of the particle from the bulk liquid to the surface of the filter media and attachment of the particle to the media surface. The types of physical mechanisms depend on the size of the particle. Certain sized particles can be difficult to capture. The filter cycle has a filtration phase for particle removal and a backwash phase to rejuvenate the filter.

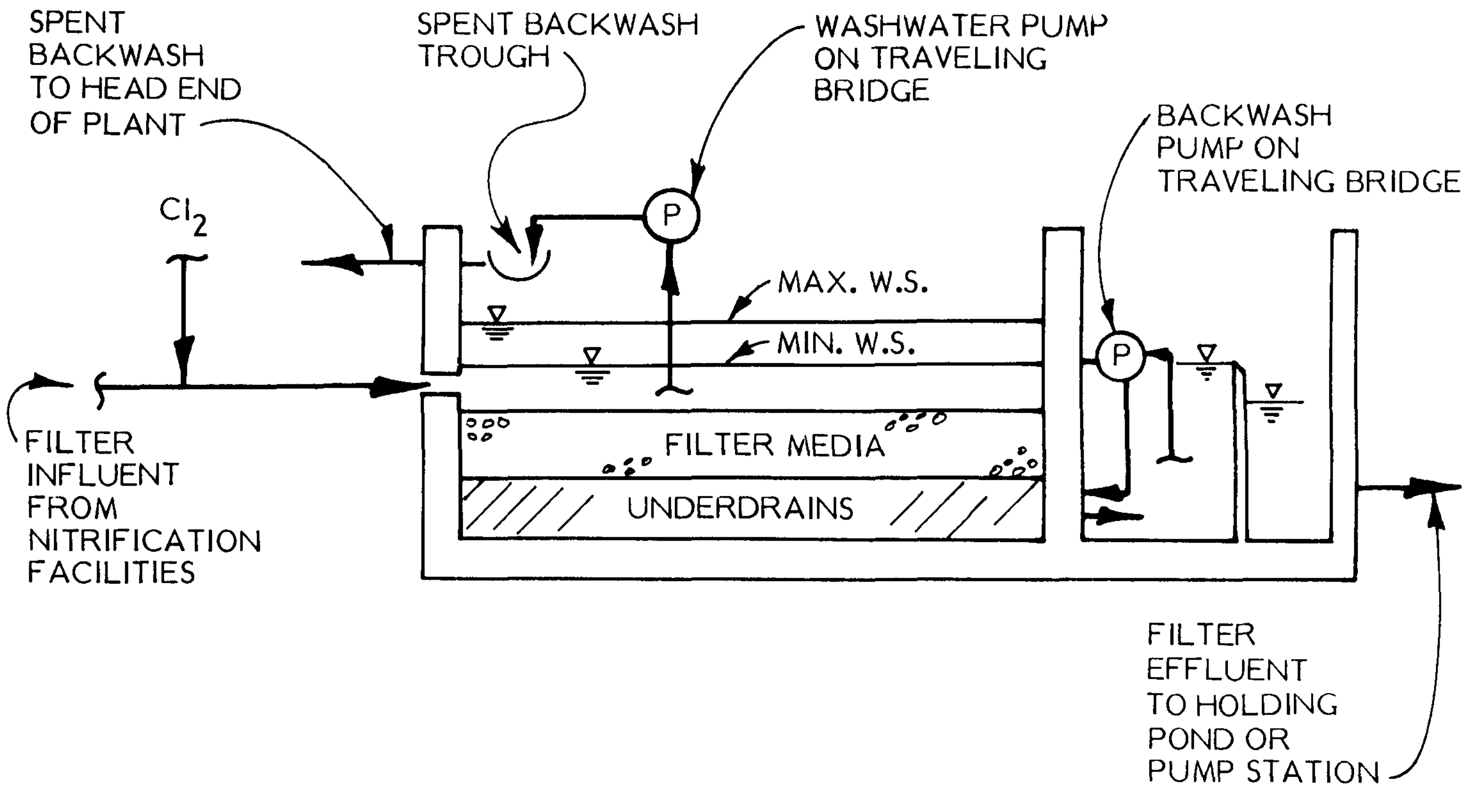
a. Granular media filtration by low head gravity filter

Low head filters have shallow multi-compartmented filters. Individual cells may be backwashed while the rest of the filter continues to operate (see Figure 2-4). This type of system must be frequently backwashed for effective results. Most of the removal occurs at the surface of the filter. Heavy loading of the filters leads to frequent backwashing. Chlorination of the influent is recommended to reduce accumulation of slime, algae or grease in the filters. This type of filter has fairly widespread use.

Capital costs:	$6,920,000
O & M costs:	$ 329,000
of this	$ 11,000 is for electric power
Present worth costs:	$9,900,000

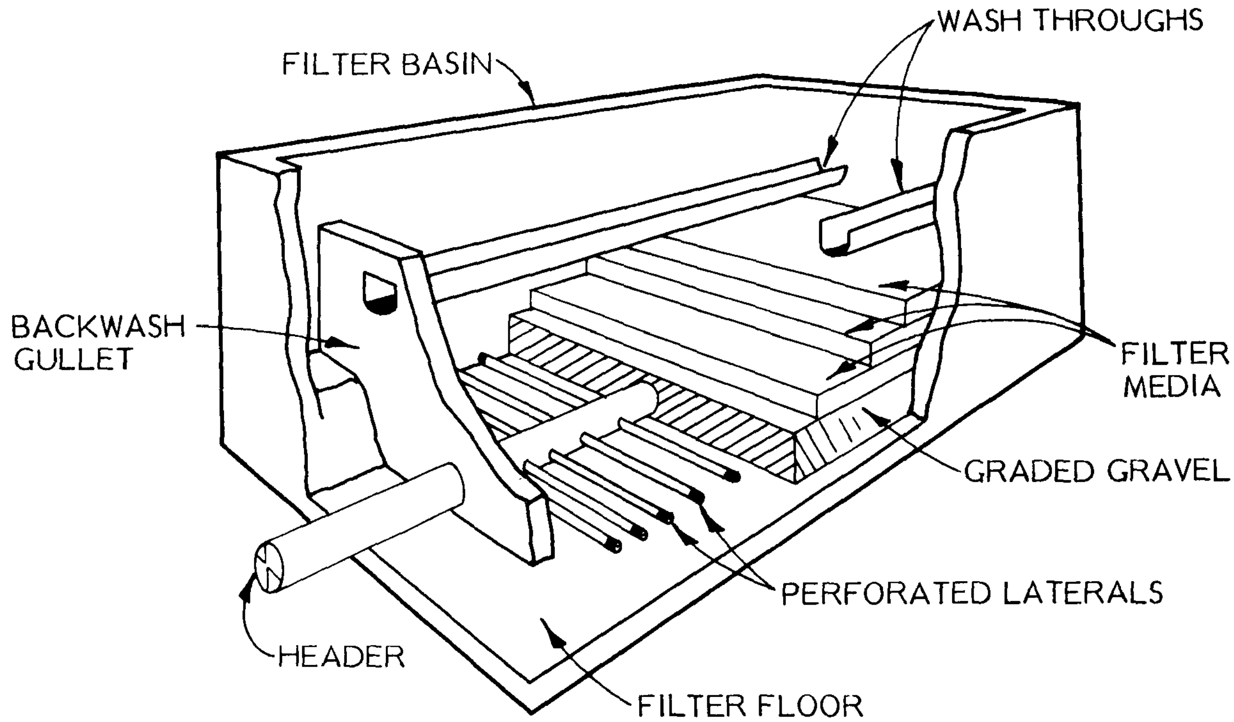
b. Granular media filtration by high head gravity filters (deep bed)

Deep bed filters have a longer filter run and the entire unit is backwashed at once, in contrast to low head gravity filters. Removal occurs throughout the



Source: Facilities Plan Update
Technical Memorandum 4-D

LOW HEAD GRAVITY FILTRATION SYSTEM



COURTESY: NEPTUNE MICROFLOC, INC.

Source: Facilities Plan Update
Technical Memorandum 4-D

HIGH HEAD GRAVITY FILTER CONFIGURATION

filter (see Figure 2-5). Media are selected to be compatible with the influent and the degree of particle removal desired. Dual media filters have been used in past pilot studies at Nine Springs. High head gravity filters are widely used in water and wastewater treatment.

Capital costs:	$4,760,000
O & M costs:	$ 350,000
of this	$ 32,000 is for electric power
Present worth costs:	$8,200,000

c. Granular media filtration by pressure filters

Pressure filters operate in an enclosed structure, as shown in Figure 2-6. Backwashing is performed on the entire unit. Pressure filters have the advantage of boosting hydraulic pressure in subsequent units of the wastewater treatment system. Filter media are selected to provide the desired degree of treatment. The pressure of the system can be adjusted to match influent characteristics.

Capital costs:	$5,460,000
O & M costs:	$ 339,000
of this	$ 42,000 is for electric power
Present worth costs:	$9,000,000

d. Advanced secondary settling by clarification or flocculation

These are potentially innovative treatment techniques. Chemicals such as polymers and alum enhance natural flocculation patterns. This can be done within existing or new clarifiers. A combination of new flocculating clarifiers plus a retrofit of some of the existing clarifiers is proposed for the Nine Springs facility (see Figure 2-7).

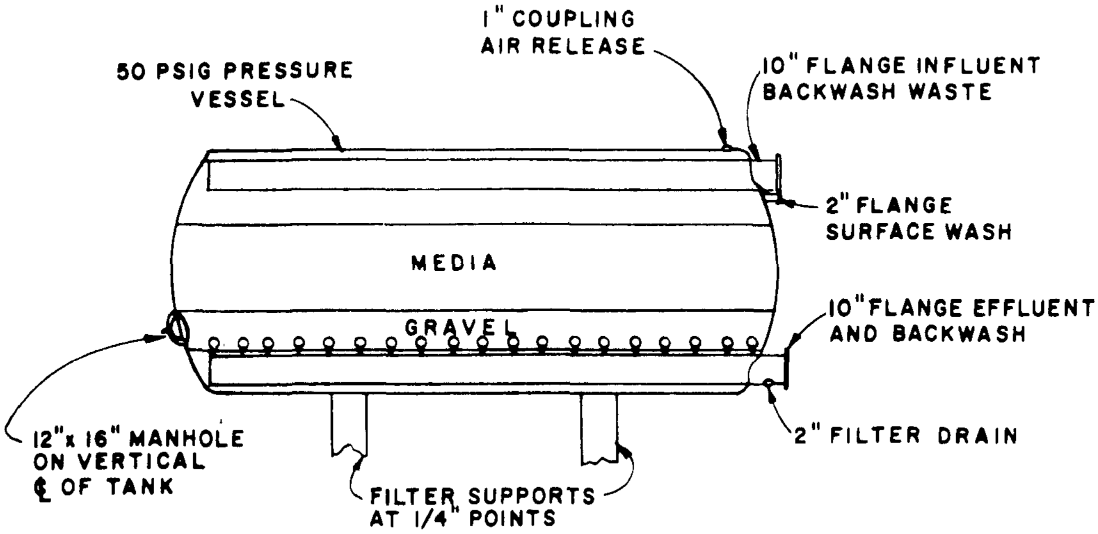
Capital costs:	$2,690,000
O & M costs:	$ 73,000
of this	$ 3,000 is for electric power
Present worth costs:	$3,400,000

4. Disinfection

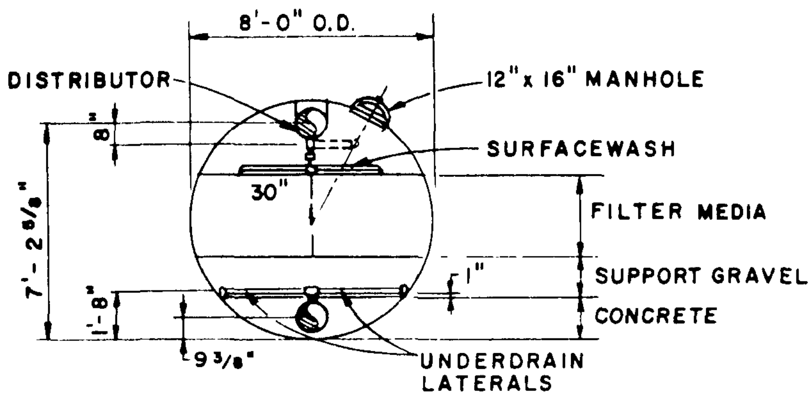
Effluent disinfection is required by the discharge permit to limit bacterial contamination instream. The Facilities Plan proposed breakpoint chlorination-dechlorination for ammonia control plus disinfection. The Draft EIS has determined that biological nitrification was preferable for ammonia control.

Ozonation was selected over chlorination for effluent disinfection. Technical Memorandum 4-E presents an additional planning analysis of disinfection alternatives. These include:

-- chlorination-dechlorination
-- ozonation
-- ultraviolet radiation (UV).



ELEVATION

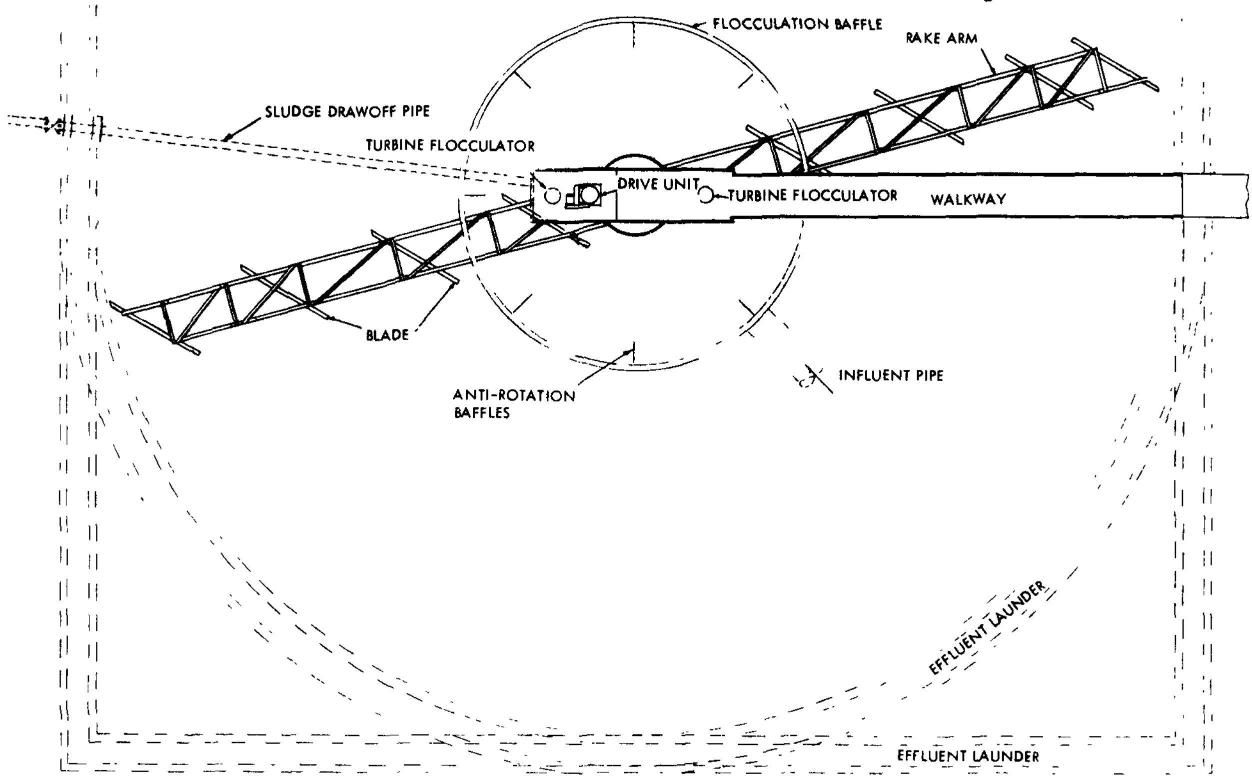


COURTESY: NEPTUNE MICROFLOC, INC.
SOURCE: U.S. EPA, JANUARY 1975

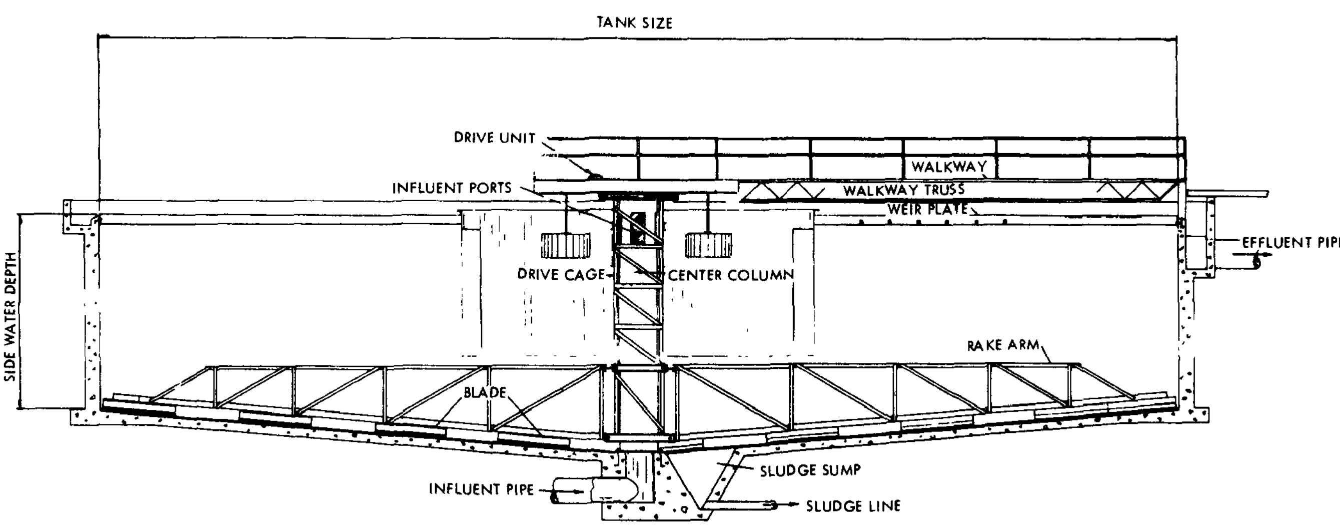
Source: Facilities Plan Update
Technical Memorandum 4-D

PRESSURE FILTER CONFIGURATION

Figure 2-7



PLAN



SECTION

COURTESY OF: GENERAL FILTER COMPANY

Source: Facilities Plan Update
Technical Memorandum 4-D

FLOCCULATING CLARIFIER

a. Chlorination-Dechlorination

Chlorination is the most usual way to disinfect effluent. It may be followed by dechlorination to protect aquatic life from the potentially harmful effects of chlorine concentrations.

Presently the Nine Springs effluent is chlorinated. Much of the existing disinfection equipment is old and must be replaced to meet the needs of the 20-year planning period. A new system is considered for this alternative.

When a chlorine solution is mixed with wastewater, hypochlorous acid forms. The acid is effective in reducing the number of bacteria in the treated effluent. Chlorine may be stored on-site. Dechlorination may be accomplished by activated carbon or sulfur dioxide. Adsorption on activated carbon particles is the more expensive dechlorination process. Sulfur dioxide will instantaneously reduce chlorine to chloride in the wastewater. Reaeration is necessary after this step to restore DO levels.

Capital costs	$3,290,000
O & M costs	$ 283,000
of this	$66,000 is for electric power
Present worth costs:	$5,900,000

b. Ozonation

Ozone inactivates viral particles and bacterial cells in a two-stage process. This makes it an effective disinfectant for highly treated effluent. It also has the advantage of increasing the effluent's DO level. Ozone must be generated on-site, with comparatively high power use. Energy costs are reduced if ozone is produced from oxygen rather than from air. Because of the quantities of ozone needed for a 50 MGD facility, it is preferable to generate it from oxygen. Both a once-through and recycled ozone systems were considered, with the once-through system being less expensive.

Ozonation has been used for many years to disinfect drinking water supplies, but its use with wastewater is more recent. Better results are achieved with highly treated effluent than with more turbid effluent.

Cost estimates presented here do not assume recycling through an oxygen activated sludge system. The costs have previously been calculated in the nitrification alternatives.

Capital costs:	$3,780,000
O & M costs:	$ 340,000
of which	$ 235,000 is for electric power
Present worth costs:	$7,300,000

c. Ultraviolet (UV)

Ultraviolet light of wavelength 2500-2600 Å, produced by a low pressure mercury vapor lamp, has disinfecting action. The light physically disrupts the nucleoproteins of bacteria and viruses, with lethal results. The effectiveness of a UV system depends on having a high quality effluent so that good light penetration occurs. Some components of wastewater may form a film on the UV lamps. This must be removed by a wiper system, or other means, for successful system operation.

The use of UV light for wastewater disinfection is a new application, so it is potentially innovative technology. It has been used for water supply and food processing disinfection.

Capital costs:	$3,190,000
O & M costs:	$ 275,000
of which	$ 86,000 is for electric power
Present worth costs:	$6,100,000

5. Post Aeration

Post aeration is used to increase the DO concentration of treated effluent. The discharge permit mandates a minimum DO of 5.0 mg/l for effluent discharge to Badfish Creek. This is less than the 6.0 mg/l required at the time the Draft EIS was prepared. Post aeration could occur in the effluent pipeline, effluent ditch, or upper reach of Badfish Creek. A number of alternatives are presented in Technical Memorandum 4-F of the Facilities Plan Addendum:

-- Mechanical surface aeration
-- Fine bubble diffused aeration
-- Cascade aeration
-- Ozone diffusion
-- Pressure aeration

a. Mechanical Surface Aeration

Surface aerators mechanically agitate water to mix air bubble in with it. Although this is a simple system, part of the system can ice up in the winter. Figure 2-8-A shows a suitable type of surface aeration system. It is not a suitable method for instream aeration, and so will not be considered further.

b. Fine Bubble Diffused Aeration

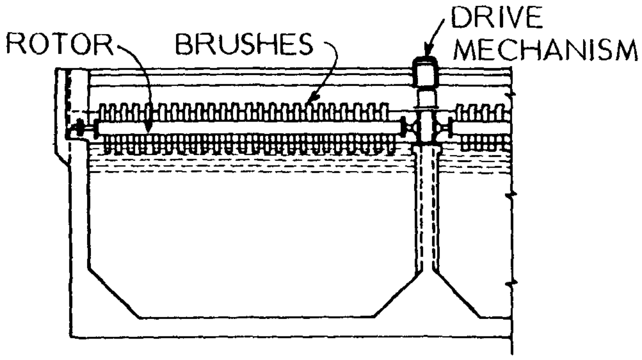
Air is bubbled from tubes to aerate the effluent in this type of system. Figure 2-8-B shows a static tube system, which is less subject to clogging than some other fine bubble designs. It is also not a suitable method for instream aeration, and so will not be considered further.

c. Cascade Aeration

A series of shallow waterfalls can also be used for aeration, as shown in Figure 2-8-C. No energy is required, but the amount of oxygen added cannot be regulated. Two cascade aerations have been in use in the effluent ditch since 1957. No net gain in DO concentrations could be added by using additional cascade aerators, so it will not be considered further.

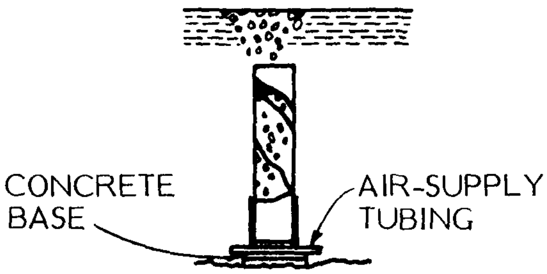
Figure 2-8

BRUSH AERATOR



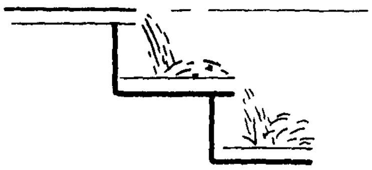
A. MECHANICAL AERATION

STATIC TUBE AERATOR



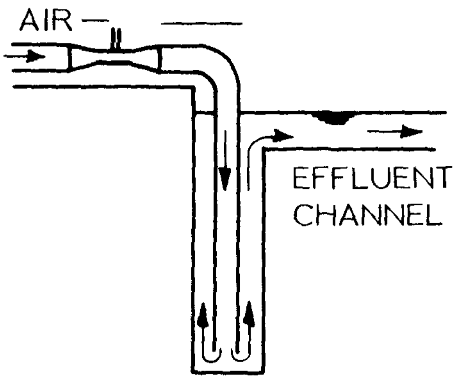
B. DIFFUSED BUBBLE AERATION

CASCADE STEP AERATOR



C. CASCADE AERATION

U-TUBE AERATOR



D. PRESSURE AERATION

Source: Facilities Plan Update
Technical Memorandum 4-F

POST AERATION DEVICES

d. Ozone Diffusion

If ozone is used for wastewater disinfection, it also has the benefit of increasing DO in the effluent. This alternative has already been discussed under disinfection alternatives.

e. Pressure Aeration

Oxygen under pressure is more soluble in water. Becuase of this, pressure aeration can be used to add large amounts of DO to effluent. Air can be added at the suction end of effluent pumps, at the effluent pipeline in U-tubes at the outfall, or force main, see Figure 2-8-D.

The force main installation would require the least amount of construction for an effective system. This is the preferable alternative, and because it is a new application, may be potentially innovative.

Capital costs:	$ 360,000	
O & M costs:	$ 84,000	
of which	$ 65,000	is for electric power
Present worth costs:	$1,300,000	

6. Effluent Pumping and Transport

Effluent must be transferred from the Nine Springs plant to Badfish Creek. The existing facilities will be inadequate to meet the 20-year planning needs for Madison. The Facilities Plan Addendum, Technical Memorandum 4-G, details six alternatives:

a. This provides for renovation of the existing effluent pumping station. The existing 54-inch effluent pipeline to Badfish Creek would be used to carry a maximum sustained flow of 75 MGD. The difference between this flow and the maximum day flow of 95 MGD would be stored on-site in a peaking storage basin.

b. This would be similar to the first alternative except that a second parallel 54-inch pipeline to Badfish Creek would be installed, with the objective of reducing total pumping head.

c. This would require that the existing effluent pump station be replaced with a new 75-MGD pump station. This alternative would be implemented in conjunction with peaking storage.

d. This would be similar to the third alternative, but a second parallel 54-inch pipeline would also be added to reduce pumping head.

e. This would consist of a new 115-MGD pump station and a second parallel 54-inch pipeline. No peaking storage would be required.

f. This would provide for a new 115-MGD effluent pump station, and a second 115-MGD booster pump station to be located at an intermediate point in the effluent pipeline. No peaking storage would be provided.

Capital costs:	O & M Costs:	Energy Costs:	Present Worth Costs:
a. $4,560,000	a. $392,000	a. $296,000	a. $8,400,000
b. $7,790,000	b. $297,000	b. $203,000	b. $9,300,000
c. $5,580,000	c. $389,000	c. $296,000	c. $9,400,000
d. $8,810,000	d. $296,000	d. $203,000	d. $10,300,000
e. $6,770,000	e. $312,000	e. $227,000	e. $8,700,000
f. $4,840,000	f. $474,000	f. $296,000	f. $9,400,000

7. Flow Equalization

The Draft EIS proposed flow equalization for a 12-hour retention period in order to dilute toxic pollutants prior to discharge, to equalize flow throughout the wastewater treatment plant and to dampen diurnal flow fluctuations to Badfish Creek. Technical Memorandum 4-B describes additional Facilities Planning evaluations, including a dye study and flow equalization analysis. The use of flow equalization basins (a) was compared to providing capacity within the system, in the filtration and effluent pumping facilities, to handle the peak instantaneous flow rate (b). The peak instantaneous flow is 115-MGD compared to the average daily (design flow) of 50 mgd. Table 2-5 presents a cost comparison for the two flow equalization alternatives.

Table 2-5

Cost Component	With Equalization	Without Equalization
Flow Equalization		Not Applicable
Capital Cost	4,100,000	
O & M Cost	5,400,000	
Salvage Value	(200,000)	
Total PW	9,300,000	
H. H. Gravity Filters		
Capital Cost	4,300,000[(1)]	4,800,000(2)
O & M Cost	3,700,000	3,700,000
Salvage Value	(300,000)	(300,000)
Total PW	7,700,000	8,200,000
Effluent Pumping		
Capital Cost	9,100,000[(3)]	9,800,000[(4)]
O & M Cost	2,700,000	3,300,000
Salvage Value	(1,000,000)	(1,000,000)
Total PW	10,800,000	12,100,000
Total Costs		
Capital Cost	17,500,000	14,600,000
O & M Cost	11,800,000	7,000,000
Salvage Value	(1,500,000)	(1,300,000)
Total PW	27,800,000	20,300,000

(1) Costs estimated for this TM based on filtration process designed for 95 mgd; apply to Treatment Strategies 1-3 if preceded by equalization.

(2) Costs from TM 4D based on filtration process designed for 115 mgd.

(3) Costs estimated for this TM apply to 95 mgd effluent pump station with parallel effluent pipe.

(4) Costs from TM 4G; Alternative 5, for 115 mgd effluent pump station with parallel effluent pipe.

Source: Facilities Plan Update
Technical Memorandum 4-B

FLOW EQUALIZATION COST EFFECTIVENESS

CHAPTER 3

EXISTING ENVIRONMENT

A. INTRODUCTION

The discussion of the existing environment in the Draft EIS is in most cases adequate for the analysis of this Final EIS. Please consult Chapter 2 of the Draft EIS for the following topics:

Item	Section
Atmosphere/Climate	A
Land	
Topography	B-1
Geology	B-2
Biological Resources	
Habitat	E-1
Fauna	E-2
Sensitive Natural Areas	E-3
Air	
Air quality	F-1
Noise	F-2
Odor	F-3
Land Use, Zoning and Development Trends Existing Land Use in General Study Area	G-1
Future Land Uses and Development Trends in the General Study Area	G-2
Land Use and Development Trends In Vicinity of Nine Springs Sewage Treatment Plant Expansion Site	G-3
Sensitive Man-Made Resources	
Historical and Archaeological	I-1
Recreation and Open Spaces	I-2
Agriculture	I-3
Energy Resources	I-4

B. SOILS

In addition to the information cited in Section C, Chapter 2, of the Draft EIS, a 1978 published Soil Survey for Dane County is available from the Soil Conservation Service.

C. WATER RESOURCES

This material will update Section D, Chapter 2 of the Draft EIS with additional data from Badfish Creek.

1. Fifth Addition Effluent Quality

The Fifth Addition, to provide an increase in secondary capacity at the Nine Springs Plant, went into operation in the fall of 1977. The resulting improvements in effluent quality will aid in improving instream conditions in Badfish Creek. Data for this discussion was provided by MMSD to EPA in August 1979. November 1977-April 1979 was the test period for experimentally operating part of the plant as a single-stage nitrification system. Ammonia nitrogen levels of 1 mg/l (summer) and 3 mg/l (winter) were successfully achieved. Additional capacity would be needed to continue this form of operation throughout the 20-year planning period, as discussed in Section F of Chapter 2.

Figure 3-1, prepared by the MMSD, shows BOD and suspended solids levels before and after the Fifth Addition. BOD levels are higher than they would be from only a nitrified effluent. This is because the nitrified effluent from the experimental portion of the treatment plant was mixed with the effluent produced by the usual contact-stabilization process. The mixture resulted in combining ammonia from the contact-stabilization effluent to feed the nitrification bacteria in the nitrifying effluent. This resulted in a large nitrogeneous oxygen demand, which affects the BOD test values.

From January 1976 until October 1977 the average percent removals of BOD and suspended solids were 85.7% and 77.0%, respectively. Since the Fifth Addition has been completed, the average removals have been 88.0% BOD and 91.1% suspended solids. Further evidence of increased treatment stability can be found by examining the maximum daily BOD and suspended solids concentrations which occurred each month:

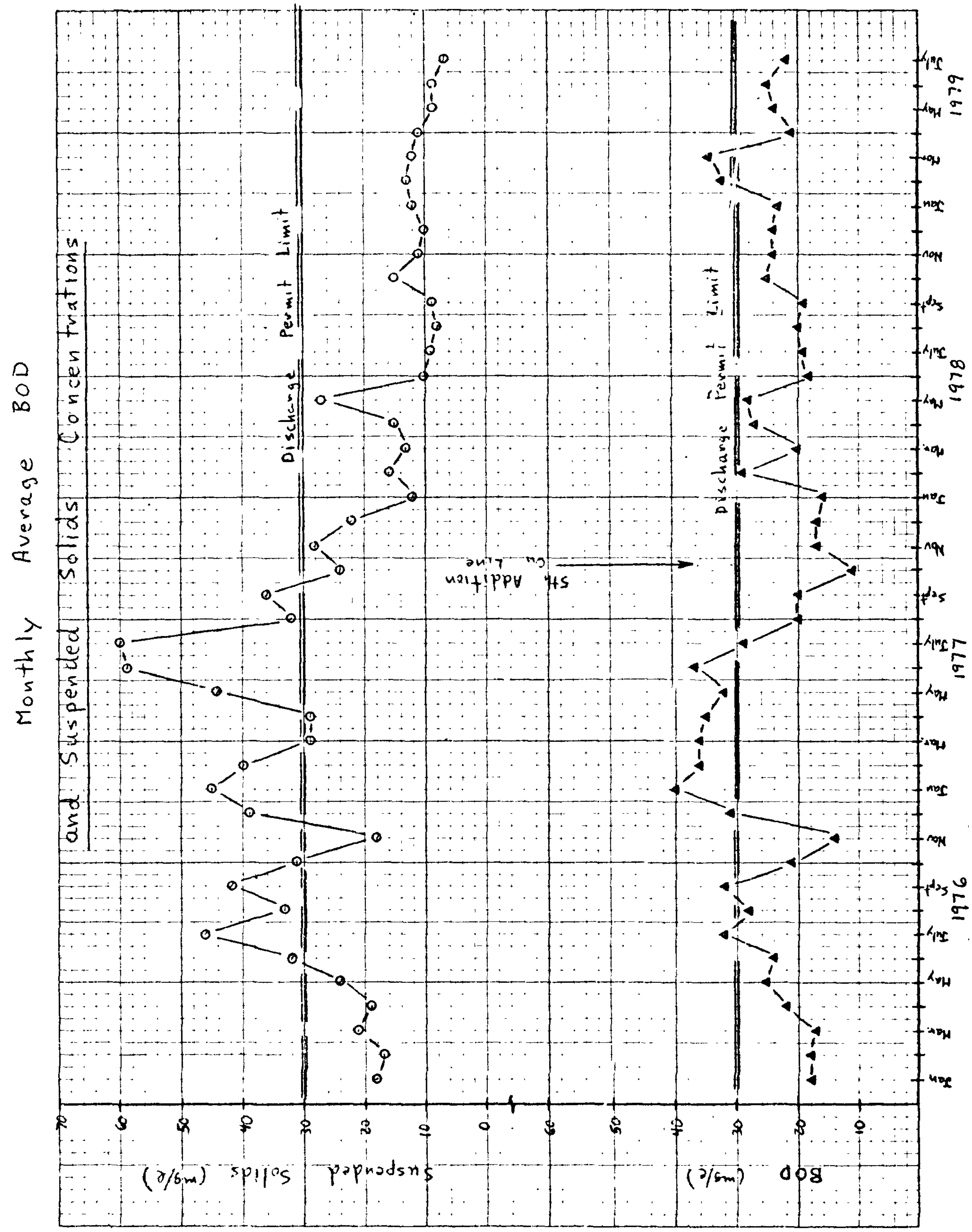
	Average Maximum Monthly Values	
	BOD (mg/l)	SS (mg/l)
Jan 1976 - Sept 1977	51	31
Oct 1977 - July 1979	44	35

Although the Fifth Additon helped to reduce the average effluent BOD concentration, it had a much greater effect on the effluent suspended solids concentration. Figure 3-2 shows the monthly averages of the pounds of BOD and suspended solids entering and leaving the plant each day. The average loadings prior to and after the Fifth Addition are shown below:

	Loadings	
	BOD (lb/day)	SS (lb/day)
Plant Influent:		
Jan 1976 - Sept 1977	53,530	41,990
Oct 1977 - July 1979	56,330	47,475
Plant Effluent:		
Jan 1976 - Sept 1977	7,765	9,305
Oct 1977 - July 1979	6,375	4,110

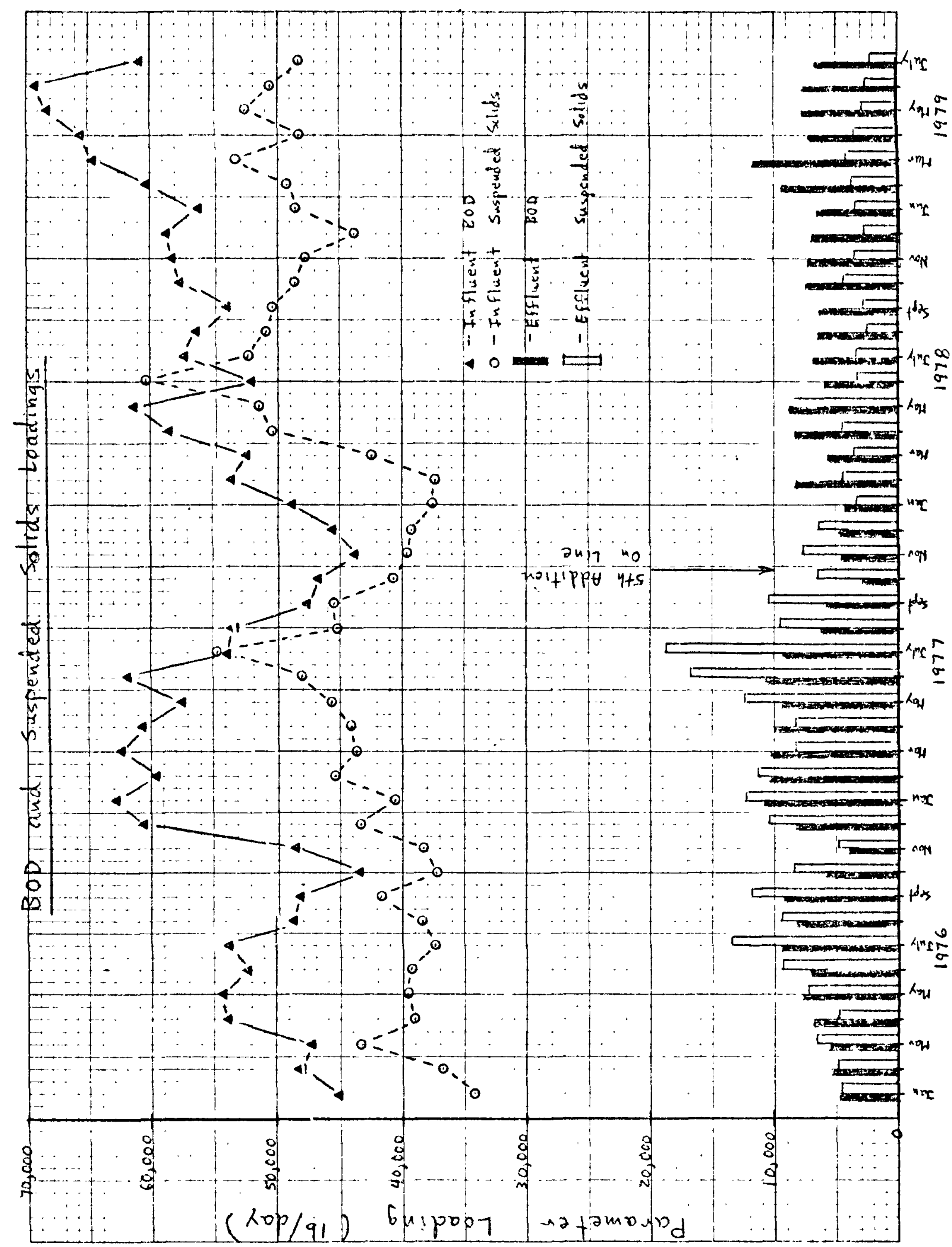
Figure 3-1

MONTHLY AVERAGE BOD AND SS CONCENTRATIONS



Source: MMSD

Figure 3-2



Source: MMSD

These data indicate the average BOD and suspended solids loading to the treatment plant increased 6.2% and 13.1%, respectively, from the 21-month period prior to the completion of the Fifth Addition to the time period after the Fifth Addition was on line. However, the BOD and suspended solids loading on the stream decreased 11.5% and 58.1%, respectively, from the first to the second time period. The decrease in BOD loading to the stream may not be representative of the actual reduction of BOD. Because of the nitrifiers in the nitrification plant effluent, a significant amount of nitrogeneous oxygen demand was being exerted during the 5-day BOD test. This same nitrogeneous oxygen demand was not being exerted during the 5-day BOD's measured prior to the Fifth Addition.

Prior to the completion of the Fifth Addition about 11 MGD of plant inflow was routed to the trickling filter system. After the Fifth Addition was placed on line, the amount of flow sent to the trickling filters was reduced to about 5 MGD. This change is evident in Figure 3-3 which shows the total plant inflow and the amount of flow to the activated sludge system.

With the construction of the selected alternative from the EIS process, the trickling filter plant will be abandoned. The following data show the results of the activated sludge systems for summer 1979. These data were collected after the nitrification project had been terminated. They are probably representative of the results that would be achieved if the trickling filter plant were abandoned and no attempt were made to remove ammonia in the activated sludge system.

Monthly Average Concentrations

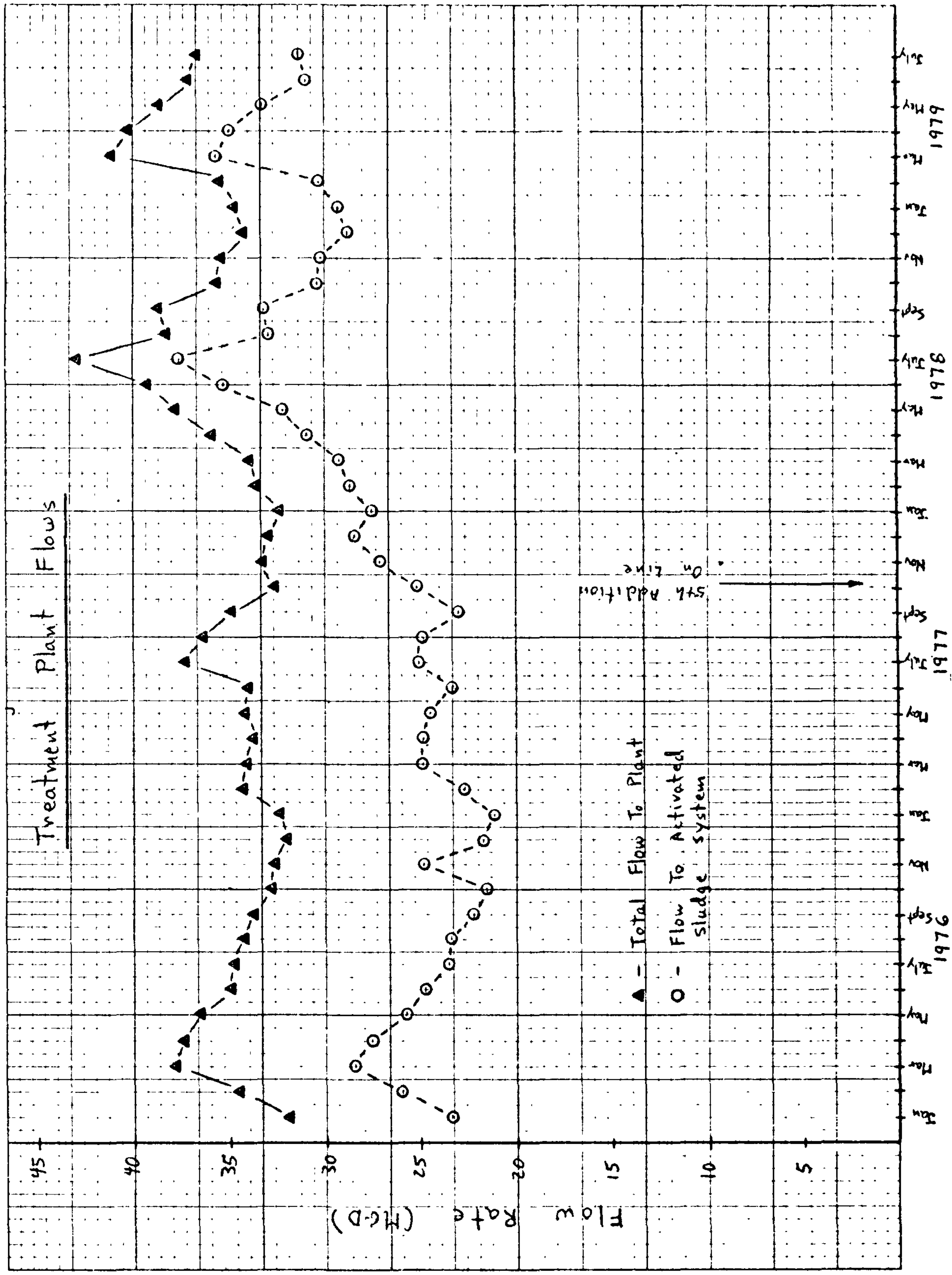
	Contact-Stabilization		Step Aeration	
	BOD (mg/l)	SS (mg/l)	BOD (mg/l)	SS (mg/l)
May 1979	18	8	21	13
June 1979	20	8	23	11
July 1979	13	9	9	7
Average	17	8	18	10

2. Badfish Creek Surveys

Additional water quality surveys have been conducted in 1978 and 1979. Survey data were later used to model ammonia in future instream conditions, see Chapter 2, section C-3. Table 3-1 summarizes survey results and compares these values to earlier samples. Parameters sampled included total 5-day biochemical oxygen demand (TBOD), total Kjeldahl nitrogen (TKN), temperature, dissolved oxygen (DO), and a diurnal (24-hour) oxygen survey. Values are presented for the effluent ditch, the improved channel and the natural channel.

Water quality conditions observed in the six surveys had some similar characteris-

TREATMENT PLANT FLOWS



Source: MMSD

Table 3-1

	$TBOD_5$ Range (mg/l)	TKN Range (mg/l)	Temp Range (°C)	DO Range (mg/l)	Diurnal DO Variation (mg/l)
May 1979 Survey					
Eff. Ditch	15.0-25.0	3.2- 9.5	16.4-20.6	1.3- 9.0	7.7
Imp. Channel	3.0-18.0	2.1- 7.2	15.0-22.0	1.2-12.5	5.9-10.0
Natural Channel	7.0-12.0	1.4- 4.3	15.2-22.0	4.7- 9.5	4.1
Oct. 1978 Survey					
Eff. Ditch	-	6.7-12.5	16.5-17.5	0.1- 0.7	0.6
Imp. Channel	3.0-13.0	2.9-10.5	12.0-16.0	0.5- 5.0	1.0-1.7
Natural Channel	6.0- 8.0	1.8- 4.1	10.5-13.0	4.7- 8.2	1.0-1.6
Summer 1978 Survey					
Eff. Ditch	4.0- 9.0	4.1- 5.9	19.0-22.0	0.4- 4.3	No
Imp. Channel	4.0- 8.0	0.9- 5.7	18.0-21.0	0.6- 6.9	No
Natural Channel	4.0- 6.0	2.1- 3.7	19.0-20.0	5.2- 7.2	No
Aug. 1976 Survey					
Eff. Ditch	-	16.5-17.2	20.8	0.9- 7.0	No
Imp. Channel	18.0-28.0	16.5-16.8	21.0-22.0	0.4- 1.2	No
Natural Channel	10.0-33.0	11.8-14.7	18.2-21.0	0.5- 3.9	No
July 1975 Survey					
Eff. Ditch	11.0-29.0	12.6-14.1	20.0	4.9- 6.7	No
Imp. Channel	14.0-29.0	10.4-12.4	21.0-21.5	1.4- 3.5	No
Natural Channel	23.0-37.0	6.8- 8.9	12.0-20.0	1.6- 4.5	No
Oct. 1975 Survey					
Eff. Ditch	-	15.5-19.1	20.5-22.0	0.8- 7.2	No
Imp. Channel	56.0-66.7	11.6-14.8	15.0-16.0	0.4- 2.4	No
Natural Channel	46.5-56.0	6.9-10.3	14.0-17.0	3.4- 7.4	No

Source: Facilities Plan Update
Technical Memorandum 3-A

WATER QUALITY SURVEY DATA

tics, as demonstrated in Table 3-1. Levels of TBOD, TKN and conductivity were high in the effluent ditch and decreased downstream due to decay, settling and dilution. The TBOD measurements for some surveys were erratic but this was believed to be due to residual chlorine inhibition. Ammonia represented over 90 percent of the observed TKN concentration. Overall, concentrations of pollutants, particularly TKN and TBOD, varied widely among surveys depending on experimentation being performed at the Nine Springs Plant. Instream dissolved oxygen concentration also varied widely from survey to survey, but in general showed a significant sag in concentrations in the vicinity of the improved channel followed by recovery in the lower stream. Diurnal variations in dissolved oxygen varied, although such studies are quite limited.

In May 1979, MMSD personnel conducted an intensive diurnal water quality and loadings survey, as fully described in Technical Memorandum 3-C. Stream quality and loadings were monitored for 24 hours at two-hour intervals. Measurements were made of TBOD , TBOD , TKN, ammonia, nitrate, temperature, conductivity and dissolved oxygen. Environmental conditions were partly cloudy, with moderate stream flow and temperature. The Nine Springs Plant was operating under secondary treatment during this time.

High concentrations of TBOD, TKN and conductivity were observed at the discharge, while concentrations decreased downstream. No net instream loss of nitrogen was observed as in some previous surveys, but a slight accrual of BOD was noted. This may be a consequence of erosion and nonpoint loading, dredging activities in Oregon Creek, or measurement problems. Aquatic weed densities were low to moderate. Dissolved oxygen concentrations were, on the average, lower upstream. Significant diurnal variations (4 to 10 mg/l) caused water quality violations for brief periods throughout the stream.

The most intensive survey was conducted in October of 1978. This 24-hour survey, as presented in Technical Memorandum 3-B, was similar in design to the May 1979 survey, but did not include long-term measurements of TBOD. Environmental conditions were cloudy with moderate stream flow and warm to moderately cool temperatures.

Water quality conditions were again characterized by high concentrations of TBOD, TKN and conductivity, which decreased with time of passage downstream. A net loss of instream nitrogen was observed, probably due to denitrification. Upstream TBOD measurements were affected by residual chlorine, so these measurements were discarded. Dissolved oxygen concentrations exhibited a dramatic sag and recovery with near anaerobic conditions in the effluent ditch and improved channel. A small (1 to 2 mg/l) diurnal DO variation was observed.

MMSD also collected water quality data in the summer of 1978. During this period, stream flows were moderate to high and temperatures were moderately high. Nine Springs plant was producing a nitrified effluent during this survey. TBOD, TKN, and conductivity concentrations were observed to vary widely, but typically showed a significant sag in the vicinity of the effluent ditch and improved channel, and a recovery downstream. No diurnal measurements were made.

3. Demography and Economics

This section will supplement Section H, Chapter 2, of the Draft EIS. Data from the 1980 census have not yet been refined. Preliminary results indicate a slight loss from the City of Madison and a gain in outlying areas. Since the Nine Springs facility serves much of the metropolitan population, these shifts should not affect the earlier population projections presented in the Draft EIS.

CHAPTER 4

ALTERNATIVE SELECTION AND ENVIRONMENTAL IMPACT

A. INITIAL SELECTION

1. Methodology

Charts were prepared in the Facilities Plan Update to compare the treatment component alternatives presented in each section of Chapter 2. The factors evaluated include costs, engineering criteria, land required, and the innovative/alternative classification. Such a matrix comparison is appropriate for the preliminary selection process, and we will use it here.

2. Ammonia Removal (Nitrification)

Table 4-1 presents this comparison. All alternatives are retained for subsequent detailed analysis as part of the system alternatives, because of their diversity of advantages and disadvantages, see Technical Memorandum 4C of the of the Facilities Plan Update.

3. Suspended Solids Reduction

Alternatives comparisons are shown in Table 4-2. Two alternatives, high head gravity filters and advanced secondary settling, are retained for the system alternatives analysis. Advanced secondary settling is appealing for cost reasons. High head gravity filters are a more conventional technology, with certain cost and operating advantages.

4. Disinfection

See Table 4-3 for a matrix on the disinfection alternatives. Chlorination has potentially adverse environmental effects which make it unacceptable. Ozonation and ultraviolet disinfection will be considered further system alternatives.

5. Post Aeration

Several alternatives were ruled out in the Chapter 2 discussion. The existing cascade aerators can be retained if needed, in the effluent ditch. Ozonation may provide aeration benefits, as well as disinfection.

6. Effluent Pumping and Transport

The matrix in Table 4-4 gives a comparison of these alternative components. Alternatives e and f are the most promising. They would be capable of handling the projected peak flows. No peak storage would be needed with these alternatives. Construction of the improvements could be phased over the 20-year planning period.

7. Flow Equalization

Providing a flow equalization basin is much more costly than designing the treatment units to be capable of accommodating peak flows. This makes treatment unit sizing the preferred approach.

Table 4-1

NITRIFICATION ALTERNATIVES

ALTERNATIVE	N1	N2	N3	N4	N5
PROCESS	Single Stage Nitrification Using Standard Efficiency Diffusers	RBC Process	Single Stage Nitrification Using High Efficiency Diffusers	SURFACT PROCESS	Air/Oxygen Single Stage Nitrification
PRESENT WORTH COST $	25,300,000	28,500,000	20,600,000	25,300,000	21,900,000
ENERGY COST $	893,000	889,000	489,000	521,000	487,000
ANNUAL CHEMICAL COST $	0	0	0	0	0
PROCESS STABILITY AND FLEXIBILITY	Good flexibility in operation, can vary return and waste sludge rates. Process stability susceptible to "wash-out" and cold temperatures.	Least flexibility in operation since only shaft rotation speeds can be varied. Process stability enhanced by fixed film growth and the preceding activated sludge system.	Good flexibility in operation similar to alternative N1. Process stability susceptible to plugging of diffusers, cold temperatures, and "wash-out".	Potential for good flexibility. More operational data is necessary to establish process stability.	Good flexibility in operation; can vary return rates, waste rates, and oxygen in the covered basins. Process stability susceptible to "wash-out", pH depressions, plugging diffusers, and cold temperatures.
DEMONSTRATED PROCESS EXPERIENCE	Most demonstrated process experience. Extensive full scale analysis of capability and reliability at the Nine Springs Plant.	A number of plants are presently under construction, or in the design phase.	Process experience with high efficiency diffusers is not fully proven at the Nine Springs Plant.	Potential exists for nitrification, however, no process and performance data available.	No full scale process experience available for combined air/oxygen nitrification system.
COMPLEXITY OF OPERATION	Control of return and waste sludge in maintaining appropriate solids in the aeration basins involves some operational complexity.	Minimal operation and maintenance requirements.	Similar to alternative N1. Addition complexity due to the potential problem of plugged diffusers.	Some control of return and waste sludge, however, solids inventory for SURFACT alternative are less than that of single stage nitrification.	Similar to single stage nitrification with additional complexity due to instrumentation, control, and safety requirements for pure oxygen system.
UTILIZATION OF EXISTING FACILITIES	Utilizes existing system completely.	Utilizes existing system completely.	Utilizes existing system, with replacement of diffuser system in aeration basins 7 to 15.	Utilizes existing system, with replacement of diffuser system in aeration basins 7 to 15.	Utilizes existing system, with replacement of diffuser system in aeration basins 7 to 15.

PHASING FOR FUTURE GROWTH AND HIGHER EFFLUENT STANDARD	By staging the additional system requirements, this alternative can easily meet any phasing requirement. Higher effluent standards can be achieved with additional expansion.	Phasing of the RBC process can easily by accomplished since units of 4 shaft assemblies per basin are installed as a modular unit. Higher effluent standards can be achieved with additional expansion.	Similar to alternative NI.	By phasing the addition of media assemblies in the aeration basins, the SURFACT process meets any phasing requirement. The potential for higher effluent standards exists if additional expansion is made.	By staging the covered and uncovered basins along with other system requirements, this alternative can meet any phasing requirement. Higher effluent standards can be achieved with additional expansion.
TREATMENT CONTINUITY DURING CONSTRUCTION	No effect on present treatment.	No effect on present treatment.	No effect on present treatment.	A temporary and minor effect since one or more aeration basins must be removed from service in order to install the supporting structures for the media assemblies.	No effect on present treatment.
LAND REQUIREMENTS	6.2 acres for additional system requirements.	2.5 acres for additional system requirements.	6.0 acres for additional system requirements.	3.5 acres for additional system requirements.	6.2 acres for additional system requirements.
SAFETY CONSIDERATIONS	Little safety problem.	Little safety problem.	Little safety problem	Little safety problem.	Potential safety problems due to pure oxygen environment.
ENVIRONMENTAL IMPACT	Similar environmental impact.	Similar environmental impact.	Similar environmental impact.	Similar environmental impact.	Similar environmental impact.
I/A CLASSIFICATION	Low risk potential, full scale pilot study has demonstrated the feasibility of standard efficiency diffusers. Alternative is therefore conventional.	Low risk potential; stability is ensured because of the existing activated sludge system, design criteria is well established. Alternative is therefore conventional.	High risk potential; although much of the design criteria can be used from the full scale study, criteria on air requirements are not well established. Alternative is therefore potentially innovative.	High risk potential; no proven design criteria is presently available. Alternative is therefore potentially innovative.	High risk potential; combination of the air/oxygen systems have not been used for nitrification, therefore design criterial for combined system is not established. Alternative is therefore potentially innovative.

Source: Summary of the Facilities Plan Update

EVALUATION OF NITRIFICATION ALTERNATIVES

Table 4-2

ALTERNATIVE PROCESS	S1 LOW HEAD GRAVITY FILTERS	S2 HIGH HEAD GRAVITY FILTERS	S3 PRESSURE FILTERS	S4 ADVANCED SECONDARY SETTLING
PRESENT WORTH ($ x 10^6)	9.9	8.2	9.0	3.4
ANNUAL ENERGY COST ($/YEAR)	11,000	32,000	42,000	3,000
ANNUAL CHEMICAL COST ($/YEAR)	49,000	0	0	41,000
PROCESS STABILITY AND FLEXIBILITY	Almost continuous back-washing during periods of high solids loading; little flexibility in operating headloss.	Greater solids storage capacity compared to low head filters; greater flexibility in operating headloss and filter run time.	Largest solids storage capacity of the three filtration systems; flexible operating headloss to maintain or adjust filter run times during high solids loadings.	Stability is highly dependent on biological process preceeding settling. Flexibility in adding different chemicals and dosage during period of biological process upset.
DEMONSTRATED PROCESS EXPERIENCE	Current installations at small plants, but construction of 200 MGD Houston plant; no data on nitrified effluent.	Most common granular media filtration system; pilot data on nitrified effluent at Madison.	Generally used at smaller plants when downstream pumping is required.	Limited experience at other plants, difficult to apply results from plant to plant. Chemicals shown to improve thickening.
COMPLEXITY OF OPERATION	Minimal operation requirements with automatic or manual controls.	Minimal operational requirements with automatic controls; more complex backwash system than low head gravity filters.	Complex system, but minimal operational requirements with automatic controls; more mechanical equipment than gravity filters.	Minimal operational require-ments during normal plant operation; considerable operator attention during plant upsets.
UTILIZATION OF EXISTING FACILITIES	None of the existing used in the process.	Reuse of effluent storage tanks for backwash supply.	Reuse of effluent storage tanks for backwash supply.	Utilizing existing secondary clarifier, except for replacement of mechanisms in older clarifers.
PHASING FOR FUTURE GROWTH AND HIGHER EFFLUENT STANDARDS	Individual unit filters easy to expand; easily exceeds effluent standards.	Individual unit filters easy to expand; easily exceeds effluent standards.	Individual unit filters easy to expand; easily exceeds effluent standards.	Individual clarifiers easy to expand; filters required for higher effluent standards.

TREATMENT CONTINUITY DURING CONSTRUCTION	No effect on present treatment.	No effect on present treatment.	No effect on present treatment.	Staged construction required to maintain treatment continuity.
LAND REQUIREMENTS	41,600 sq. ft. filter building	18,000 sq. ft. filter building	7,300 sq. ft. filter influent pump station and pipe gallery plus 15,000 sq. ft. for filter vessels.	No additional land requirement, except for construction of flocculation tanks.
SAFETY CONSIDERATIONS	Shallow tanks; little safety problems.	Deep tanks but little safety problems.	Low pressure vessels and more mechanical equipment. Possible safety problems with media observation.	None
ENVIRONMENTAL IMPACT	Chlorination of filter influent may cause toxic chlorine residuals and halogenated organics in the effluent.	Little environmental impact, except if chlorine is used periodically during filter backwashing. Possible localized odors in filter building.	Little environmental impact, except if chlorine is used periodically during filter backwashing.	Little environmental impact, but the process is not fully proven.
I/A CLASSIFICATION	Widely-used, fully-proven low risk, conventional.	Widely-used, fully-proven low risk, conventional.	Widely-used at smaller plant, fully-proven, low risk, conventional.	Not widely-used or fully-proven, moderate risk, potentially innovative.

EVALUATION OF SUSPENDED SOLIDS REDUCTION ALTERNATIVES

Table 4-3

ALTERNATIVE PROCESS	D1 CHLORINATION-DECHLORINATION	D2 OZONE	D3 UV
PRESENT WORTH ($ x 106)	5.9	7.3	6.1
ANNUAL ENERGY COST ($/YEAR)	66,000	235,000	86,000
CHEMICAL CONSUMPTION ($/YEAR)	106,000	None	None
PROCESS STABILITY AND FLEXIBILITY	Performance dependent on NH_4-N concentrations, pH and temperature. Flexibility by varying chlorine dose to incoming flow.	Higher ozone dosages (> 5 mg/l) required for effluent having turbidities above 4 JTU's. Flexibility by varying ozone dose to wastewater flow.	Performance inhibited by high suspended solids, turbidity, and UV absorbing constituents in the wastewater. Flexibility by varying UV light intensity to incoming flow.
DEMONSTRATED PROCESS EXPERIENCE	Chlorination widely used. Dechlorination well established, but not as widely used as chlorination.	Ozone disinfection is presently in use at full scale treatment plants up to 35 mgd. Ozone disinfection piloted at the Nine Springs Plant.	Full-scale feasibility recently demonstrated during a 15-month demonstration project at Northwest Bergen County, New Jersey. Also, currently being piloted at the Nine Springs Plant.
COMPLEXITY OF OPERATION	Simple, automatic operation similar to existing system.	Sophisticated equipment, yet relatively simple mechanics of operation.	Minimal operational and maintenance requirements, except when changing UV lamps.
UTILIZATION OF EXISTING FACILITIES	Requires complete replacement of existing disinfection system.	Requires construction of two covered concrete contact basins, housing for PSA system and ozone generators. Cannot utilize any of the existing disinf ction system.	Requires construction of separate channels for the placement of UV chambers. Cannot utilize any of the existing disinfection system.

PHASING FOR FUTURE GROWTH AND HIGHER EFFLUENT STANDARDS	Chlorination and Sulfonator capacity can be increased with auxilliary units. Chlorine contact basin can also be expanded. one	Ozone generators and contact tanks can be added as needed since both are modular units. Oxygen generation can also be expanded.	Additional UV units can be installed as needed along with feed channeling.
TREATMENT CONTINUITY DURING CONSTRUCTION	Can use existing disinfection system during construction.	Can use existing disinfection system during construction.	Can use existing disinfection system during construction.
LAND REQUIREMENT	Minimal, about one and one-half acre.	Minimal, less than one acre.	Minimal, less than one acre.
SAFETY CONSIDERATIONS	Requires safety precautions because of storage and handling of chlorine and sulfur dioxide.	Good safety history, yet the inherent danger of high ozone concentrations exists.	Safety problems associated with UV irradiation have not been fully documented.
ENVIRONMENTAL IMPACT	Halogenated hydrocarbons formed by chlorination are suspected of being toxic to man and aquatic life.	The potential for forming toxic compounds is uncertain; no significant problems have been reported to date. Very high dissolved oxygen concentration (15 mg/l) in effluent.	The potential for forming toxic compounds is uncertain; no significant problems have been reported to date.
I/A CLASSIFICATION	Fully-proven; Conventional.	Fully-proven and conventional if used for disinfection only. Use of oxygen vent gas may qualify this alternative as potentially innovative.	High risk potential since no wastewater installations currently in operation, and possibility of photoreactivation; therefore, potentially innovative.

Source: Summary of the Facilities Plan Update

EVALUATION OF DISINFECTION ALTERNATIVES

Table 4-4

PUMPING ALTERNATIVES

ALTERNATIVE	P1	P2	P3	P4	P5	P6
PROCESS	Existing 75-mgd pump station with peaking storage.	Existing 75-mgd pump station with peaking storage and parallel pipeline.	New 75-mgd pump pump station with peaking storage.	New 75-mgd pump station with peaking storage and parallel pipeline.	New 115-mgd pump station with parallel pipeline.	New 115-mgd effluent pump station and booster pump station.
PRESENT WORTH COST $	8,400,000	9,300,000	9,400,000	10,300,000	8,700,000	9,400,000
ENERGY COST $	296,000	203,000	296,000	203,000	227,000	296,000
CHEMICAL CONSUMPTION	Intermittent chlorine addition may be needed for peaking storage.	Intermittent chlorine addition may be needed for peaking storage.	Inermittent chlorine addition may be needed for peaking storage.	Intermittent chlorine addition may be needed for peaking storage.	No chemicals required.	No chemicals required.
PROCESS STABILITY AND FLEXIBILITY	Equal flexibility from a process standpoint.	Equal flexibility from a process standpoint.	Equal flexibility from a process standpoint.	Equal flexibility from a process standpoint.	Equal flexibility from a process standpoint.	Equal flexibility from a process standpoint.
DEMONSTRATED PROCESS EXPERIENCE	Fully demonstrated.	Fully demonstrated.	Fully demonstrated.	Fully demonstrated.	Fully demonstrated.	Fully demonstrated.
EASE OF OPERATION	Existing pump station requires close maintenance due to age; additional O & M requirements with peaking storage.	Existing pump station requires close maintenance due to age; additional O & M requirements with peaking storage.	New pump station may be highly automated; additional O & M requirements with peaking storage.	New pump station may be highly automated; additional O & M requirements with peaking storage.	New pump station may be highly automated; no other O & M requirements.	Two pump stations to operate; although may be highly automated.
UTILIZATION OF EXISTING FACILITIES	Uses existing pump station for intended purpose.	Uses existing pump station for intended purpose.	Uses existing pump station as main-tenance facility; effluent storage tanks abandoned.	Uses existing pump station as main-tenance facility; effluent storage tanks abandoned.	Uses existing pump station as main-tenance facility; effluent storage tanks abandoned.	Uses existing Pump station as main-tenance facility; effluent storage tanks abandoned.
PHASING FOR FUTURE GROWTH AND HIGHER EFFLUENT STANDARDS	Minimal phasing potential for future growth.	Future growth with parallel pipeline; pump station not expandable.	New pump station would provide for expansion.	New pump station would provide for expansion; parallel pipeline can accommodate growth.	New pump station would provide for expansion; parallel pipeline can accommodate growth.	Future growth can be accomodated due to booster pump station; However, growth is limited by existing pipeline.

TREATMENT CONTINUITY DURING CONSTRUCTION	Requires shutdown of pump station during pipeline modifications and interconnection with peaking storage facilities.	Requires shutdown of pump station during pipeline modifications, interconnection with peaking storage facilities, and parallel pipeline.	Shutdown required during intercon-nection with new pump station.	Shutdown required during intercon-nection with new pump station.	Shutdown required during intercon-nection with new pump station.	Shutdown required during intercon-nection with new pump station.
LAND REQUIREMENTS	6.0 acres, of which 5.5 acres is for peaking storage.	6.0 acres, of which 5.5 acres is for peaking storage.	6.0 acres, of which 5.5 acres is for peaking storage.	6.0 acres, of which 5.5 acres is for peaking storage.	0.5 acres, since peaking storage is not required.	0.5 acres, since peaking storage is not required.
SAFETY OF OPERATION	Potential safety problems associ-ated with peaking storage reservoir.	Potential safety problems associ-ated with peaking storage reservoir.	Potential safety problems associ-ated with peaking storage reservoir.	Potential safety problems associ-ated with peaking storage reservoir.	Little safety problem.	Little safety problem.
ENVIRONMENTAL IMPACT	Some environmental impact due to peaking storage.	Some environmental impact due to peaking storage; short term impact due to construc-tion of parallel force main.	Some environmental impact due to peaking storage.	Some environmental impact due to peaking storage; short term impact due to construc-tion of parallel force main.	Short-term impact due to con-struction of parallel force main.	Minimal environ-mental impact.

Source: Summary of the Facilities Plan Update

EVALUATION OF PUMPING ALTERNATIVES

B. SYSTEM ALTERNATIVES

Six treatment strategies will be examined in addition to the No Action alternative. These were developed in the Facilities Planning Addendum from the best of the various component alternatives. A land application alternative has been previously discussed in the Draft EIS and determined to be impractical.

These alternatives are:

-- No Action

No Federal funding of treatment improvements

-- Treatment Strategy I

Strategy I is essentially the existing plant, increased in capacity to accomplish single stage nitrification. Following the expanded existing plant, high head gravity filters are added to increase suspended solids removal, and ozone diffusion is added to disinfect and oxygenate the effluent.

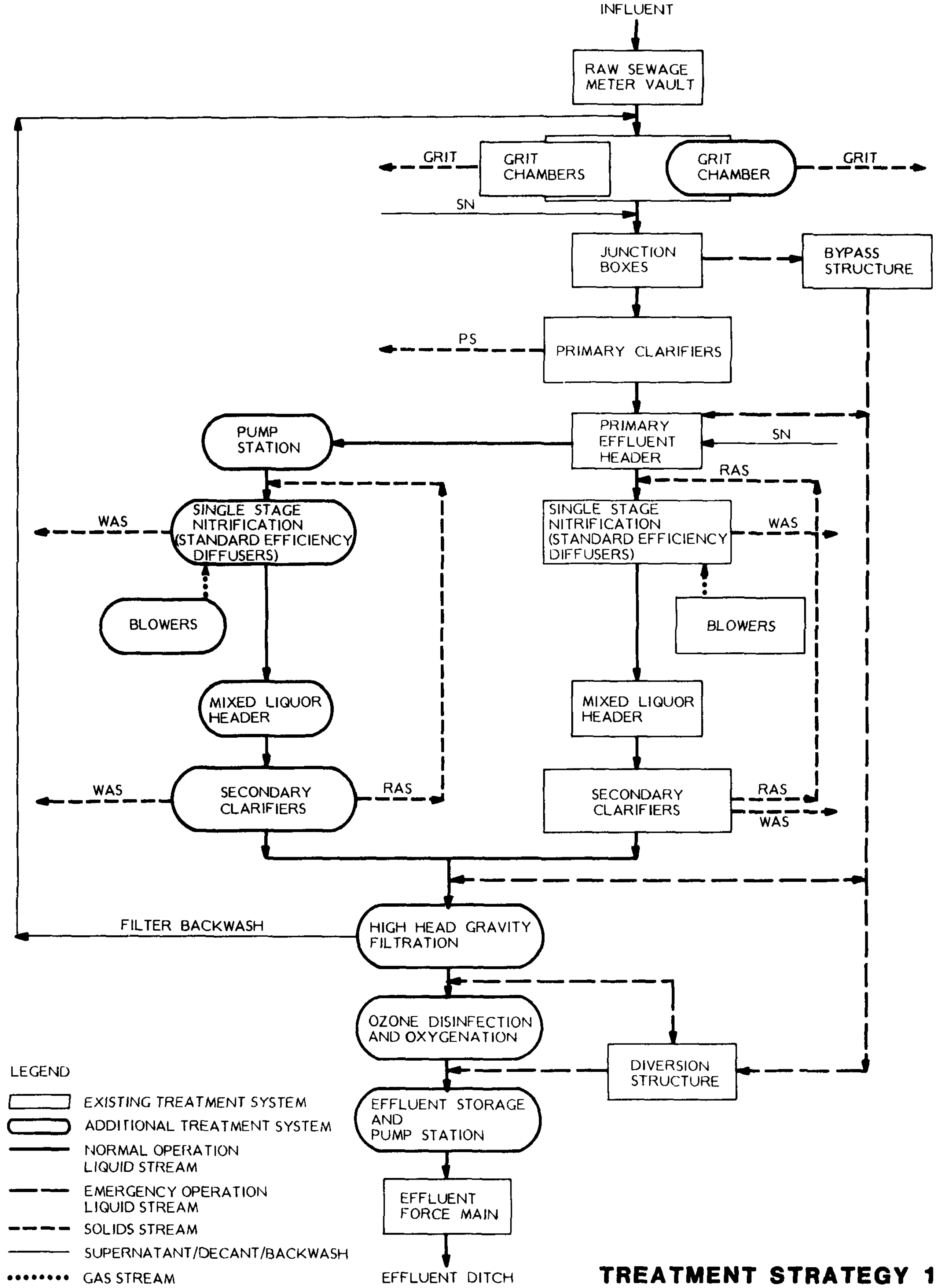
Raw wastewater enters through the existing raw sewage meter vault, where the influent flow is measured. Preliminary treatment is provided by aerated grit chambers, followed by settleable solids removal in the 14 existing primary clarifiers.

The primary effluent is split to 15 existing and 12 additional aeration basins, where single-stage biological nitrification and carbonaceous BOD removal take place. All aeration basins use standard efficiency diffusers for oxygen transfer to the wastewater. Mixed liquor from 15 existing aeration basins enters 10 existing secondary clarifiers, while mixed liquor from the 12 additional aeration basins enters 11 additional secondary clarifiers.

Nitrified flow from the secondary clarifiers is combined to enter high head gravity filters, where more suspended and collodal solids are removed. Filter backwash water is returned to the aerated grit chambers.

Ozone disinfection and oxygenation follow filtration. Ozone disinfection effluent will have a high dissolved oxygen concentration, ranging from 15 mg/l to greater than 20 mg/l. A 115-MGD pump station and integral wet well conveys disinfected effluent through the force main to Badfish Creek. The existing outfall cascade aerator is to be removed to prevent deoxygenation of the supersaturated wastewater. The downstream aerator, located in the effluent ditch, will be evaluated after the Seventh Addition has been completed to determine its effects on instream dissolved oxygen. These unit processes are all classified as conventional. The system diagram is shown in Figure 4-1.

Figure 4-1



TREATMENT STRATEGY 1

Source: Facilities Plan Update, Technical Memorandum 5-A

-- Treatment Strategy 2

Strategy 2 compares closely to the original 1976 Facilities Plan and Draft EIS recommendations. The existing plant is followed by RBC for nitrification and high head gravity filters for additional suspended solids removal. Unlike the original Facilities Plan recommendation, breakpoint chlorination is not provided since it is no longer needed to remove the last fraction of ammonia in the effluent. Disinfection and oxygenation are as described for Strategy I.

Preliminary and primary treatment are as described in Strategy I. Primary effluent enters the 15 existing aeration basins where most of the carbonaceous BOD removal takes place. All aeration basins use standard efficiency diffusers for oxygen transfer to the wastewater. Mixed liquor from the 15 existing basins enters the 10 existing secondary clarifiers, where much of the suspended solids settle and are either returned to the aeration basins or wasted.

Rotating biological contactors (RBC) are used for nitrification. This unit process consists of 176 air-driven media assemblies in 44 six-foot deep concrete basins.

Nitrified effluent from the RBC process enters high head gravity filters for additional suspended and colloidal solids removal. Since the solids concentration entering the RBC process is usually equal to the solids concentration leaving the process, solids loading to the filters should not be excessive. Filter backwash water is returned to the aerated grit chambers.

Ozone is used both for disinfection and oxygenation of the filtered effluent. A 115 MGD pump station and integral wet well conveys disinfected effluent through the force main to Badfish Creek. The existing outfall cascade aerator will be removed while the downstream cascade aerator will be evaluated after completion of the facilities to determine its effect on dissolved oxygen within the effluent ditch. This is a conventional treatment alternative. Figure 4-2 presents it diagrammatically.

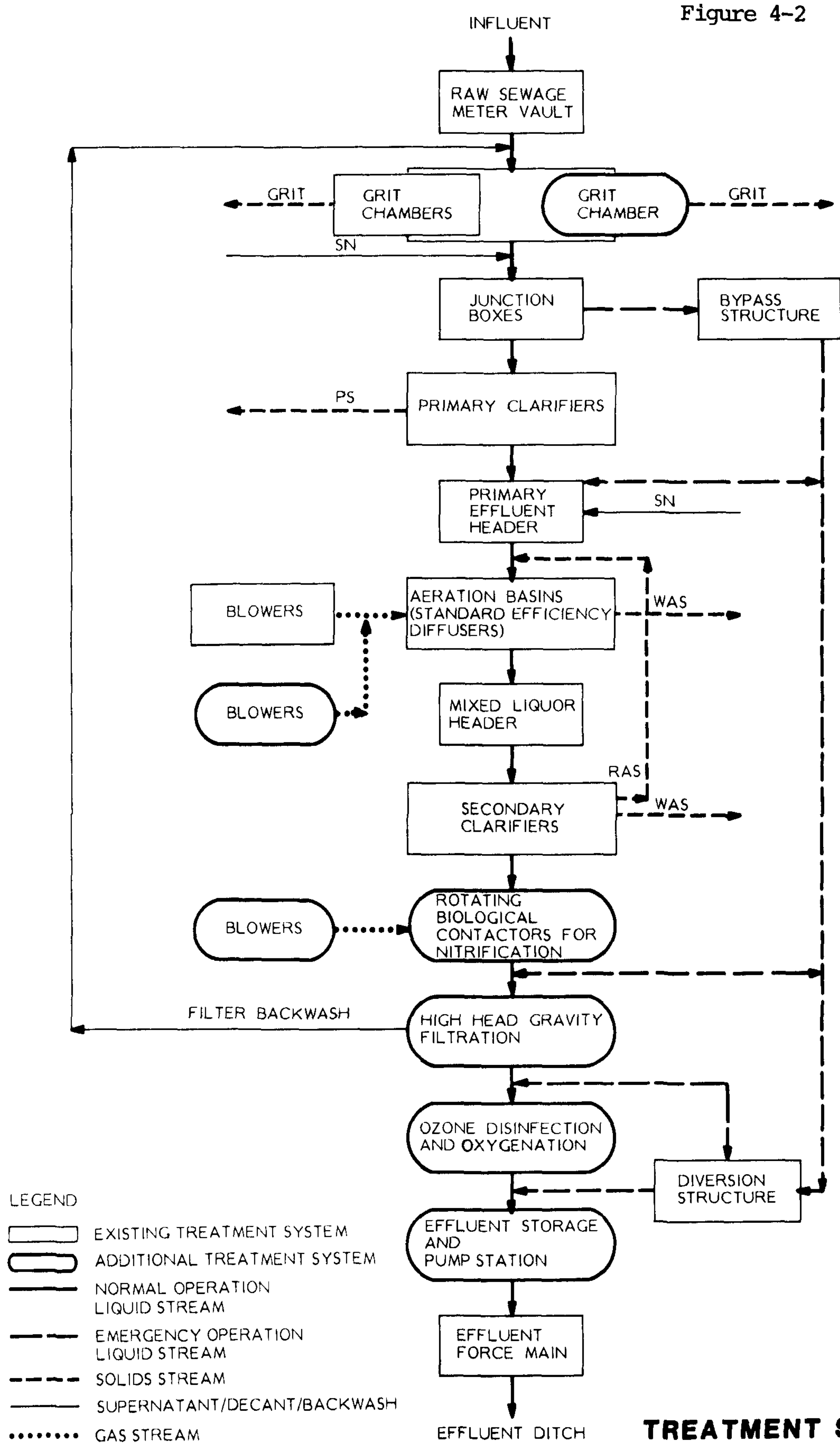
-- Treatment Strategy 3

Strategy 3 is very similar to Strategy I. However, it uses high efficiency diffusers for single-stage nitrification. It also includes ultraviolet irradiation for disinfection, which is being piloted at the plant.

Preliminary and primary treatment are as described in Strategy I. Primary effluent is split to 15 existing and 12 additional aeration basins, where single-stage biological nitrification and carbonaceous BOD removal takes place. All aeration basins use high efficiency diffusers for oxygen transfer to the wastewater. Mixed liquor from the 15 existing aeration basins enters 10 existing secondary clarifiers, while mixed liquor from the 12 additional aeration basins enters 11 additional secondary clarifiers.

Nitrified flow from the secondary clarifiers is combined and filtered, using high head gravity filters to remove additional suspended and colloidal solids. Filter backwash water is returned to the aerated grit chambers.

Figure 4-2



TREATMENT STRATEGY 2

Source: Facilities Plan Update, Technical Memorandum 5- A

Ultraviolet disinfection follows filtration. Disinfected effluent is then conveyed through the effluent force main by a 115-MGD pump station and integral wet well. The existing outfall cascade aerator and downstream cascade aerator provide the necessary instream aeration. This alternative combines both conventional and innovative processes. See Figure 4-3 for a process chart.

-- Treatment Strategy 4

Strategy 4 is a modification of Strategy 3, which mitigates the problems associated with siting restrictions by placing RBC assemblies in the aeration basins (SURFACT) to reduce the number of new aeration basins required. It also reduces land area requirements by enhancing settling with the use of flocculating clarifiers, which would take the place of secondary clarifiers and high head gravity filters. Since these clarifiers may not reduce the turbidity of the effluent to the level needed for UV irradiation, and since UV irradiation requires more land area, ozone is suggested for effluent disinfection and oxygenation. This strategy is the only one which may be sited in the vicinity of the existing plant, leaving land area to the west for any expansions needed beyond this 20-year planning period.

Preliminary and primary treatment are as described in Strategy 1. Effluent from the 14 existing primary clarifiers enters the SURFACT process where biological nitrification and carbonaceous BOD removal takes place. The SURFACT process consists of the existing aeration basins plus three additional basins and 146 air-driven RBC media assemblies. All aeration basins use high efficiency diffusers for oxygen transfer to the wastewater.

Flocculating clarifiers replace secondary clarifiers and filters for this strategy. Flocculating clarifier mechanisms are installed in existing secondary clarifiers 1 to 4, while separate flocculating basins are installed prior to existing secondary clarifiers 5 to 10. To provide the needed capacity, 10 additional flocculating clarifiers are also required.

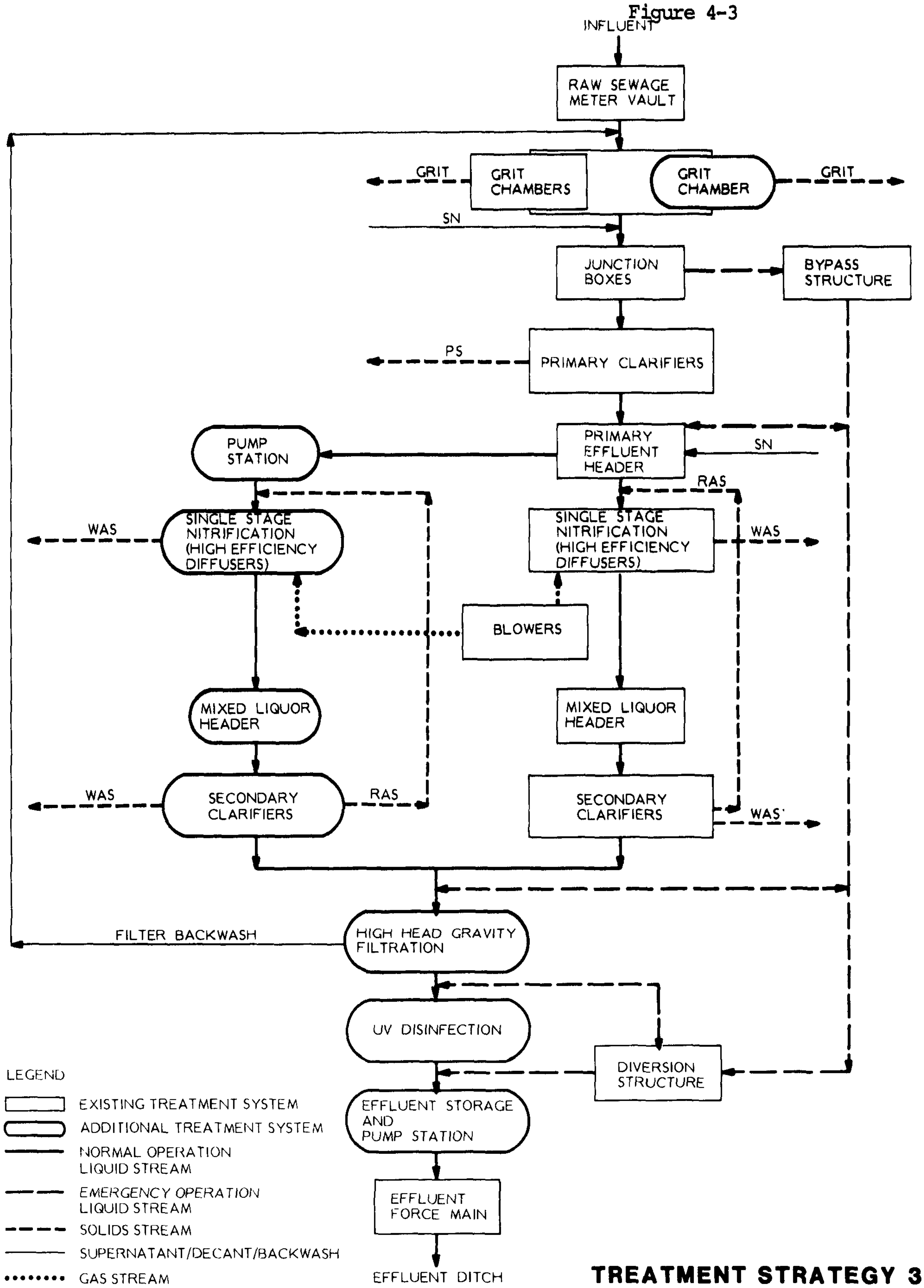
Nitrified flow from the flocculating clarifiers is combined prior to ozone disinfection and oxygenation. A 115-MGD pump station and integral wet well conveys disinfected effluent through the force main to Badfish Creek. The existing outfall aerator will be removed while the downstream cascade aerator will be evaluated after completion of the Seventh Addition to determine its effect on dissolved oxygen. This alternative also mixes innovative and conventional technologies. It is represented in Figure 4-4.

-- Treatment Strategy 5

Strategy 5 compares with Strategy 3, except that flocculating clarifiers take the place of secondary clarifiers and high head gravity filters. UV disinfection is suggested, although its use in conjunction with flocculating clarifiers would have to be demonstrated during the current piolet study. If incompatible, it would have to be substituted by ozone disinfection and oxygenation.

Preliminary and primary treatment are as described in Strategy 1. Primary effluent is split to the 15 existing and 12 additional aeration basins, where

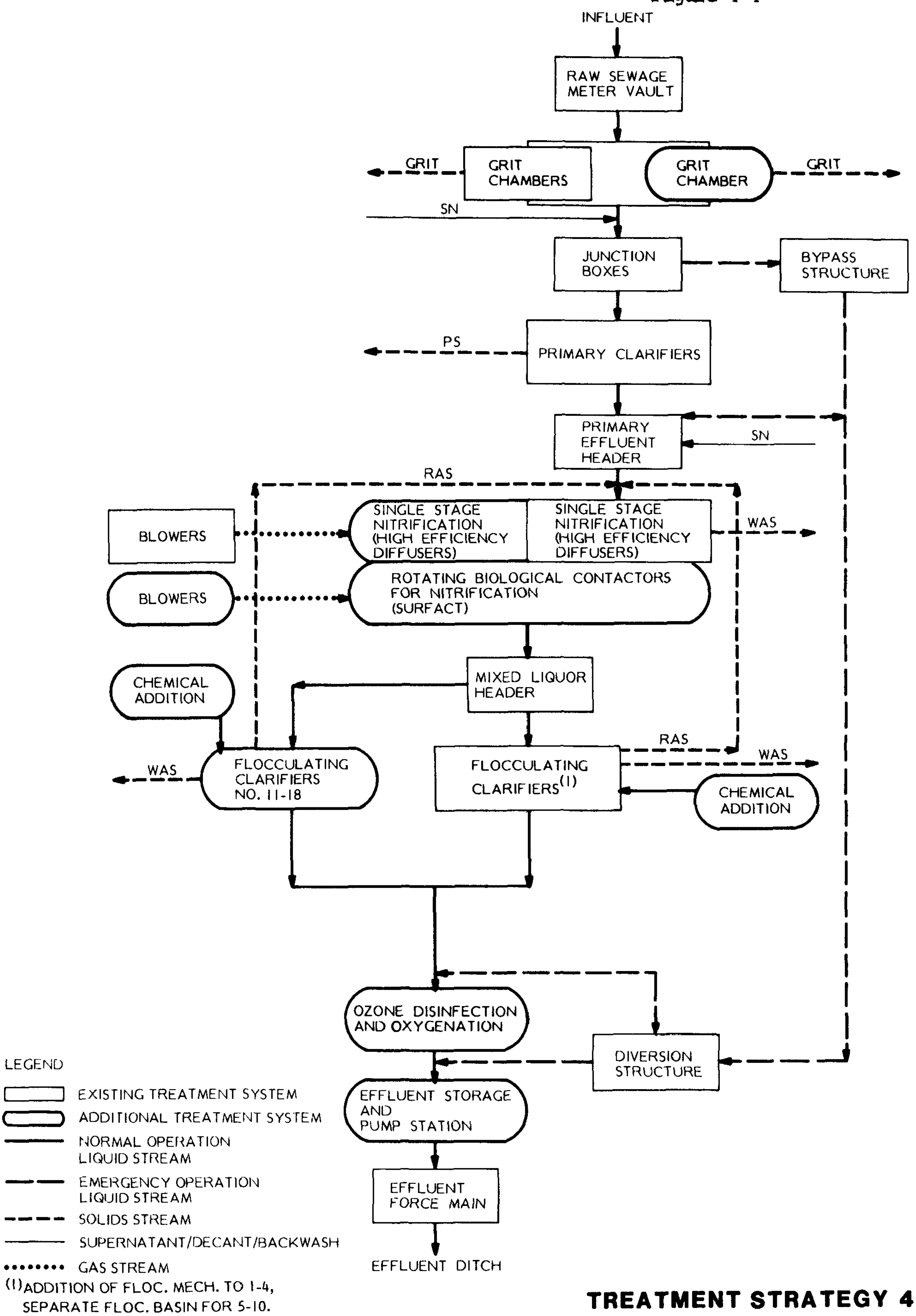
Figure 4-3



TREATMENT STRATEGY 3

Source: Facilities Plan Update, Technical Memorandum 5-A

Figure 4-4



TREATMENT STRATEGY 4

Source: Facilities Plan Update, Technical Memorandum 5-A

single-stage biological nitrification and carbonaceous BOD removal takes place. All aeration basins use high-efficiency diffusers for oxygen transfer to the wastewater.

Flocculating clarifiers replace secondary clarifiers and filters for this strategy. Flocculating clarifier mechanisms are installed in existing secondary clarifiers 1 to 4, and separate flocculating basins are installed prior to existing secondary clarifiers 5 to 10. Mixed liquor solids from the 15 existing aeration basins enter these 10 modified flocculating clarifiers, while mixed liquor solids from the 12 additional aeration basins enter 11 additional flocculating clarifiers.

Nitrified flow from the flocculating clarifiers is combined prior to UV disinfection. Disinfected effluent is conveyed through the effluent force main to Badfish Creek by a 115-MGD pump station and integral wet well. The existing outfall cascade aerator and downstream cascade aerator provide the necessary instream aeration. This is an innovative alternative and is shown in Figure 4-5.

-- Treatment Strategy 5

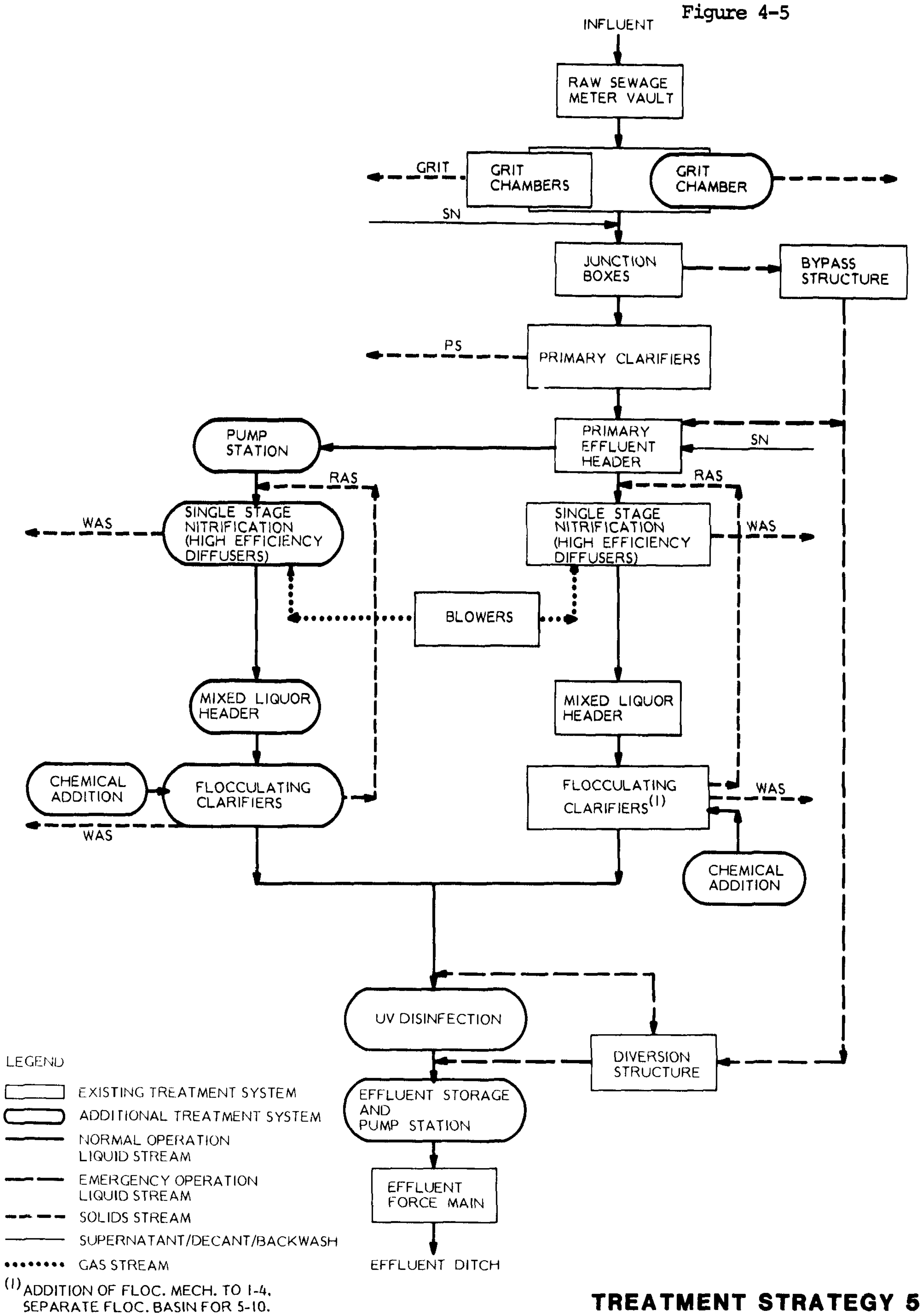
Strategy 5 is again similar to Strategy 3, except the flocculating clarifiers take the palce of secondary clarifiers and high head gravity filters. Also, ozone is used for disinfection and oxygenation, and the vent gas is used to activate 4 new pure oxygen covered aeration basins in place of 6 new air activated aeration basins.

Preliminary and primary treatment are as described in Strategy 1. Primary effluent is split to 15 existing and 10 additional aeration basins, where single-stage biological nitrification and carbonaceous BOD removal takes place. All existing aeration basins use air with high efficiency diffusers for oxygen transfer. The additional basins include 6 uncovered air activated aeration basins that use high-efficiency diffusers for oxygen transfer and 4 covered aeration basins that use mixers for pure oxygen activation and mixing. Each of the pure oxygen basins has three separate stages, with a mixer for each stage.

Flocculating clarifiers replace secondary clarifiers and filtration for this strategy. Flocculating clarifier mechanisms are installed in existing secondary clarifiers 1 to 4, while separate flocculating basins are installed prior to existing secondary clarifiers 5 to 10. Mixed liquor from the 15 existing aeration basins enters these 10 modified flocculating clarifiers. Combined mixed liquor solids from the new air and pure oxygen activated aeration basins enter 14 additional flocculating clarifiers.

Nitrified flow from the flocculating clarifiers is disinfected and oxygenated using ozone. Disinfected effluent is conveyed through the effluent force main to Badfish Creek by a 115-MGD pump station and integral wet well. The outfall cascade aerator will be removed while the downstream cascade aerator will be evaluated after completion of the Seventh Addition to determine its effect on dissolved oxygen. Figure 4-5 diagrams this innovative alternative.

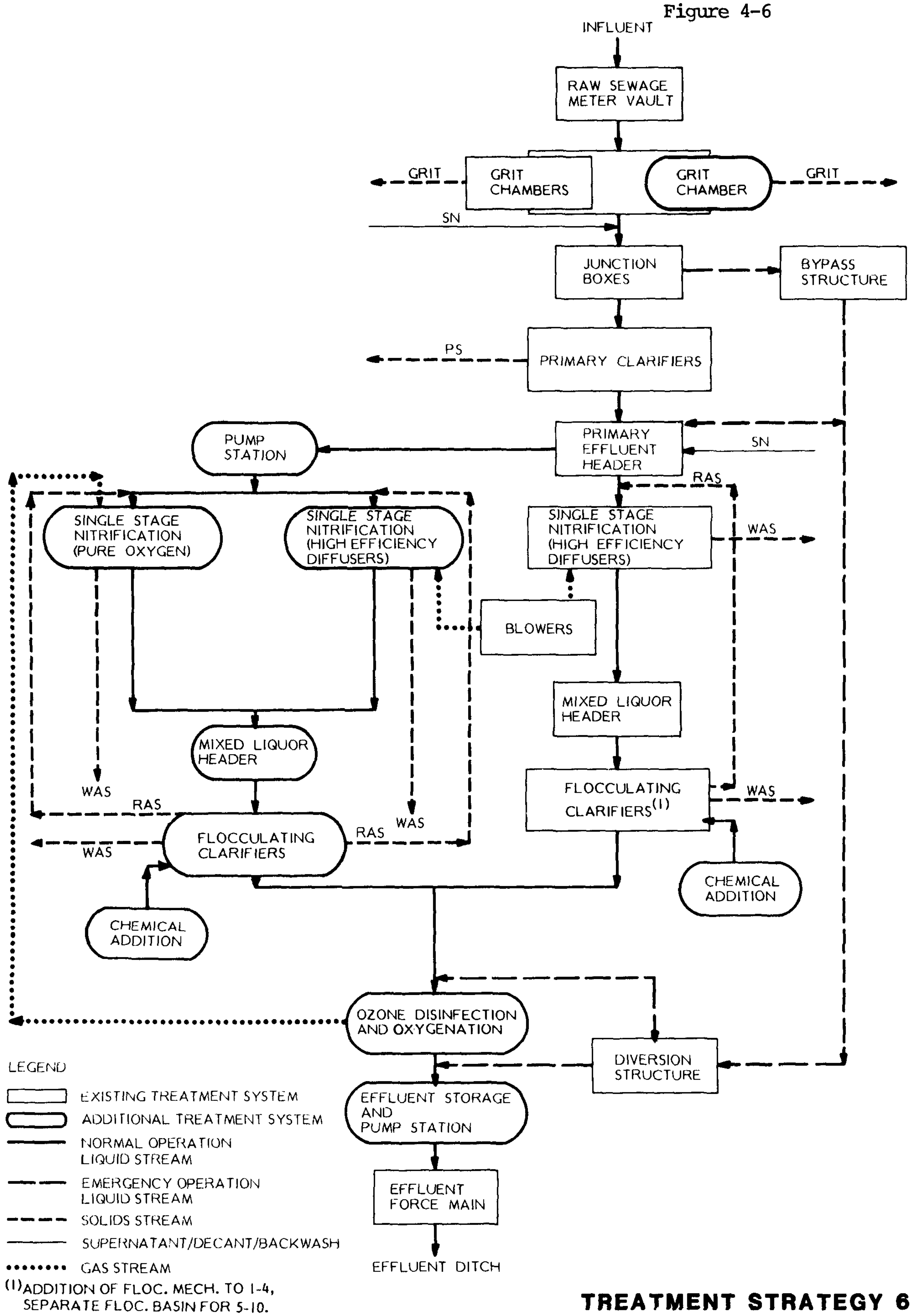
Figure 4-5



TREATMENT STRATEGY 5

Source: Facilities Plan Update, Technical Memorandum 5-A

Figure 4-6



TREATMENT STRATEGY 6

Source: Facilities Plan Update, Technical Memorandum 5- A

C. EVALUATION OF SYSTEM ALTERNATIVES

1. Cost Comparison

Dollar costs of projects provide one part of the cost-effective analysis. Table 4-5 presents a summary of present worth costs for the system alternatives.

The "No Action" alternative would not receive Federal funding. Cost breakdowns are shown in Tables 4-6 through 4-11.

Capital cost, operation and maintenance cost, salvage value, and present worth are developed for each of the treatment strategies. All cost estimates are order-of-magnitude estimates, as defined by the American Association of Cost Estimators, having an accuracy range of -30 and +50 percent. Capital costs for items supplied by manufacturers are based on quotations from various manufacturers. Reinforced concrete costs are estimated from quantity take-offs and a preliminary layout of each treatment strategy. A 40-percent allowance was added to the capital cost for engineering, legal, administrative and financing costs, and construction contingencies. Operation and maintenance costs include labor, power, materials, and supplies. Annual operation and maintenance costs include a 25-percent contingency. Salvage values are based on a 20-year life for equipment and piping and a 50-year life for structures. These values are estimated using straight-line depreciation and converting the depreciated value to a present worth credit. The total present worth for each treatment strategy is developed based on a 20-year life interest rate of 6-7/8 percent.

Since the improvements and modifications to the existing plant listed in Alternative I are common to all treatment strategies, these are included in each strategy, as derived from Table 4-12.

Alternative 5 has the lowest present worth costs. Since it is a project using innovative technology, the innovative portions would be eligible for 85% Federal funding while other eligible capital cost items would receive the standard 75% funding.

2. Construction Impacts

Between 5 and 10 additional areas will be needed for the new treatment improvements. Alternative 2 uses the least land while Alternative I requires the most. The MMSD owns over 400 acres at the Nine Springs site, so the acreage for any alternative presents no special problems.

Treatment continuity during construction will be very good for any alternative selected. All alternatives are comparable in this respect.

3. Water Quality Impacts

All alternatives are designed to meet the provisions of the WPDES discharge permit for the Nine Springs plant. Certain alternatives present

Table 4-5

TREATMENT STRATEGY COST COMPARISONS

Present Worth	Treatment Strategies					
	TS 1	TS 2	TS 3	TS 4	TS 5	TS 6
Capital Cost	$ 27,500,000	$ 30,200,000	$ 27,600,000	$ 29,900,000	$ 25,500,000	$ 27,700,000
O & M Cost	$ 29,100,000	$ 29,300,000	$ 23,000,000	$ 21,400,000	$ 20,100,000	$ 20,800,000
Salvage Value	$ (1,200,000)	$ (900,000)	$ (1,100,000)	$ (700,000)	$ (800,000)	$ (1,000,000)
Total	$ 55,400,000	$ 58,600,000	$ 49,500,000	$ 50,600,000	$ 44,800,000	$ 47,500,000
Relative Cost						
Percent of TS 1	100	106	89	91	81	86

Source: Facilities Plan Update
Technical Memorandum 5-B

Table 4-6

CAPITAL COST	Common Modifications	$ 1,150,000
	Single Stage Nitrification Using Standard Efficiency Diffusers	7,510,000
	High Head (deep bed) Gravity Filtration	3,400,000
	Ozone Disinfection and Oxygenation (including removal of outfall cascade aerator)	2,720,000
	Effluent Pumping and Transport	4,840,000
	Subtotal	$19,620,000
	Allowances for Engineering, Administration, Legal, Financial, and Construction Contingencies (40%)	7,850,000
	Total Capital Cost	$27,470,000
ANNUAL OPERATION AND MAINTENANCE COST	Operations and Maintenance Labor (including treatment of spent backwash)	$ 624,000
	Power Costs	1,456,000
	Maintenance Parts and Supplies	95,000
	Subtotal	$ 2,175,000
	Contingencies (25%)	544,000
	Total Operation and Maintenance Cost	$ 2,719,000
PRESENT WORTH	Capital Cost	$27,500,000
	Operation and Maintenance Cost	$29,100,000
	Salvage Value	$(1,200,000)
	Total Present Worth Cost	$55,400,000

Source: Facilities Plan Update
Technical Memorandum 5-B

TREATMENT STRATEGY I COST SUMMARY

Table 4-7

CAPITAL COST	Common Modifications	$ 1,150,000
	RBC System for Nitrification	9,440,000
	High Head (deep bed) Gravity Filtration	3,400,000
	Ozone Disinfection and Oxygenation (including removal of outfall cascade aerator)	2,720,000
	Effluent Pumping and Transport	4,840,000
	Subtotal	$21,550,000
	Allowances for Engineering, Administration, Legal, Financial, and Construction Contingencies (40%)	8,620,000
	Total Capital Cost	$30,170,000
ANNUAL OPERATION AND MAINTENANCE COST	Operations and Maintenance Labor (including treatment of spent backwash)	$ 633,000
	Power Costs	1,452,000
	Maintenance Parts and Supplies	104,000
	Subtotal	$ 2,189,000
	Contingencies (25%)	547,000
	Total Operation and Maintenance Cost	$ 2,736,000
PRESENT WORTH	Capital Cost	$30,200,000
	Operation and Maintenance Cost	$29,300,000
	Salvage Value	$ (900,000)
	Total Present Worth Cost	$58,600,000

Source: Facilities Plan Update
Technical Memorandum 5-B

TREATMENT STRATEGY 2 COST SUMMARY

Table 4-8

CAPITAL COST	Common Modifications	$ 1,150,000
	Single Stage Nitrification using High Efficiency Diffusers	8,010,000
	High Head (deep bed) Gravity Filtration	3,400,000
	UV Disinfection	2,280,000
	Effluent Pumping and Transport	4,840,000
	Subtotal	$19,680,000
	Allowances for Engineering, Administration, Legal, Financial, and Construction Contingencies (40%)	7,870,000
	Total Capital Cost	$27,550,000
ANNUAL OPERATION AND MAINTENANCE COST	Operations and Maintenance Labor (including treatment of spent backwash)	$ 626,000
	Power Costs	903,000
	Maintenance Parts and Supplies	192,000
	Subtotal	$ 1,721,000
	Contingencies (25%)	430,000
	Total Operation and Maintenance Cost	$ 2,151,000
PRESENT WORTH	Capital Cost	$27,600,000
	Operation and Maintenance Cost	$23,000,000
	Salvage Value	$(1,100,000)
	Total Present Worth Cost	$49,500,000

Source: Facilities Plan Update
Technical Memorandum 5-B

TREATMENT STRATEGY 3 COST SUMMARY

Table 4-9

CAPITAL COST	Common Modifications	$ 1,150,000
	SURFACT Process	10,750,000
	Flocculating Clarifiers	1,870,000
	Ozone Disinfection (including removal of outfall cascade aerator)	2,720,000
	Effluent Pumping and Transport	4,840,000
	Subtotal	$21,330,000
	Allowances for Engineering, Administration, Legal, Financial, and Construction Contingencies (40%)	8,530,000
	Total Capital Cost	$29,860,000
ANNUAL OPERATION AND MAINTENANCE COST	Operations and Maintenance Labor	$ 385,000
	Power Costs	1,055,000
	Maintenance Parts, Supplies, and Chemicals	157,000
	Subtotal	$ 1,597,000
	Contingencies (25%)	399,000
	Total Operation and Maintenance Cost	$ 1,996,000
PRESENT WORTH	Capital Cost	$29,900,000
	Operation and Maintenance Cost	$21,400,000
	Salvage Value	$ (700,000)
	Total Present Worth Cost	$50,600,000

Source: Facilities Plan Update
Technical Memorandum 5-B

TREATMENT STRATEGY 4 COST SUMMARY

Table 4-10

CAPITAL COST	Common Modifications	$ 1,150,000
	Single Stage Nitrification using High Efficiency Diffusers	8,010,000
	Flocculating Clarifiers	1,920,000
	UV Disinfection	2,280,000
	Effluent Pumping and Transport	4,840,000
	Subtotal	$18,200,000
	Allowances for Engineering, Administration, Legal, Financial, and Construction Contingencies (40%)	7,280,000
	Total Capital Cost	$25,480,000
ANNUAL OPERATION AND MAINTENANCE COST	Operations and Maintenance Labor	$ 387,000
	Power Costs	874,000
	Maintenance Parts, Supplies, and Chemicals	238,000
	Subtotal	$ 1,499,000
	Contingencies (25%)	375,000
	Total Operation and Maintenance Cost	$ 1,874,000
PRESENT WORTH	Capital Cost	$25,500,000
	Operation and Maintenance Cost	$20,100,000
	Salvage Value	$ (800,000)
	Total Present Worth Cost	$44,800,000

Source: Facilities Plan Update
Technical Memorandum 5-B

TREATMENT STRATEGY 5 COST SUMMARY

Table 4-11

CAPITAL COST	Common Modifications	$ 1,150,000
	Air/Oxygen Nitrification System	9,020,000
	Flocculating Clarifiers	2,070,000
	Ozone Disinfection (including removal of outfall cascade aerator)	2,720,000
	Effluent Pumping and Transport	4,840,000
	Subtotal	$19,800,000
	Allowances for Engineering, Administration, Legal, Financial, and Construction Contingencies (40%)	7,920,000
	Total Capital Cost	$27,720,000
ANNUAL OPERATION AND MAINTENANCE COST	Operations and Maintenance Labor	$ 385,000
	Power Costs	1,021,000
	Maintenance Parts, Supplies, and Chemicals	148,000
	Subtotal	$ 1,554,000
	Contingencies (25%)	389,000
	Total Operation and Maintenance Cost	$ 1,943,000
PRESENT WORTH	Capital Cost	$27,700,000
	Operation and Maintenance Cost	$20,800,000
	Salvage Value	$(1,000,000)
	Total Present Worth Cost	$47,500,000

Source: Facilities Plan Update
Technical Memorandum 5-B

TREATMENT STRATEGY 6 COST SUMMARY

Table 4-12

GRIT REMOVAL IMPROVEMENTS	Grit Chamber Grit Removal Mechanisms Grit Washers Grit Washing Pumps	$ 310,000
JUNCTION BOX MODIFICATIONS	Bypass Control Modifications Flow Control Gates	30,000
PRIMARY CLARIFIER UPGRADING	Refurbish Mechanisms	40,000
AERATION BASIN MODIFICATINS	Influent Valve Modifications Concrete Work	40,000
SECONDARY CLARIFIER IMPROVEMENTS	Wier Modifications and Flow Measurements	110,000
ACTIVATED SLUDGE SYSTEM IMPROVEMENTS	Meter Modifications on Return and Waste Sludge Pumps Chlorine System for Filamentous Control Aluminum Gratings	150,000
SAMPLING EQUIPMENT		20,000
DEMOLITION OF TRICKLING FILTER PLANT		450,000
	TOTAL	$1,150,000

Source: Facilities Plan Update
Technical Memorandum 5-B

COSTS FOR COMMON MODIFICATIONS

potential additional benefits, should effluent requirements become more stringent. Alternatives 1, 2 and 3 utilize filtration, which is the most effective process for BOD and suspended solids removal, and so have a slight advantage for this consideration. Alternatives 1, 2, 4 and 5 use ozonation and will provide a high effluent DO which is desirable.

4. Land Use Impacts

MMSD owns sufficient property to provide a buffer zone around the treatment plant for any of the alternatives. This will reduce adverse impacts to a nearby residential area.

5. Wetlands and Floodplains Impacts

No wetlands will be directly affected by the construction of any new wastewater treatment alternative under consideration in the Final EIS. The wetland area adjacent to Badfish Creek is the Green Lake wetland, located above the effluent ditch. The wetlands no longer drain to the effluent ditch. The wetlands adjacent to the Nine Springs plant are by the sludge facilities and will not be affected by the wastewater treatment expansion if proper construction practices are followed.

Section 5-E of the Environmental Assessment (v.2 of the Draft EIS) discusses the results of flood projections for Badfish Creek. Flood flows are not anticipated to significantly increase with any of the proposed alternatives for a Badfish Creek discharge. As the severity of the flood increases, the proportion of effluent in the flood flow decreases. For the once-in-ten-year flood, no existing structures would be inundated. Most of the floodplain area is used for pasture or is uncultivated. The Nine Springs Treatment Plant, itself, is not located in a floodplain.

6. Archaeological and Historic Sites

Archaeological and historic surveys have found no evidence of sites in the proposed construction area, see Section I-I of Chapter 2 of the Draft EIS.

7. Energy and Chemical Use

Energy cost differences between the alternatives are influenced by the type of aeration system used in the activated sludge process. The standard efficiency diffusion system used in Alternatives 1 and 2 is more energy intensive. Alternative 5 has the lowest energy costs.

Alternatives 1, 2 and 3 would require up to one ton of chlorine per year for the filter backwash system. Alternatives 4, 5 and 6 would need up to 300 tons of alum and 6 tons of polymer per year to operate the flocculating clarifiers. Thus a filtration system would be somewhat less consumptive of chemicals than a flocculation system.

3. Flexibility, Reliability and Safety Considerations

These engineering aspects of the alternatives are summarized in Table 4-13. The RBC process is considered to be most stable and flexible since this process separates the functions of carbonaceous BOD removal and nitrogenous BOD removal. Various modifications of the single-stage nitrification process are considered to be slightly less stable or flexible since the potential for microbial "wash out" exists. Additionally, increased potential for diffuser plugging is associated with the high efficiency diffusion system. Stability and flexibility of filtration is considered to be approximately equal to flocculating clarifiers. Filters respond better to mild changes or plant upsets, whereas flocculating clarifiers can best respond to severe upsets. UV irradiation has a higher dependency on low TSS concentration for efficient performance than does ozonation.

Process experience comparison relates closely to documented experience as well as the amount of pilot testing performed for each process at the Nine Springs plant. Therefore, Alternative I is considered to be superior since all processes have been piloted. Flocculating clarifiers have not been specifically piloted at the Nine Springs plant. The SURFACT process, Alternative 4, has not been piloted anywhere for the purpose of nitrification.

Ease of operation reflects how closely the processes must be controlled in order to attain the desired results. Therefore, the RBC process is most favored because it is a two-stage process in which control is least critical. As the need to control the solids inventory in the single-stage nitrification process increases, the relative scores decrease. There are additional operational requirements of controlling chemical feed to the flocculating clarifier alternatives.

The ability to reuse existing facilities is relatively high for all strategies. In some processes the standard efficiency diffusion system in the existing aeration basins must be replaced with a high efficiency diffusion system. For all strategies, a new pump station is to be provided and the existing pump station is to be converted to an equipment maintenance building.

The filtration process alternatives have the advantages of being able to produce even lower BOD and suspended solids concentration if lower levels should ever be required in the future, while flocculating clarifiers are less flexible in this respect.

Safety considerations focus on the use of ozone or pure oxygen as a part of the treatment strategy. The safest alternatives use neither, intermediate alternatives use ozone for disinfection and oxygenation, while Alternative 6 is considered the least desirable because of the inherent danger with the use of pure oxygen.

D. FINAL SELECTION PROCESS

The Facilities Plan Addendum used a numerical matrix to select preferred treatment alternatives. This Final EIS will use a narrative analysis, based on the

ENGINEERING COMPARISON OF TREATMENT STRATEGY ALTERNATIVES

Table 4-13

ALTERNATIVE	TREATMENT STRATEGIES TS1	TS2	TS3	TS4	TS5	TS6
PROCESS	Single stage nitrification with std efficiency diffusers, high head gravity filtration, ozone disinfection and oxygenation, followed by effluent pumping and transport.	Activated sludge process followed by RBC process for nitrification, high head gravity filtration, ozone disinfection and oxygenation, followed by effluent pumping and transport.	Single stage nitrification with high efficiency diffusers, high head gravity filtration, UV disinfection, followed by effluent pumping and transport.	SURFACT process, flocculating clarifiers, ozone disinfection and oxygenation, followed by effluent pumping and transport.	Single stage nitrification with high efficiency diffusers, flocculating clarifiers UV disinfection, followed by effluent pumping and transport.	Air/oxygen single stage nitrification, flocculating clarifiers, ozone disinfection and oxygenation, followed by effluent pumping and transport.
PROCESS STABILITY AND FLEXIBILITY	Good, except for possibility of microbial washout; also, possibility of filters blinding during severe upset; ozone disinfection less affected by TSS.	Very good, due to two stage system; however, slight possibility of filters blinding during severe upset; ozone disinfection less affected by TSS.	Good, except for possibility of microbial washout and diffuser plugging; also, possibility of filters blinding during severe upset; UV disinfection more more affected by TSS.	Expected to be good, but additional experience needed to document; flocculating clarifiers well able to respond to severe upset; ozone disinfection less affected by TSS.	Good, except for possibility of microbial washout and diffuser plugging; flocculating clarifiers well able to respond to severe upset; UV disinfection more affected by TSS.	More stable and flexible due to added advantage of pure oxygen system, possibility exists for microbial washout and diffuser plugging; flocculating clarifiers well able to handle severe upset; ozone disinfection less affected by TSS.
DEMONSTRATED PROCESS EXPERIENCE	All processes proven elsewhere and piloted at Nine Springs Plant.	All processes proven elsewhere, except air drive system on RBC assemblies. Mechanical drive RBC process piloted at Nine Springs Plant.	Nitrification process with high efficiency diffusers and UV disinfection not fully proven; filtration and UV processes piloted at Nine Springs Plant.	SURFACT, and flocculating clarifiers not fully proven but some experience with each; ozone disinfection proven elsewhere and piloted at Nine Springs Plant.	Nitrification process with high efficiency diffusers and flocculating clarifiers not fully proven, but some experience with each; UV disinfection piloted at Nine Springs Plant.	Combined air/oxygen system and flocculating clarifiers not fully proven, but some experience with clarifiers; ozone disinfection proven elsewhere and piloted at Nine Springs Plant.
EASE OF OPERATION	Solids inventory in single stage system requires close attention; filtration and disinfection require little attention.	Two stage system requires moderate attention; filtration and disinfection require little attention.	Solids inventory in single stage system requires close attention; filtration and disinfection require little attention.	Solids inventory less critical because of fixed growth; attention to flocculating clarifiers needed for chemical addition; disinfection requires little attention.	Solids inventory in single stage system requires close attention; attention to flocculating clarifiers needed for chemical addition; disinfection requires little attention.	Solids inventory in single stage system and pure oxygen portion require close attention; attention to flocculating clarifiers needed for chemical addition; disinfection requires little attention.
UTILIZATION OF EXISTING FACILITIES (1)	All facilities used for originally intended purpose, except pump station to vehicle maintenance and effluent storage tanks to filter backwash tanks.	All facilities used for originally intended purpose, except pump station to vehicle maintenance and effluent storage tanks to filter backwash tanks.	All facilities used for originally intended purpose, except pump station to vehicle maintenance and effluent storage tanks to filter backwash tanks; existing diffuser system to be replaced in basins 7 to 15.	All facilities used for originally intended purpose, except pump station to vehicle maintenance, diffuser system to be replaced in basins 7 to 15, effluent storage tanks to to be abandoned.	All facilities used for originally intended purpose, except pump station to vehicle maintenance, diffuser system to be replaced in basins 7 to 15, effluent storage tanks to to be abandoned.	All facilities used for originally intended purpose, except pump station to vehicle maintenance, diffuser system to be replaced in basins 7 to 15, effluent storage tanks to to be abandoned.
PHASING FOR FUTURE GROWTH AND HIGHER EFFLUENT STANDARDS	Capable of meeting limits of 2.5 mg/l NH_4-N, 10 mg/l BOD, 10 mg/l TSS, and lower coliform count; can be phased for growth.	Capable of meeting limits of 2.5 mg/l NH_4-N, 10 mg/l BOD, 10 mg/l TSS, and lower coliform count; can be phased for growth.	Capable of meeting limits of 2.5 mg/l NH_4-N, 10 mg/l BOD, 10 mg/l TSS, and lower coliform count; can be phased for growth.	Capable of meeting limits of 2.5 mg/l NH_4-N, and lower coliform count; filters required to meet limits of 10 mg/l TSS and 10 mg/l BOD; all can be phased for growth.	Capable of meeting limits of 2.5 mg/l NH_4-N, and lower coliform count; filters required to meet limits of 10 mg/l TSS and 10 mg/l BOD; all can be phased for growth.	Capable of meeting limits of 2.5 mg/l NH_4-N, and lower coliform count; filters required to meet limits of 10 mg/l TSS and 10 mg/l BOD; all can be phased for growth.
TREATMENT CONTINUITY DURING CONSTRUCTION	Slight disruption for aeration basin, filtration, and pump station connection.	Slight disruption for RBC and pump station connection.	Disruption for aeration basin, filtration and pump station connection; also for diffuser system replacement.	Disruption of aeratin basin for for RBC installation of clarifiers for installation of flocculating mechanisms, and pump station connection.	Disruption for aeration basin and pump station connection; also replacement of diffuser system and installation of flocculating mechanisms.	Disruption for aeration basin and pump station connection; also replacement of diffuser system and installation of flocculating mechanisms.
SAFETY CONSIDERATIONS	Concern with ozonation system.	Concern with ozonation system.	Little concern with UV system.	Concern with ozonation system.	Little concern with UV system.	Moderate concern with ozone and pure oxygen systems.
TECHNOLOGY CLASSIFICATION (2)	Conventional.	Conventional.	Partially innovative	Partially Innovative	Fully Innovative	Fully innovative.

(1) Trickling filter system to be demolished for all strategies.
(2) Effluent pumping and transport conventional for all strategies.

criteria of cost-effectiveness. The cost-effective alternative is the one with the lowest costs which also meets the necessary social and environmental needs. It is not necessarily the least cost alternative. Please remember that this selection process assumes the Badfish Creek discharge alternative selected in the Draft EIS. Detailed environmental considerations were presented in that analysis.

As in the Draft EIS the "No Action" alternative has been rejected because it will not meet National water quality goals and because it would create severe environmental impacts. Although water quality modeling was not completed for the "No Action" alternative, we expect that the "No Action" alternative would provide extremely poor water quality conditions in Badfish Creek by the end of the planning period. Without the construction of the proposed advanced waste treatment facilities, Badfish Creek will be subject to severe loadings of organic and inorganic pollutants. Population growth and land use patterns in the Madison area could be severely impacted by the "No Action" alternative if sewer hookups are restricted. If the Madison Metropolitan Sewerage District chose a "build" alternative to fund entirely with local monies, it would greatly increase the user charges because of the lack of the 75%-85% Federal contribution for eligible capital costs.

All the remaining system alternatives are comparable in terms of construction impacts, land use impacts, wetlands and floodplains, and archaeological and historic sites. The differences between the alternatives are in costs, water quality, energy and chemical use, and engineering considerations.

Project present worth costs are straightforward. Ranked from low to high, the alternatives are 5, 6, 3, 4, 1 and 2. Since portions of Alternatives 3 and 4 and even larger portions of Alternatives 5 and 6 are classified as innovative technology, they would receive a 10% bonus of additional Federal funds for the eligible items. This would help to reduce the local user charges to pay for the new system.

The water quality impacts will be satisfactory and will result in improvements to Badfish Creek and downstream rivers. The advantages of the potential for increased BOD and suspended solids removal capabilities of the filtration process of Alternatives 1, 2 and 3 is significant for the future flexibility of the system, should more stringent treatment ever be required. Immediate water quality benefits would be comparable for either the filtration or the flocculation process. The flocculating clarifiers have the advantage of being more resistant to severe upsets than filters.

Projected energy costs, ranked from low to high, for the alternatives are: 5, 3, 6, 4, 2 and 1. Chemical use is slightly less for Alternatives 1, 2 and 3 than 4, 5 and 6.

Engineering factors are more diverse. Those alternatives which are strong in demonstrated process experience, 1, 2 and 3, are not considered to be innovative technology. Alternative 5 is relatively weak and Alternative 2 is relatively strong in process stability and flexibility. All are considered acceptable. Alternative 3 is the weakest at using existing facilities; while Alternatives 5 and 6 are more difficult to operate; Alternative 5 has the most serious safety problem.

As a result of comparing the alternatives, Alternative 5 is the one preferred It has distinct cost and energy conservation advantages and promotes innovati technology. Water quality presents no problems. Engineering plusses are utilization of existing facilities and safety. Its flexibility is sufficient to meet future needs, although other alternatives are stronger in this area. Careful operation will be essential for Alternative 5.

CHAPTER 5

RECOMMENDED ACTION

A. THE PROPOSED ALTERNATIVE

Alternative 5 is the recommended treatment strategy. It consists of single-stage nitrification, flocculating clarifiers and UV disinfection of the effluent. Treated wastewater will be conveyed from the Nine Springs plant to Badfish Creek through the existing effluent pipeline with a 115-MGD effluent pumping station and an intermediate booster pump station.

The existing facilities at the Nine Springs Plant will be used for preliminary and primary treatment. The primary effluent will be split between the new and existing aeration basins where single-stage biological nitrification and BOD removal will take place. Suspended solids will be reduced in the flocculating clarifiers, with chemical feed added for better solids sedimentation. A new ultraviolet light disinfection system will treat the effluent prior to its being transported to Badfish Creek through an improved, phased pumping system.

The component requirements for this selected alternative are listed in Technical Memorandum 5-A of the Facilities Plan Update. The effluent booster pump may be phased to be built about 1990, or as the need arises. Phasing is not recommended for the other components, which will be designed to provide for 50 MGD treatment for the 20-year planning period.

Diagrams of the selected system have been presented in Figure 4-5. Total capital costs are estimated to be $25,480,000. Seventy-five percent of eligible costs and eighty-five percent of eligible innovative costs will be covered by Federal grant assistance. The system users must pay for the non-eligible capital costs and the on-going operation and maintenance costs through the user charge system. These are estimated to be about $36 per year for each household, in 1980 dollars. Municipal sewer service charges would be added to the user's bill, as well, at an approximate cost of $16 per year. Larger users will pay proportionately to their volume of effluent.

B. ENVIRONMENTAL IMPACTS OF THE PROPOSED ACTION

1. Overview

Impacts are unchanged from the Draft EIS analysis in many areas: climate, topography and geology, soils, water quality management planning, groundwater, biology, air quality, noise, odors, land use, population, historic and archaeological sites, open space, recreation and agriculture.

Surface water and energy use will be discussed in more detail below.

2. Surface Water

a. Water Quality and Hydrology

This section remains the same, except for an update on lake level management. The City of Madison has adopted the recommendations on lake level management from the City-County Lakes Committee Report. The Dane County Department of Public Works is responsible for operating the locks to regulate lake levels. Thus the local support and initiative is in place to provide a coordinated system for lake level management. This program will minimize low flows in the downstream segment of the Yahara River. An operating rules study has not yet been conducted.

b. Water Quality

This section presents additions or alterations to the Draft EIS analysis. Dissolved oxygen levels instream are affected by the total ammonia nitrogen level. By limiting the total ammonia nitrogen to 2.7 mg/l, a 5.0 mg/l DO effluent will maintain the instream 5.0 mg/l instream standard for DO The predictive modeling for DO assumed a higher 5.0 mg/l total ammonia nitrogen value. So this conservative ammonia value means that a sufficient DO value will be achieved.

Suspended solids concentration will improve as the effluent quality improves with advanced treatment. Loadings decreased from 9,305 lbs/day to 4,110 lbs/day after the Fifth Addition was built to improve secondary treatment. Even when the Nine Springs plant achieves its full design flow of 50 MGD, the loading of 8,345 lbs/day of suspended solids is a decrease from the 1973-74 load, prior to the Fifth Addition.

When the Fifth Addition was built, BOD loadings decreased to 6,875 lbs/day from 7,785 lbs/day. Achieving the 50 MGD design flow will increase the loading to 8,345 lbs/day. This is because the BOD concentration of 22 mg/l prior to the Fifth Addition is close to the final permit limit of 20 mg/l.

Ammonia nitrogen limits have been extensively studied for the Final EIS, see Section C of Chapter 2. The effluent limits are designed to achieve the instream unionized ammonia nitrogen limit of 0.05 mg/l. Thus the warm water fish population will be protected with the degree of treatment proposed for this project. Ammonia nitrogen loadings will decrease sharply from the 1973-74 value of 5,220 lbs/day. At design flow, the summer loading will be 1,127 lbs/day and the winter loading 3,338 lbs/day.

Section 3-b-12 of Chapter 5 of the Draft EIS discussed the heavy metals issue in detail. Substances of greatest concern were aluminum, copper, lead, mercury, and zinc. Table 5-7 from the Draft EIS is presented here as Table 5-1. The background levels in some of the local streams exceed the Nine Springs effluent value prior to the Fifth Addition. Improved suspended solids removal with the new treatment facilites will tend to remove more heavy metals from the effluent and concentrate them in the sludge. More importantly, MMSD has begun its analysis of an industrial pretreatment program. This program will work to identify and control any substantial industrial contributions of heavy metals before they reach the Nine Springs treatment plant. Flow equalization will be provided within the treatment plant units rather than in a separate basin. This capacity for peak flow will also serve to dampen any momentarily high concentration of heavy metals.

3. Energy Use

The analyses in Chapters 2 and 4 have itemized energy use values for each of the components and alternate systems. The selected alternative has the lowest energy costs of the final group of alternatives considered, except for the No Action alternative.

Table 5-1

Selected Heavy Metal Concentration
Nine Springs Effluent and Receiving Streams

Parameter	Nine Springs Effluent	Nine Springs Effluent [2]	Badfish Creek Headwaters	Rutland Branch	Badfish below Rutland	Spring Creek	Badfish Mouth	Yahara above Badfish Creek	Yahara below Badfish Creek	Maximum Allowable Concen-tration
		Sta. 3-1	Sta. 3-3	Sta. 1-1	Sta. 3-5	Sta. 2-1	Sta. 3-12	Sta. 4-10	Sta. 4-11	
Aluminum	0.344	0.37	0.37	0.2-0.5	0.56	--	1.2	1.2	1.26	0.10
Copper	0.15	0.15	0.15	0.03-0.2	0.065	0.01-0.10	0.15	0.14	0.09	0.01
Lead	0.044	$<$0.01	$<$0.01	$<$ 0.01	$<$ 0.01	$<$ 0.01	$<$0.01	$<$0.01	$<$0.01	0.03
Mercury	2.22	2.37	2.37	3.34-7.26	1.43	3.04-7.06	1.90	1.54	3.54	2
Zinc	0.096	0.046	0.046	0-0.129	0.052	0-0.123	0.044	0.038	0.027	0.10

1 *Effluent Characterization*

2 Stream Survey Data

Note: All values in mg/1 except for mercury which is in ug/1.

Source: Volume V, Appendix F, Section 5.01 of MMSD's Facilities Plan

C. ADVANCED WASTEWATER TREATMENT REVIEW

1. Background

Both EPA and Congress have been concerned about the high cost and energy consumption of many wastewater treatment projects. Often these costs are attributable to optimistic population projections or sophisticated extra unit treatment processes. Funding facilities with these conditions takes limited grant funds from other projects and delays in accomplishing the basic secondary treatment goal for all publicly-owned treatment plants. High operation and maintenance costs can place a long-term burden on the community.

The Congressional Appropriations Conference Committee has specified "that grant funds may be used for construction of new facilities providing treatment greater than secondary... only if the incremental cost of the advanced treatment is $1 million or less, or if the Administrator (of EPA) personally determines that advanced treatment is required and will definitely result in significant water quality and public health improvements."

A distinction has been made between two classes of treatment that is more advanced than secondary. These are advanced secondary treatment (AST) and advanced wastewater treatment (AWT) based on the following monthly averages:

	Secondary	AST	AWT
BOD	30 mg/l or 85% removal	29-11 mg/l	10 mg/l
SS	30 mg/l or 85% removal	29-11 mg/l	10 mg/l
Total Nitrogen (TKN + nitrite + nitrate)		less than 50% removal	50% removal

Review criteria are less stringent for AST projects than AWT project.

The proposed improvements at Madison have been classified as an AST project, with incremental costs of $17 million, and have been subject to a detailed review by EPA.

2. AST Review Results

The AST review has been completed for this project and concured with the appropriateness of the single stage nitrificalton system. Adequate technical studies have been conducted to justify the additional treatment costs to protect Badfish Creek by maintaining water quality standards.

D. MITIGATIVE MEASURES

1. Monitoring Program

A stream quality monitoring program is planned by MMSD to determine the compliance of the future Nine Springs effluent discharge with established water quality standards. Both chemical and biological studies will be conducted. Table-5-2 outlines the chemical sampling while the monitoring station locations are shown in Figures 5-1 and 5-2. Additional studies are designed to monitor the sludge facilities, but they are beyond the scope of this EIS. The exact sampling location at each monitoring station will be determined during a preliminary field survey of the receiving streams.

The importance of monitoring many of these stations relates to assessing the assimilative capacity of Badfish Creek. Also, some of the stations had been monitored by the District before diversion of Nine Springs effluent to Badfish Creek in 1959. Continued monitoring will be expected to show the improvement in the water quality with increasing levels of wastewater treatment at the Nine Springs Plant. It will also detect special problems, should any develop.

The two existing District monitoring stations on the Yahara River (9-Y and 10-Y) will be monitored on a temporary basis to assess the impact of Badfish Creek on water quality in the Yahara River. By similar reasoning, two stations on the Rock River (15-r and 16-r) will continue to be monitored to assess the impact on water quality of the Rock River. These stations should be monitored until it is determined that the impact of the effluent discharge on these streams is of reduced importance.

As shown in Table 5-2, sampling for many of the parameters will be on a monthly basis to detect water quality changes over the long-term. In addition to monthly grab samples, 24-hour continuous monitoring surveys will be conducted in early spring and late summer to provide information on diurnal fluctuations during these two different seasons. Parameters which were found not to vary appreciably, such as aluminum, copper, mercury, and zinc, will be monitored quarterly.

Collecting and analyzing the water quality samples will not be the final step of the water quality monitoring program. The water quality data will be analyzed and reviewed thoroughly to detect if there are any changes in water quality that warrant early actions. Also, from the data analysis, decisions can be made relative to modifications of the monitoring program, such as changing the parameters monitored or sampling frequency. Data will be tabulated or graphed to show any water quality trends and for comparison to water quality standards. Also, time-of-travel plots will be prepared from 24-hour survey data to show the natural assimilative capacity of Badfish Creek.

In addition, a water quality index should be used for data presentation, as developed in Technical Memorandum 2-D of the Facilities Plan Addendum. This

Table 5-2

Station	Physical/Chemical Parameter Group Monthly	Quarterly	24-hour
B-e	4	--	4
C-e	1	1, 2	1, 2
D-b	1	1, 2	1, 2
1-b	1	1, 2	1, 2
3-b	1	1, 2	1, 2
4-b	1	1, 2	1, 2
5a-f	-	1, 2	--
6-b	1	1, 2	1, 2
6a-s	-	1, 2	--
8-b	1	1, 2	1, 2
9-Y	1	1, 2	--
10-Y	1	1, 2	--
15-r	1	1, 2	--
16-r	1	1, 2	--
18	3	--	--
19	3	--	--
20	3	--	--

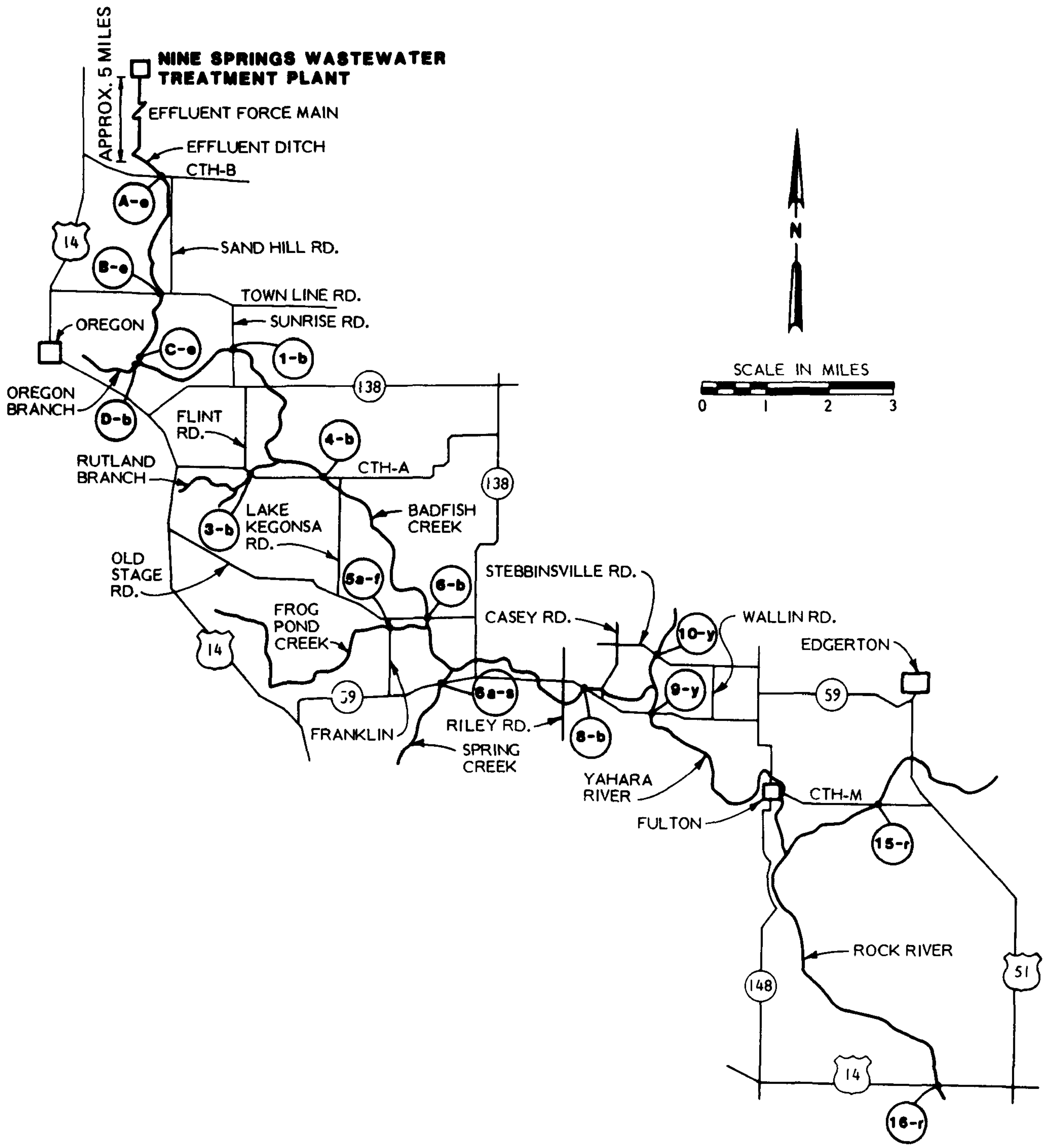
Physical/Chemical Parameter Groups:

1 Temp, DO, pH, $TBOD_5$, TSS, VSS, Total-P, ORG-N, NH_4-N, NO_2-N, NO_3-N, Fecal Coliform.
2 Al, Cu, Hg, Zn.
3 NH_4-N, NO_3-N, $TBOD_5$.
4 DO.

Source: Summary of the Facilities Plan Update

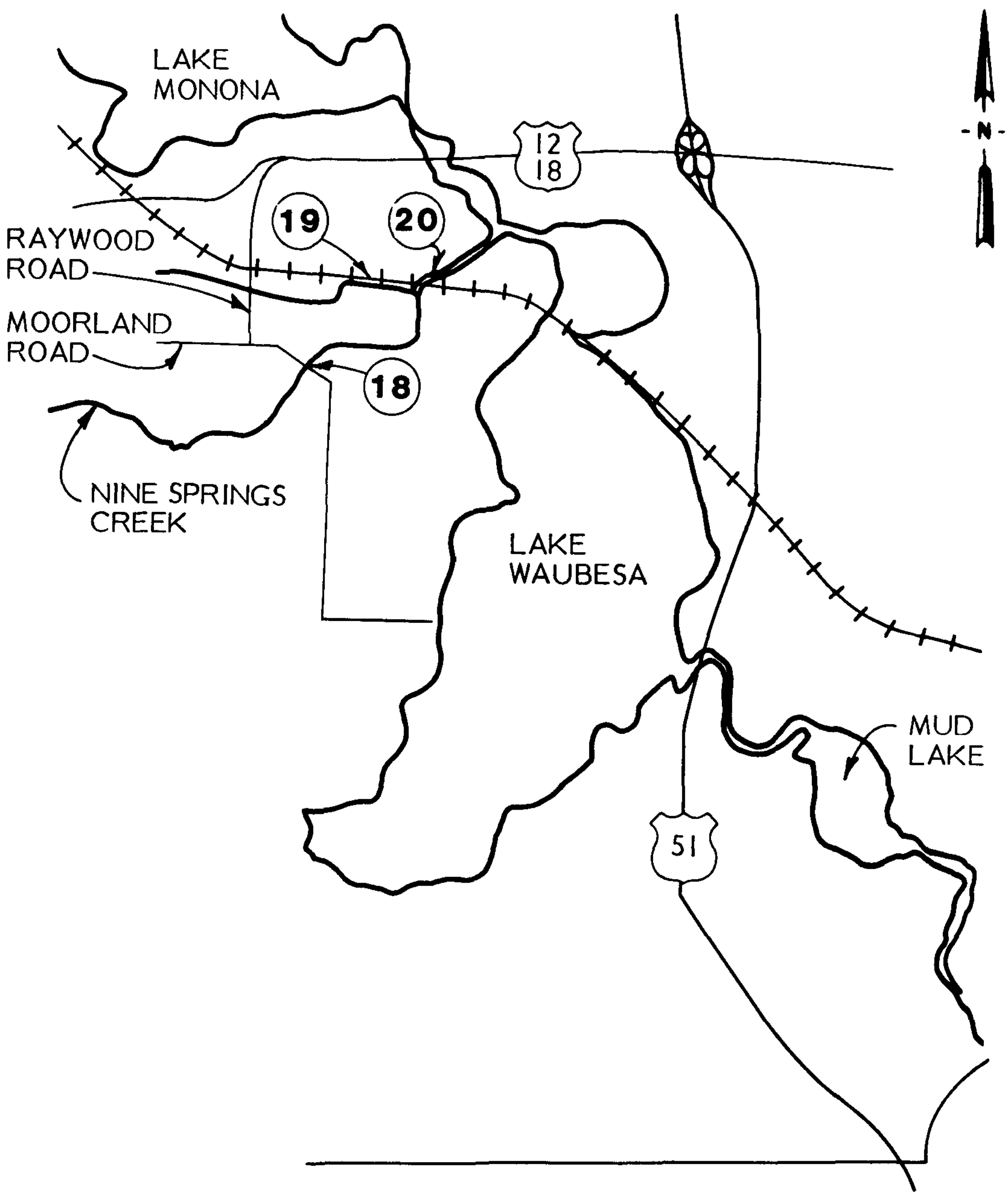
WATER QUALITY MONITORING
PARAMETERS AND SAMPLING FREQUENCIES

Figure 5-1



LOCATIONS ON BADFISH CREEK,
YAHARA RIVER, AND ROCK RIVER

STREAM MONITORING STATIONS



LOCATIONS ON NINE SPRINGS CREEK AND THE OLD EFFLUENT CHANNEL

Source: Facilities Plan Update Summary

STREAM MONITORING STATIONS

water quality index is a mathematical approach to combine data on two or more water quality parameters to produce a single number. A water quality index requires careful presentation and interpretation, but it is useful in presenting overall water quality trends to the general public.

Table 5-3 presents values for a water quality index derived from the District's monitoring data. It uses a slightly modified form of the National Sanitation Foundation water quality index. These results are presented to illustrate how a water quality index may be used to present water quality data. The indices for individual monitoring stations could be plotted versus time to show trends in water quality.

Biological parameters are a useful tool in assessing the impact of a wastewater discharge on the water quality of a receiving stream, because biological organisms tend to respond to the entire historical record of water quality. In many cases they can tell more about water quality than monthly grab samples analyzed for physical/chemical parameters, which reflect only the moment of sampling. Different aquatic organisms have different life cycles and different sensitivities to various types of stress, such as low dissolved oxygen. These differences can be used to assess the effects of water quality changes or habitat alterations. In addition, the monitoring of aquatic organisms will verify the suitability of the water quality standards for protection of fish and aquatic life.

The selection of biological parameters to be monitored is dependent on the objectives of the stream quality monitoring program, as discussed earlier. Based on a review of the literature on the effects of wastewater effluents on aquatic organisms, two biological surveys performed for the 1976 Facilities Plan, and discussions with biologists, it was concluded that a biological monitoring program should include an analysis of periphyton, (microscopic aquatic plants which grow on stones, sticks, large plants, etc.), macrophyton, (large aquatic plants), macroinvertebrates and fish. Selected parameters are indicated on Table 5-4, and the time sequence and frequency for obtaining samples of various biological parameters are presented in Table 5-5.

Biological monitoring stations were selected reference stations, stations below discharges or tributaries, ecologically similar stations, and avoidance of atypical habitats. The selected biological monitoring stations, located in Figure 5-1, include C-e, D-b, 1-b, 3-b, 4-b, 6-b and 8-b. Technical Memorandum 2-D of the Facilities Plan Addendum contains a discussion of various sample collection and analysis procedures for biological parameters, such as the use of a dredge sampler for macroinvertebrates or artificial substrates for periphyton.

There are no standard methods for presenting data from a biological monitoring study. There are numerous methods for analyzing and presenting the data to determine the effects of an effluent on the receiving stream. Methods range from a simple presentation of the number of species and individual organisms collected

Station	Location(1)	Annual Average Water Quality Index(2)					
		1955-1958(3)	1972-1975	1976	1977	1978	1979
B-e	Effluent Ditch	-	-	35	34	40	37
1-b	Badfish Creek	67	44	44	40	49	51
3-b	Rutland Branch	72	72	75	73	80	80
4-b	Badfish Creek	54	32	34	33	44	43
5a-f	Frog Pond Creek	-	-	-	-	74	73
6a-s	Spring Creek	-	-	-	-	74	77
8-b	Badfish Creek	66	40	38	37	51	54
9-Y	Yahara River	57	49	53	48	60	62
10-Y	Yahara River	56	65	66	65	72	73
15-r	Rock River	62	61	64	60	71	70
16-r	Rock River	62	62	62	60	67	69

(1) Locations shown on Figure 2

(2) Index ranges from 0 to 100 as water quality increases

(3) Prior to diversion of effluent to Badfish Creek

Source: Using water quality data from Tables 2 through 11 in Appendix A and the Water Quality Index developed by the National Sanitation Foundation (Ott, 1978), with the following modified parameter weights:

D.O.	0.21
Fecal Coliforms	0.18 (Total coliforms prior to 1976)
pH	0.15
$TBOD_5$	0.12
NH_4-N	0.12 (linear sub-index from 0 at 25 mg/l to 100 at 0 mg/l)
Total-P	0.12
TSS	0.10 (Using turbidity sub-index in Ott, 1978)

Source: Summary Facilities Plan Update

WATER QUALITY INDEX RESULTS

Table 5-4

Parameter	Station						
	C-e	D-b	1-b	3-b	4-b	6-b	8-b
Periphyton	X	X	X	X	X	X	X
Macrophyton	X	X	X	X	X	X	X
Macroinvertebrates	X	X	X	X	X	X	X
Fish	X	X	X	X (1)	-	X (2)	X

(1) Limited to times when samples can be collected with the assistance of the Wisconsin DNR.

(2) Sample location between station 4-b and 6-b in public hunting grounds.

Source: Summary Facilities Plan Update

BIOLOGICAL MONITORING PARAMETERS

Table 5-5

SAMPLING SCHEDULE FOR BIOLOGICAL PARAMETERS

	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.
WEEK	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4	1 2 3 4
Periphyton										
Substrate in			X		X		X		X	
Substrate out				X		X		X		X
Macroinvertebrates										
Substrate in		X		X		X		X		
Substrate Out				X		X		X		X
Non Substrate Sample		X		X		X		X		X
Fish			X		X		X		X	
Macrophyton		X	X	X	X	X	X	X	X	X

Source: Summary Facilities Plan Update

to detailed interpretations of diversity. The use of a diversity index is probably the best tool to use for measuring the quality of the environment, and the effect of induced stress on the structure of biological communities. Diversity indices assume that the greater the number of species present in proportion to the total number of individual organisms, the greater the stability and health of the system. The biological monitoring data, along with any numerical indices, will be plotted on graphs to show any observable trends.

2. Industrial Pretreatment

Madison has begun its industrial pretreatment analysis, as required by the provisions of their WPDES discharge permit. The entire analysis and implementation program must be completed by March 1982.

The purpose of industrial pretreatment is to control high concentrations of industrially-produced substances at their source, rather than having to remove them at the municipal wastewater treatment system. This may help control the heavy metals concentration entering the Nine Springs influent.

3. Construction Practices

Site construction practices can be planned to reduce construction erosion and sedimentation. Erosion and sedimentation controls will be employed at the Nine Springs site to avoid construction damage to the wetland areas near the sludge facilities.

4. Other

Fencing selected residential areas along Badfish Creek or the effluent ditch can protect local children from the dangers of falling down the steep banks.

MMSD's aquatic weed harvesting program should continue. This will help to reduce DO sags in Badfish Creek.

The Record of Decision will present more specific details on implementing all of the mitigative measures selected by EPA.

E. NEPA REVIEW OF IMPACTS

1. Adverse impacts which cannot be avoided

Short term: Construction disruption, noise, dust, some erosion and sedimentation, and traffic.

Long term: Use of land and construction materials, consumption of energy and labor; diversion of water from the Yahara watershed to a downstream point in that watershed; chance of occasional odors at the treatment plant during system upsets.

2. <u>Short term-long term relationship</u>

Water quality of the proposed receiving stream would be substantially improved from its existing condition upon implementation of the proposed actions. The quantity and quality of the flow in the Badfish Creek would provide ample habitat for fish, especially the downstream areas which have not been channelized in the past. That portion of the Creek in Rock County, in particular, has a variety of habitat areas (pools, swift currents, overhanging stream bank vegetation, etc.) which would provide the areas for resting, feeding and reproduction required to maintain a good warm water fish population.

Improvement of water quality parameters including dissolved oxygen, suspended solids, and other chemical and physical properties of the Nine Springs effluent would provide for gradual change in the quality of Badfish Creek, allowing desirable fish species to make use of the existing habitat areas in the Badfish Creek. In conjunction with the proposed improvements to the treatment facilities, some changes should be made in the local agricultural community farming practices to reduce nutrient loadings from non-point runoff. This problem is being addressed in the 208 Planning effort. Many of these benefits will help contribute to improving downstream areas of the watershed in the Yahara and Rock Rivers, as well as Badfish Creek.

With improved water quality in the Badfish Creek, other recreational uses of the Creek would be possible, such as canoeing. The development of the receiving stream, including provision for adequate public access and removal of fences crossing the Creek, might be considered in the future.

These benefits will be obtained from the short-term costs of construction impacts and the long-term costs of land, materials, labor and energy.

3. <u>Irreversible or Irretrievable Commitment of Resources which would be Involved if the Proposed Actions Should be Implemented</u>

The proposed actions would have the following irreversible or irretrievable commitments:

-- Additional land at the Nine Springs plant site would be dedicated to treatment facilities.

-- Labor and energy resources expended in the construction of the facilities would not be available for other uses.

-- Diversion of water from a portion of the Yahara River basin would continue.

CHAPTER 6

COMMENTS ON THE DRAFT EIS

A. COMMENT LETTERS

Copies of the letter are reproduced following our responses.

1. HUD 7/28/80

   Response: Comments noted

2. Oscar Mayer Company 8/17/80

   Response: a. Badfish Creek discharge support
   Comment noted.

   b. Need for rotating biological contactor questioned

   The single-stage nitrification alternative has been selected in the Final EIS.

   c. Bioassay for ammonia limit

   These studies were performed for the Final EIS.

   d. Need for ozonation questioned

   Ultraviolet light has been selected as a less hazardous form of disinfection than either chlorination on ozonation.

   e. Need for tertiary treatment questioned

   Treatment levels have been chosen to meet the WPDES permit requirements. A full analysis of the greater-than-secondary requirement is found in Section C of Chapter 5.

   f. Effluent equalization questioned
   Separate effluent equalization has not been selected in the Final EIS.

3. Norb Holmblad 8/21/78

   Response: a. Herbicide impacts

   The letter in Figure 6-1 explain the past program of herbicide application along the discharge ditch. Use of this particular herbicide, "silvex," was suspended nationwide by EPA in 1979 except for use on rice fields or range land. The training of the MMSD employees in the proper application of another approved herbicide, such as "roundup," should result in its application according to instructions, with no resulting groundwater pollution.

   b. Town of Dunn impacts

   Planning is in progress for sewers in Dunn Township

MADISON METROPOLITAN SEWERAGE DISTRICT

104 NORTH FIRST STREET
MADISON, WISCONSIN 53704
TELEPHONE (608) 244-3582

RECEIVED
'79 FEB 20 PM 1 46
WATER DIVISION

February 15, 1979

U. S. EPA
Region V Water Division
230 South Dearborn Street
Chicago, Illinois 60604

Attention: Catherine Grissom, Community Planner

Re: Control of Brush Along Badfish Creek

Dear Ms. Grissom:

At the meeting held in Madison on February 14, 1978 you requested that we provide you with information regarding the spray the District uses for brush control along the Badfish Creek and effluent ditch.

The District sprays tree stumps and brush with 2, 4, 5 - TP (Silvex). It is applied by our people who hold a commercial application - activity Code 6 permit from the Wisconsin Department of Agriculture, Trade and Consumer Protection Department. Mr. Tom Whalen, labor Foreman, is licensed under I.D. No. 102313.

Mr. Larry Streeter, assistant labor foreman, is licensed under I. D. No. 1023004.

Attached for your use is a letter from the Wisconsin Department of Natural Resources indicating the District's compliance with the requirements of the Wisconsin Administrative Code.

Hope this information is satisfactory.

Sincerely yours,
MADISON METROPOLITAN SEWERAGE DISTRICT

James L. Nemke
JAMES L. NEMKE
Chief Engineer and Director

JLN/pl
Encl:
as

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

L. P. Voigt
Secretary

BOX 450
MADISON, WISCONSIN 53701

IN REPLY REFER TO: 4200

May 2, 1975

MADISON METROPOLITAN SEWERAGE DISTRICT
RECEIVED
MAY - 5 1975

Mr. Ted R. Beckan, Sr.
Madison Metropolitan Sewerage Dist.
104 N. First Street
Madison, Wisconsin 53704

Dear Mr. Beckan:

Thank you for your notice dated April 21, 1975, indicating your intent to spray with 2,4,5-TP (Silvex) for the purpose of box elder re-growth control on property at T5N, R10E Sections 23, 24 and 25 in Dane County.

Your compliance with the provisions of Wisconsin Administrative Code NR 80 concerning the application of pesticides is appreciated.

Sincerely,
Division of Environmental Standards

Lloyd A. Lueschow nan
Lloyd A. Lueschow, Chief
Laboratory Services Section

LAL:nan

cc: A. E. Ehly - SD Headquarters
Donald Renlund - SD Headquarters

that would go to the existing secondary treatment plant at Stroghton. The Stroghton plant discharges to the Yahara River and has adequate capacity to accommodate this additional flow. Modernization improvements to the Stroughton facility are under construction.

4. Corps of Engineers 8/28/78

Response: We do not anticipate that a 404 permit will be required for this project. This portion of the Madison Nine Springs improvements will affect no wetland areas. Those wetlands near the treatment plant are by the sludge bed areas (discussed in the previous EIS on the Organic Solids Reuse Plan) and are not near the treatment area proposed for expansion.

5. Richard Wedepohl 8/28/78

Response: a. AWT need

Treatment levels for the Madison effluent are determined by the WPDES permit requirements and the special studies of ammonia levels. A detailed analysis of the justification for AWT/AST treatment is given in Section C of Chapter 5.

b. Results of Fifth Addition

The final EIS presents data on the in-stream water quality improvements in Section C of Chapter 3.

c. Fishery improvements

The water quality standards are designed so that Badfish Creek can support a healthy warm water fish population.

d. Definition of impacts

Water quality which does not support a balanced fish population would be a "severe" impact for Badfish Creek. The 2.0 mg/l value for DO would not sustain fish life. High ammonia levels are toxic to fish and other aquatic life.

e. State law on costs and benefits

No hardship will be caused by the relatively low user charges proposed for this project, see Section A of Chapter 5.

6. Soil Conservation Service 8/30/78

Response: Availability of the soil survey is noted in Section B of Chapter 3.

7. Dane County Regional Planning Commission 9/1/78

Response: a. Nitrogen removal

Specific studies on ammonia limits for the Badfish Creek have been prepared for the Final EIS, see Section B-2 of Chapter 2.

b. Project costs and benefits

Project costs have been reduced from the alternative originally proposed in the 1975 Facilities Plan because of the new stream classification and the custom-tailored ammonia limits. Innovative portions of the proposed facility will be eligible for 85% Federal funding, also easing the financial burden on local users. The Final EIS proposes the most cost-effective solution to the water quality limits Madison must achieve.

c. Yahara and Rock River improvements

Improvements to Badfish Creek, itself, will be significant. This, in turn, will improve water quality downstream in the Yahara and Rock Rivers.

d. Financing arrangements

Comment noted. Achieving secondary treatment levels can be painfully expensive for some communities, even including Federal grant assistance. User charges for Madison, however, are quite reasonable.

e. Water level management

The status of lake level management is reported in Section B-2 of Chapter 5.

8. Department of the Interior 9/7/78

Response: a. Yahara River data

The Draft and Final EIS are based on extensive amounts of studies and data, not all of which can be workably included in the EIS documents themselves. We are forwarding you a copy of this background data and will do so for any other background information which readers need to understand the EIS.

b. Dissolved solids impacts

As stated on page 5-30 of the Draft EIS, total dissolved solids concentrations will remain at present levels when the treatment project is completed. No effect is foreseen on macroinvertebrate populations, such as crayfish, from changes in total dissolved solids. The concentration of total suspended solids will decrease, which is favorable for invertebrate filter feeders.

c. Heavy metals impacts

Section B-2-b of Chapter 5 covers heavy metals impacts. An industrial pretreatment program will assist in limiting heavy metals before they enter the Nine Springs treatment plant. Improved treatment will also result in higher removal of heavy metals from the effluent, as the concentration of suspended solids is reduced.

d. Wetlands

e closest wetland to Badfish Creek is the Green Lake wetland, located above ne effluent ditch. Construction measures have been taken to prevent drainage from the wetland to the effluent ditch. Because of differences in elevation, flooding should not be a problem. Other wetlands, adjacent to the Yahara River and the treatment plant, will not be significantly affected by this project.

. Recreation and Badfish Creek access

Dane County is acquiring land for a green belt around Madison. The Nine Springs treatment facility area will be part of this area. Informational ar as are being planned in the green belt.

Recreational access to the effluent ditch and Badfish Creek is limited, due to private ownership. Some duck hunting occurs near the effluent ditch. Canoe access is found adjacent to roads and bridges.

f. No Action alternative

The most recent water quality data for Badfish Creek, after the Fifth Addition, is presented in Section C-1 of Chapter 3. Treatment plant effluent loadings have decreased during the experimental operation of the Fifth Addition as a single-stage nitrification system. However, as the flows to be treated increase over the years, sufficient capacity for this process would not continue and effluent quality would decrease to the secondary level. More capacity is necessary to operate the facility in the single-stage nitrification process for the 20-year planning period.

g. Ozonation

Ozonation data would be developed from pilot studies. The DO level for any alternative is a minimum of 5.0 mg/l to support fish and aquatic life.

h. Yahara River flow

Flow augmentation plans for the Yahara are discussed in Section B-2 of Chapter 5.

i. Water conservation

Madison's conservation effort is outlined in Section A-2 of Chapter 2.

9. Wisconsin Department of Natural Resources 9/22/78

Response: a. Dissolved Oxygen

The 5.0 mg/l DO level is being used for Madison.

b. Water quality standards

Water quality standards are affected both by point and non-point discharges. Both kinds of discharges can have significant impacts on instream water quality. However, point sources, such as a wastewater treatment plant discharge, are much easier to control than the diffuse non-point sources, so a major effort is being made to clean up point sources. Areawide water quality management plans are being developed to help reduce the impact of non-point sources to water bodies, so that water quality standards can be met in all streams.

c. Sludge odors

This was covered in the previous solids EIS for Madison.

d. Stream standards

In the Draft EIS evaluations full fish and aquatic life standards were assumed to be required for all reaches of Badfish Creek. This was to keep the treatment requirements between the various discharge alternatives (Badfish Creek, Yahara River, Wisconsin River, etc.) fairly comparable, and to not immediately "tip" the analysis to the Badfish Creek alternative. Since this initial Draft EIS analysis was conducted and Badfish Creek recommended as the discharge location on this basis, the stream standards have been somewhat relaxed in the upstream reaches of Badfish Creek.

e. Ammonia limit

The additional work done on this topic is given in Section 3 of Chapter 2.

f. Heavy metals

See the response to item c of letter 8, above.

g. Water Quality Criteria book

The 1976 edition was not available when the 1976 Facilities Plan was being prepared, which is the basis of Volume 2 of the Draft EIS.

h. Sludge deposition

The level of suspended solids in the permit is 20 mg/l as a 30-day average. This is considered to be a high level of protection for the aquatic community, see page 5-21 of the Draft EIS. The projected loading at the design size of 50 MGD is 8,345 pounds per day of suspended solids. This is less than the 9,805 pounds per day before the Fifth Addition was built, for a 36 MGD flow, see Section C-1 of Chapter 3.

i. Summary on Draft EIS Alternatives

This information was presented in Table 3-7 of the Draft EIS.

j. Advanced treatment costs and benefits

The AWT/AST review has covered these concerns, see Section C of Chapter 5. Energy considerations are presented in Chapters 2, 4 and 5. UV has less energy requirements than the ozonation method selected in the Draft EIS.

10. Bureau of Land Management 9/25/78

Response: Comment noted.

1.

DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
AREA OFFICE
744 NORTH 4TH. STREET
MILWAUKEE, WISCONSIN 53203

REGION V
300 South Wacker Drive
Chicago, Illinois 60606

JUL 28 1978

IN REPLY REFER TO:
5.5SS

Mr. Gene Wojcik, Chief
EIS Preparation Section Planning Branch
U.S. EPA, Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Wojcik:

Subject: EPA-5-WI-Dane-Madison-WWTP-78
DEIS Wastewater Treatment & Discharge, Dane Co., Wisconsin

We are in receipt of the above captioned material, submitted for our review and comment in accordance with the National Environmental Policy Act of 1969. We have reviewed the material and have determined the following.

XX The Department has no substantive comments regarding the proposal.

___ If practicable, request is made for extension of the review period. We intend to submit Departmental comments to you by ____________.

Sincerely,

John L. Kane
Area Director

2.

Quality Foods Since 1883 OSCAR MAYER & CO. · GENERAL OFFICES
P O Box 7188 · Madison, WI 53707 · (608) 241 3311 · TELEX 26 5468

August 17, 1978

U. S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Attention: Mr. Gene Wojcik, Chief
EIS Preparation Section
Planning Branch

Re: Draft Environmental Impact Statement
Wastewater Treatment and Discharge
Madison Metropolitan Sewerage District

Gentlemen:

Oscar Mayer & Co. Inc. is pleased to have this opportunity to comment on the Draft Environmental Impact Statement, Wastewater Treatment and Discharge, Madison Metropolitan Sewerage District, Dane County, Wisconsin. We find that the Draft EIS competently presents the results and conclusions of a thorough study of the projected future wastewater needs and discharge requirements of the Madison Metropolitan Sewerage District. We complement Region V on this document for its advocacy of a flexible approach whereby there appears to be opportunities to further assess District requirements versus benefits during the tenure of the overall improvement program.

Our specific comments and recommendations follow:

1. We completely support the preferred alternative of continued discharge of treated effluent to Badfish Creek. We see no benefit in partial or full discharge to the Yahara River where preexisting natural conditions preclude measurable improvement of river water dissolved oxygen.

2. We question the immediate need and probably the future need to construct a Rotating Biological Contactor Nitrification treatment facility. Current, highly successful single stage nitrification in the activated sludge mode is being achieved on a partial plant basis by the District. This single stage approach warrants serious consideration as a much less costly approach to the minor problem of the effluent ammonia nitrogen content.

3. The District should be allowed to conduct further bioassay studies to determine the actual levels of ammonia nitrogen and un-ionized ammonia which can safely be tolerated in Badfish Creek rather than rely on the Quality Criteria for Water level of 0.02 mg/l un-ionized ammonia which

Is the Madison Metropolitan Sewerage District using these chemicals to maintain the Badfish effluent ditch? Do they drift into the water? Will the Final EIS address this? The ditch runs through my land and I know that whatever they are spraying is very devistating.

Norb Holmblad
1510 Winslow Ln
Madison, Wi 53711

THE CAPITAL TIMES, Thursday, Aug. 17, 1978 — 21

Unchecked herbicides worry EPA

By PETER J BERNSTEIN
Newhouse News Service

ATLANTA — Federal environmental officials are on the lookout for adverse health effects of farmland weed killers sprayed from the air

The herbicides are 2,4 D and 2,4 5 T, the same chemicals once used by the U S military as part of the notorious Agent Orange to defoliate the jungles in Vietnam The Defense Department stopped the defoliation program in 1970 after finding that Agent Orange caused birth defects in mice and rats

Today the herbicides are being sprayed on farm crops throughout the southeastern states with virtually no government safeguards Any licensed pilot can spray the chemicals without informing government authorities in advance No federal or state permit is needed

"There's no health hazard if the stuff is applied properly," said John Puglise, chief of the pesticides compliance section of the U S Environmental Protection Agency's regional headquarters here **"But there could be a problem if the chemicals drift into rivers or lakes that supply drinking water,"** he said

The EPA relies on citizens to report any adverse effects from spraying But the agency has only six inspectors to cover an eight-state region of the Southeast

Congress has passed legislation that will shift responsibility for monitoring such aerial spraying from EPA to the states beginning Oct 1 But most states in this region where the economic importance of herbicides long has taken precedence over their potential dangers have yet to develop effective monitoring systems

The herbicides in question contain small amounts of dioxins, a chemical known to cause birth defects and still-births in laboratory animals Such dioxins occur in far greater quantities in Agent Orange, which is a mixture of 2,4 D and 2,4,5 T To hold down the level of dioxins, EPA requires that the chemicals be applied separately, never as a mixture

3

was established as 1/10th the lowest lethal concentration found for the most sensitive fish specie. It appears that greater effluent strength variability for ammonia nitrogen would be in order rather than to permanently accept the seasonable ranges now incorporated in the WPDES Permit to Discharge. This greater strength flexibility is particularily warranted in light of the fact that the effluent ammonia nitrogen content appears to be minor when considered against the runoff related sources of nitrogen.

4. There appears to be no documented need to switch to Ozonation of effluent disinfection and the undetermined increased operating and maintenance costs are lightly dismissed. Based upon examination of the low levels of total chlorine found in the plant effluent, we find no need to discontinue effluent chlorination during the annual months disinfection is required.

5. We question if there is a demonstrated need for tertiary filtration facilities. Examination of the effluent suspended solids levels now achieved indicates that a high level of protection to fish and aquatic life is in fact already provided. Before construction of these costly facilities, there must be a demonstration of a worthwile cost benefit, said benefit being the BOD_5 removal component value only.

6. Effluent equalization may ultimately be required. However, it is not needed at this time and when and if constructed we recommend permanent concrete tankage rather than an open storage lagoon.

In summary, we recommend that the Draft EIS when approved be clearly indicative of the fact that it is not a rigid treatment plan, but that it represents a compendium of plausible approaches for meeting the long term wastewater treatment needs of the Madison Metropolitan Sewerage District. We have complete confidence in the Districts' Commissioners and their fine staff, ably abetted by the resources of the University of Wisconsin: and that through these dedicated individuals complete protection of the affected water resources will be attained at a reasonable cost to all those served by the District.

Please contact us if additional information or questions arise as to this statement.

Very truly yours,

D.O. Dencker

D. O. Dencker
General Engineering
Environmental Manager

DOD:jg

cc: J. T. Weyrough
D. B. Johnson
J. E. Spohn

Dunn goes for sewer system 7/22/78

By Richard Cameron
Press Connection Writer

Dunn Kegonsa sewer district commissioners Friday announced they have formally applied to the Farmers Home Administration (FHA) for a $1.5 million grant to install a sewer system in the Town of Dunn.

To be eligible for the grant, sewer district taxpayers still must approve a $1.8 million bond issue to finance the local share of the $1.6 million project. The remainder of the project will be funded by the state and the federal Environmental Protection Agency.

Final FHA approval of the grant will not be known at least until October, commissioner Olaf Hestnes said. "I think we have a very favorable chance," Hestnes commented. "Things are falling right into place."

Dunn resident William Stone, meanwhile, announced that he has collected nearly 400 names in his petition drive to oust the three Kegonsa commissioners.

8/21/78

will this system cause more strain on the Badfish? Is the system considered in the EIS?

Norb Holmbled
1570 Winslow Ln.
Madison Wi 53711

4.

DEPARTMENT OF THE ARMY
ROCK ISLAND DISTRICT CORPS OF ENGINEERS
CLOCK TOWER BUILDING
ROCK ISLAND, ILLINOIS 61201

IN REPLY REFER TO
NCRED-PB

28 AUG 1978

Mr. Kent Fuller, Chief
Planning Branch
Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Fuller:

This office has reviewed your agency's draft environmental statement for "Wastewater Treatment and Discharge" for the Madison Metropolitan Sewage District, Dane County, Wisconsin. Our comments are as follows.

No mention of Section 404 of the FWPCA amendments of 1972 is made in the statement. Although the discharge system selected will utilize an existing and operating outlet system to Badfish Creek, the proposed improvements at the plant site may involve construction activities encroaching on wetland areas contiguous to the existing plant site. Clarification and description is desired in regard to any discharges of dredged or fill material into wetlands located adjacent to the Yahara River.

This office has not had any previous coordination regarding permit requirements for the subject project, and is willing to assist your office in these determinations upon request. Please inquire of Mr. Monte Hines, Regulatory Functions Branch, Operations Division, of this office concerning these matters.

Thank you for the opportunity to review and comment on the subject proposal.

Sincerely yours,

Doyle W. McCully

DOYLE W. McCULLY, P.E.
Chief, Engineering Division

6.

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE
4601 Hammersley Road, Madison, Wisconsin 53711

August 30, 1978

Gene Wojcik, Chief
EIS Preparation Section
Planning Branch
U.S. Environmental Protection Agency
Region V
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Wojcik:

We have reviewed the draft environmental impact statement for Wastewater Treatment and Discharge and the Summary Plan and Environmental Assessment Wastewater Treatment and Discharge, Madison Metropolitan Sewerage District, Dane County, Wisconsin referred to our agency on July 25, 1978. Our review comment follows:

Updated soils information should be obtained for Dane County, Wisconsin. Published soils surveys dated January 1978 are available from the Soil Conservation Service, Agricultural Service Center, 57 Fairgrounds Drive, Room 116, Madison, WI 53713.

We appreciate the opportunity to review and comment on the proposed action.

Sincerely,

J.C. Hytry
J.C. Hytry
State Conservationist

7.

Dane County Regional Planning Commission

Room 114 City-County Bldg. Madison, Wisconsin 53709 Tel. 608 266-4137

September 1, 1978

Mr. Gene Wojcik
Chief, EIS Preparation Section
Planning Branch, U.S. EPA Region V
230 S. Dearborn Street
Chicago, Illinois 60604

RE: Environmental Impact Statement, Wastewater Treatment and Discharge, Madison Metropolitan Sewerage District

Dear Mr. Wojcik:

The Dane County Regional Planning Commission has reviewed the draft Environmental Impact Statement, Wastewater Treatment and Discharge, Madison Metropolitan Sewerage District. Our staff participated in the development of portions of the Facilities Plan for the proposed project, and have been involved in developing the Dane County Water Quality Plan over the last three years.

The alternative favored in the EIS is the same as that favored in the Facilities Plan - provision of advanced waste treatment and discharge to Badfish Creek. The EIS proposes modifying the project recommended in the Facilities Plan. The modifications would relax requirements for ammonia nitrogen removal, and require instead continued monitoring and bioassays to determine ammonia nitrogen limitations appropriate to conditions and fish species which exist, or could exist in Badfish Creek. If these continuing studies indicate the need for additional ammonia nitrogen removal, the design would be flexible enough to incorporate needed facilities at a later date.

The project favored in the EIS - Alternative #3 - is generally consistent with draft recommendations of the Dane County Water Quality Plan. We support the revisions to the project regarding ammonia nitrogen removal. Data is lacking regarding ammonia nitrogen toxicity under conditions and with fish species appropriate to Badfish Creek. There are several Dane County communities facing ammonia nitrogen limitations in their effluents. Too restrictive ammonia nitrogen limitations can result in large cost increases without significant water quality benefits.

Our work on the Water Quality Plan over the last few years has raised questions regarding the priorities and emphasis of present funding programs. While state and federal programs and policies cannot be changed for this particular project, we feel it is important to review the overall effects of the proposed project.

5.

4410 Hammersley Road
Madison, Wi. 53711

August 28, 1978

Mr. Gene Wojcik
Chief, EIS Preparation Section
U.S. EPA Region V
230 South Dearborn Street
Chicago, Ill. 60604

Subject: Comments on the draft EIS for the Madison Met

Dear Mr. Wojcik,

My comments to you are directed from my viewpoint as a resident and taxpayer in the City of Madison.

My conern regarding this draft statement is that it does not adequately address the need for advanced wastewater treatment facilities, that it does not adequately address the "no action" alternative, nor does it adequately describe the benefits that will be achieved should this proposed action be implemented.

It appears that the "need" for advanced wastewater treatment was partially addressed on page 3-7 of the EIS under the "no action" alternative. It was stated that this alternative was rejected because, quote, "it will clearly not meet national water quality goals and because it would create severe environmental impacts." Then the paragraph continues by saying that, in fact, no water quality modelling had ever been completed for this alternative.

I find it very difficult to understand how the judgement was made that severe environmental impacts would clearly result from this alternative. Granted, even though the present Fifth Addition facilities may not be adequate at some point in the future, as was stated, I feel that it is very presumptuous to assume that advanced, rather than increased secondary facilities would be necessary to treat this expected additional flow.

Because the EIS does not adequately describe the present conditions of the Badfish system (with the Fifth Addition on-line) I find it very difficult to make some important value judgements. For example,

1. What will be the real improvement in the stream's fisheries resource?

2. What specifically is a "severe" environmental impact for Badfish Creek? As an example, does a severe impact result when the dissolved oxygen in a small portion of the stream is only 2 mg/l instead of 5 mg/l ? Similarly does a severe impact exsist when the ammonia level of the ditch causes discomfort and signs of stress to a specific species of game fish during the summer?

I cannot make a judgement as to whether the proposed advanced treatment facilities will radically change the present usefullness of the Badfish system. Is the expenditure of large amounts of dollars and energy worth the "unknown" improvements which might result from new facilities?

What is this stream worth? Is it worth the additional estimated $14.7 million in capital costs plus the $1.7 million per year in operating costs? Especially, is it worth this much money when, as a net result of new advanced facili few game fish might venture into areas that they do not now inhabit? It pointed out in the EIS that, as a concession to local citizens living ad to a portion of the stream, that the stream would be fenced to protect s children from entering it! Surely there has to be a more cost-effective of improving this nation's waters than by spending this large amount of taxpayer's money on advanced wastewater treatment facilities for Madison

I was also concerned because the EIS implied that advanced wastewater tr was required by the state for a discharge to the present site; that ther no alternatives such as secondary treatment. It is my impression that S does allow some flexibility in this regard and nowhere in the EIS or the plan can I find such reference. Chapter 147.05 (3) of the Wisconsin Nat Resources Laws states "If a person affected by such limitations demonstr at the hearing that there is no reasonable relationship between the econ and social costs and the benefits to be obtained, the department shall modify such limitation as it applies to that person."

In summary, I do not feel that the EIS adequately identified the benefit might be obtained from an advanced wastewater discharge to Badfish Cree do I agree that 'severe environmental impacts would clearly result from "no action" alternative.

Sincerely,

Richard E. Wedepohl, P.E.

The cost of the project in relation to the water quality benefits seems disproportionate, particularly as compared with the benefits which could be received from other water quality improvement programs in Dane County. The initial construction cost of the proposed facilities is $20-25 million, and advanced waste treatment will increase operation and maintenance costs by more than $1.5 million each year. A substantial portion of the increased cost will be borne by local residents. Preliminary estimates indicate that this single project represents over one-third of the total public costs associated with the Dane County Water Quality Plan.

The primary water quality benefits will be felt in Badfish Creek. The upper two-thirds of the creek, in Dane County, was very marginal trout habitat prior to diversion. Alterations to the stream bed and banks, loss of wetlands and other factors have eliminated the possibility of restoring even a stocked trout fishery, with or without the MMSD effluent. Available information indicates that the downstream portion (Rock County) of Badfish Creek did not support trout before diversion. Without the MMSD effluent, the upper part of Badfish Creek (above CTH A) would probably not continuously support a warmwater fishery, and the DNR classification seems appropriate in that context. With an improved MMSD effluent, it may be possible to maintain a limited warmwater fishery above CTH A. In Dane County, there is only limited recreational demand on Badfish Creek, because of the proximity of other higher quality recreational resources. In view of these facts, we believe that the most important water quality objectives for Badfish Creek are maintenance of dissolved oxygen and ammonia nitrogen levels appropriate to a warmwater fishery, and maintenance of water quality suitable for livestock watering and body-contact recreation.

The cost of the proposed project could more easily be justified if significant water quality improvement in the Yahara and Rock Rivers were expected. Water quality effects of continued secondary treatment were not quantified, so it is impossible to determine the degree of water quality improvement in the Yahara and Rock Rivers attributable to advanced waste treatment. In many respects, the effects of the initial diversion on the Yahara and Rock Rivers were not as significant as expected. This is one area not adequately addressed in the Facilities Plan or the Environmental Impact Statement. Demonstration of significant water quality improvement in the Yahara and Rock Rivers would provide much more justification for the project than meeting water quality standards in Badfish Creek.

Present financing policies also raise some question. If all communities are required to provide secondary treatment, we would urge increased reliance on local sewer service charges for financing the costs of secondary treatment, and less emphasis on federal and state grants. Where advanced waste treatment is required, water quality improvements often benefit downstream users, rather than those paying the local share of the cost. We would support a shift in federal and state policy to emphasize using federal and state funds to pay for the construction, operation and maintenance of advanced waste treatment facilities, and to deemphasize federal and state grants for secondary treatment.

Finally, our review has satisfied us that most of the other significant issues relating to the project have been adequately addressed in the Environmental Impact Statement. The EIS expresses concern in several places about the effects of continued diversion on flows in the Yahara River. The EIS notes that the Facilities Plan analyzes this issue and proposes lake level management on the Yahara chain of lakes as the most feasible solution. The EIS notes that implementation of this proposal is outside the jurisdiction of MMSD, and expresses concern that this problem will be pursued. You should be aware that the City-County Lakes Committee, working with our staff support, is addressing this problem, and their draft report proposes initiation of action in the near future to address this situation. If the City and County adopt this report in the near future, we can expect studies to begin next year. Since flow augmentation is only one of several concerns of lake level and flow management, we are not yet sure that the proposal in the Facilities Plan can be fully implemented. There does, however, appear to be a local commitment to develop solutions to this problem.

We appreciate the opportunity to comment on the proposal, and to raise some of the larger issues discussed.

Sincerely,

Charles Montemayor
Executive Director

WL:CM:ak
cc: Senator Gaylord Nelson
Senator William Proxmire
Congressman Robert Kastenmeier

8.

United States Department of the Interior

OFFICE OF THE SECRETARY
NORTH CENTRAL REGION
2510 DEMPSTER STREET
DES PLAINES, ILLINOIS 60016

RECEIVED
SEP 0 8 1978
EPA REGION 5
OFFICE OF REGIONAL ADMINISTRATOR

ER 78/692

September 7, 1978

Mr. Valdus K. Adamkus
Acting Regional Administrator
U.S. Environmental Protection Agency
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

This is in response to the request for the Department of the Interior's comments on the draft environmental statement for the Madison Metropolitan Sewerage District, Dane County, Wisconsin.

In general, we find inadequacies in the treatment of fish and wildlife and recreational resources.

FISH AND WILDLIFE

The discussion on pages 3-14 and 3-15 concerning effects of additional effluent on dissolved oxygen and temperature in the Yahara River is lacking because the reader is referred to another document which did not accompany the EIS. The relevant portions of that document should be appended to the final statement, or at least abstracted for reader use. We would consider the EIS as inadequate until it substantiates the basis for the statement that increased temperature and biochemical oxygen demand will not harm aquatic organisms.

There is no discussion in the statement of the effects of higher total dissolved solids (TDS) concentrations on invertebrates such as crayfish--an important food source for smallmouth bass. The final statement should discuss in more detail the effects of greater TDS concentrations on the entire aquatic system.

In the discussion concerning heavy metals (pp. 5-31 to 5-41), it is stated that several metals in the effluent would approach or exceed maximum allowable limits. The rationale for permitting excess quantities appears to be that heavy metal concentrations in receiving streams are

original: Water

even higher. This does not appear to be consistent with other Federa and State regulations in Wisconsin where the "best available technolo principle is applied. Appropriate steps should be taken and describe in the report to reduce the heavy metal concentrations in the effluen to below the allowable limits prior to discharge. Cumulative concentrations of these metals may be a greater cause for concern thar the initial detrimental effects.

Badfish Creek adjoins almost 500 acres of wetlands valuable to wildlife, and increased flooding of the creek and its wetlands are predicted as a result of the proposed action. The final statement should discuss impacts of this increased flooding on wetland vegetatio and wildlife of the area.

RECREATION

From the information provided, one cannot determine which of the alternatives will result in the most favorable environment for recreational pursuits.

Public Law 92-500, as amended in 1977, states in Section 201(g)(6) that "The Administrator shall not make grants from funds authorized for any fiscal year beginning after September 30, 1978, to any State, municipality, or intermunicipal or interstate agency for the erection, building, acquisition, alteration, remodeling, improvement, or extension of treatment works unless the grant application has satisfactorily demonstrated to the Administrator that the applicant has analyzed the potential recreation and open space opportunities in the planning of the proposed treatment works." This document identifies the existing recreational facilities and lands but is lacking in specific plans for development.

Part I

Page 2-39, last par.: It is stated that lands to the south and east of the treatment plant and sludge lagoons are being held in public ownership for recreation and open space use. We believe the applicant should be directed to seek cooperation in planning and development with the public agencies owning these lands.

Page 3-7, "No Action" Alternative: Conclusions regarding the "no action alternative as presented here and in table 3-7 (following p. 3-42) are based mainly on assumption. Nearly every statement pertinent to this alternative in the table contains the word "expected", but no bases for these expectations are clearly given. The final statement, to the degree possible, should contain supporting evidence for these conclusions.

Apparently a major criterion favoring the selection of Alternative 3 is its ability to consistently meet minimum D.O. levels. It is stated on page 3-32 that "Assuming ozonation is used...the effluent may have a higher level of dissolved oxygen than the other alternatives. This would have to be substantiated by further study if this alternative would be selected." It would seem that determination of the effect of ozonation on D.O. levels should be made prior to choosing an alternative. What would be the result if ozonation is not used, and what would be the effect on D.O. levels for the other two alternatives if ozonation is considered for them as well? These questions should be answered to assure that all alternatives are covered thoroughly.

Pages 3-34 and 35, sec. 4(D)(3)(b); and page 5-3, sec. 5(E)(3)(a): These sections indicate a greater negative impact on flow levels and more need for flow augmentation to the Yahara River for Alternative 3 than for Alternatives 1 and 2. As this document acknowledges (p. 2-39) and the Wisconsin Outdoor Recreation Plan states, the Yahara River is considered one of the more significant scenic recreation resources in the area. Therefore, while the MMSD's facilities plan considers how to deal with the problem, and there is a recommendation for cooperation with area agencies to implement a flow augmentation plan (p. 3-42, last par.), a firm commitment to maintaining adequate flow levels should be included. This important problem should not be dismissed.

Table 3-7: Present-worth cost for Alternative 1 is stated as $57,223,000 and for Alternative 2 as $54,204,000; however, the verbal statement of cost for Alternative 2 reads "Significantly more costly than Alternative 3 and almost more costly than #1." This discrepancy should be corrected in the final statement.

Part II, Summary Plan

Page 2-5, sec. 2.04: Objectives (A)(1), (A)(4) and (B)(4) show an adequate consideration of recreation. This should be clearly reflected in planning. The flooding potential of Alternative 3, which would have a negative impact on land use for the most frequently occurring floods, is given minimal consideration in evaluating the alternatives. We believe this flooding potential makes open-space recreational use a desirable option along the effluent pipeline and ditch, and along Badfish Creek.

Pages 9-13-18: President Carter, in his Federal Water Resources Programs and Projects statement of June 6, 1978, emphasized that "Using water more efficiently is often cheaper and less damaging to the environment than developing additional supplies and treatment facilities." In view of this statement, we urge consideration of water conservation within section 9.03.

Part II, Environmental Assessment

Page 5-13: The second paragraph indicates that with improved water quality in Badfish Creek, recreational opportunities will increase and provisions for adequate public access might be considered in the future. Such provisions should be included in present planning. Public access for fishing and canoeing would be consistent with the Wisconsin Outdoor Recreation Plan as well as Public Law 92-500. Additionally, the area along Badfish Creek and the effluent ditch and pipeline may be well suited for trail development (assuming increased effluent quality with a concomitant decrease in odor). The recommended increase in brush and weed cutting (p. 6-5, par. b) could be coupled with trail preparation.

Sincerely yours,

David L. Jervis

David L. Jervis
Regional Environmental Officer

9.

State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Anthony S. Earl
Secretary

BOX 7921
MADISON, WISCONSIN 53707

September 22, 1978

IN REPLY REFER TO: 1600

Mr. Gene Wojcik
U. S. Environmental Protection Agency
Region V
230 South Dearborn
Chicago, IL 60604

Dear Mr. Wojcik:

Re: Draft Environmental Impact Statement -
Wastewater Treatment and Discharge
Madison Metropolitan Sewerage District,
Dane County, Wisconsin

The Department has completed its review of the above document and offers the following comments:

Specific Comments

Page 2-6, paragraph 3 - The statement contained herein should read Kegonsa not Kegona.

Page 2-10, paragraph 4 - Biological oxygen demand is not the correct nomenclature for BOD. The parameter should be described as biochemical oxygen demand. This paragraph further implies that 3 mg/l of DO will support desirable forms of aquatic life. Although some aquatic life can survive with a DO level of 3 mg/l, water quality standards and scientific data indicate that at least 5 mg/l is necessary to support a balanced fish and aquatic community.

Page 2-11, Section 6 - In the discussion of present water quality, the general conclusion is that water quality standards are not being met for a number of parameters, even in streams not subject to the influence of MMSD discharge. An effort should be made to explain why standards are being applied to effluent limitations when such standards are not being met on noneffluent influenced waters.

Page 2-14 - The abbreviations listed here should be clearly defined.

Page 2-16, paragraph 2 - The last word should read "good" not "food." Also other sources of contamination should be identified.

Page 2-17 (b4) - Should read Figure 2-5 not Figure 2-6.

Page 2-19, paragraph 1 - The two sentences starting with "the results of the study..." are confusing, especially the last part of the second sentence. We suggest this be stated in more understandable language.

Page 2-22, E.1.1(A) - This sentence is incomplete.

Page 2-25, last paragraph, first sentence - Should read macroinvertebrate not macroinvertelirate.

Page 2-28, No. 3 - Odors may be present due to the removal of sludge materials from the storage lagoons because of aerobic decomposition occurring below the sludge surface. Due to the active program proposed by MMSD of reducing the sludge lagoon volumes, complaints might be expected from area residents.

Page 3-4, paragraph 1 - It is important to explain the logic used by MMSD and DNR in assuming that fish and aquatic life standards would be required in all reaches of Badfish Creek. We encourage this procedure in an effort to limit any bias in evaluating alternatives during the facilities planning process. If a variance to the water quality standards had been proposed for Badfish Creek, it would appear that this was the most viable alternative.

Page 3-5, paragraph 1 - EPA indicates they feel the maximum limit of 1.0 mg/l of ammonia nitrogen will protect the upper reaches of Badfish Creek from toxic effects. There is no rationale given to support this conclusion.

Page 3-15 (a5) - Is the level of ammonia nitrogen correctly expressed here?

Pages 3-15 and 3-16, paragraph (a7) - What is the basis for the conclusion that heavy metals will not affect the aquatic environment?

Page 3-30, Section (c) - It should be more clearly explained what the DNR proposed variance for Badfish Creek means in terms of water quality standards. The variance is intended to apply to only a relatively small portion of Badfish Creek, and it has little effect on the final effluent limits.

Page 3-33, Section (a5) - The last sentence in this paragraph says that EPA has information showing that 1 mg/1 of ammonia in the MMSD effluent is equivalent to 0.02 mg/1 of unionized ammonia. We are unaware of any data supporting this conclusion.

Page 3-33, Section (a7) - Please state the basis for concluding that there will be no significant effect on aquatic life when the heavy metals are higher than the recommended levels?

Page 5-2, paragraph 3 - Throughout the succeeding discussion, the reference used for water quality criteria evaluation is Water Quality Criteria 1972. Why wasn't the more recent 1976 Water Quality Criteria used as a reference source for this evaluation?

Page 5-24, paragraph 1 - No mention is made of the impact of suspended solids on sludge deposition in Badfish Creek or the Yahara River.

General Comments

1. We do not disagree that the discharge of effluent to Badfish Creek appears to be the best alternative; however, summary information should be included to detail why the other two alternatives were not as desirable.

2. The report should contain a cost-benefit study on construction and operation of the advance treatment facilities. These types of systems are very energy intensive. Considering the present concern for energy conservation, it is important that the EIS discuss this. In addition, the EIS should provide an updated cost effectiveness analysis comparing the ozonation disinfection method with the originally planned breakpoint chlorination followed by dechlorination method.

3. The "layering technique" which was used for the preparation of this draft creates several problems.

   A. The many references to the facilities plan and environmental assessment make it very difficult to read and review.

   B. The end product is very confusing and lengthy.

   C. The report does not follow logically in some of its presentations.

   D. The document should be written such that almost any layman can pick it up and understand it. This is not the case.

   E. It appears that much of the information in the document could be more succinctly presented.

Thank you for the opportunity to review and comment on this Draft Environmental Impact Statement. Please feel free to contact me if you have any questions on our comments.

Sincerely,
Bureau of Environmental Impact

Howard S. Druckenmiller
Director

cc: C. Blabaum
D. Morrissette - Wakanda
J. Cain

10.

IN REPLY REFER TO

United States Department of the Interior

1793 (930)

BUREAU OF LAND MANAGEMENT

EASTERN STATES OFFICE
7981 Eastern Avenue
Silver Spring, Maryland 20910

SEP 25 1978

Mr. Kent Fuller
Environmental Protection Agency
Region V
230 S. Dearborn Street
Chicago, Illinois 60604

Dear Mr. Fuller:

We are sorry for the delay in responding to your request for comments on the Draft Environmental Impact Statement concerning Wastewater Treatment and Discharge in Dane County, Wisconsin.

As there are no BLM islands or public lands in the area influenced by the project, it will not affect any of our programs and we have no comments.

Thank you for allowing us to review your Draft Environmental Impact Statement.

Sincerely yours,

Director
Eastern States

ENVIRONMENTAL PROTECTION AGENCY
RECEIVED
SEP 28 1978
PLANNING BRANCH—REGION V
FILE NO.

B. PUBLIC HEARING

Sessions were held at Madison and Janesville on August 17, 1973.

Complete hearing transcripts may be viewed at USEPA, Region V, Chicago.

Following is a hearing summary and the responses of USEPA. (C = comment and R = response).

1. Jim Nemke, Director, Madison Metropolitan Sewerage District

C - The additional bioassay studies recommended for use in evaluating a less strict ammonia limit are not necessary; basis of past tests at the treatment plant.

R - The bioassay work has been completed and the results have been used to develop new ammonia limits for the Final EIS.

C - Costs for additional ammonia removal may not be necessary.

R - Ammonia levels have been redefined for the Final EIS, see Section B of Chapter 2.

C - Supports District monitoring of Badfish Creek before and after the new facilities.

R - This is appropriate for this project, and is described in Section D of Chapter 5.

C - Should also look at using marshlands along the effluent ditch for polishing and equalization of flow; an innovative alternative.

R - Grass Lake is the major wetland area available for this type of treatment alternative. Considerable acreage would be necessary to treat the 50 MGD design flow. Grass Lake is included in the first priority group of the 1974 Dane County Wetlands Study. It is one of the few healthy deep water marshes in the County, with considerable wildlife value, and ought to be preserved as a natural area. The high volume of effluent would destroy this resource. While innovative alternatives can be extremely valuable, this particular one is unfeasible and undesirable.

C - The secondary treatment addition is on line; treatment results have been good and should be considered.

R - See a presentation of treatment quality improvements from increased capacity of the Fifth Addition in Chapter 3.

2. Dave Holman, Environmental Protection Director, Rock County

C - Implement the Facilities Plan immediately for a five year period.

R - Since the Public Hearing, the Facilities Plan has been revised. In the meantime the Fifth Addition for secondary treatment capacity has gone on line.

C - Insufficient information is available now to make long-range predictions of water quality impacts; a monitoring program is necessary for future evaluutions.

R - The monitoring program is recommended in Chapter 5.

C - Need for an implementation plan for flow augmentation before the treatment plant goes into operation.

R - The "City-County Lakes Committee Report", issued in November 1978 addresses lake level management above the Yahara River as one of its top priorities. Section B-2 of Chapter 5 explains the local effort being undertaken to work on lake level management. Streamflow augmentation would be one of the goals of this program.

C - Need for compliance with the mitigation provisions developed in the EIS.

R - Implementation responsibilities for the mitigation measures are outlined in Chapter 5.

C - A dissolved oxygen and ammonia monitoring program is critical to comply with water quality standards and to protect stream life at all times.

R - A monitoring program is one of the EIS recommendations, described in Chapter 5.

C - If water quality plans don't work, Rock County is prepared to take legal action.

R - Comment noted.

3. Peter Ruffier, Sanitation Department, University of Wisconsin

C - Has worked on the Madison ammonia bioassay project; fish can survive 0.02 mg/l of unionized ammonia; increased removal would not increase the potential for fish and aquatic life.

R - Our analysis of this bioassay work is presented in Section B of Chapter 2.

4. Adrian Freund, Dane County Regional Commission.

C - The Draft EIS alternative is generally consistent with the Dane County Water Quality Plan.

R - Comment noted.

C - Ammonia limits not be stricter than necessary or the costs will be excessive; costs will be borne by local residents.

R - This is why we are seeking the cost-effective solution. Section B of Chapter 2 covers the latest findings on ammonia and Section C of Chapter 5 presents the AST/AWT review process.

C - Impacts to the Yahara and Rock Rivers should be addressed more thoroughly.

R - The Draft EIS analysis showed that this was difficult to do, except for total dissolved solids (TDS) concentrations. Because the Yahara and Rock Rivers have much larger flows, the impacts of Badfish Creek become more dilute and specific impacts are difficult to quantify. Improving water quality in Badfish Creek will have beneficial, although less measurable, downstream impacts.

C - Some of this money might better be spent on non-point source control.

R - Both point and non-point programs are important, as the Clean Water Act recognizes. Funding, however, is not interchangeable under the Act.

C - Water quality, including dissolved oxygen and ammonia, should support a warm water fishery, livestock watering, and body-contact recreation; past trout habitat was marginal; other stream alterations would eliminate restoring even a stocked trout fishery.

R - Warm water fishery and full-body contact standards are being used for the Madison WPDES permit.

C - Upstream residents pay for advanced waste treatment while downstream users get the benefits; funding policy should be changed to make this more equitable.

R - This policy change would require major alterations of the existing regulations and is beyond the scope of this EIS. Downstream residents are responsible for their own communities' wastewater treatment systems.

5. Chris Beebe, Cooksville, Wisconsin resident

C - Badfish Creek borders his property; local farmers don't like the present stream condition; need to clean up and not pass the problem downstream.

R - Past water quality in the Badfish has been poor, as documented in Chapter 3. Recent capacity improvements at the Madison treatment plant, the Fifth Addition, have already improved water quality. Chapter 5 describes further improvements that are planned as a result of the EIS process.

6. City of Madison

C - Resolution supporting the advanced waste treatment alternative chosen in the Facilities Plan.

R - Comment noted.

7. Don Hana, Director, Rock Valley Metropolitan Council

C - Need to proceed rapidly with advanced waste treatment construction.

R - Advanced waste treatment is one of the major conclusions of the EIS.

C - Need to monitor the new system after 5 years to see if it works, at that point, do more, if necessary.

R - Section D-I of Chapter 5 describes the monitoring program.

8. Karl Gutknecht, Cooksville, Wisconsin resident

C - Badfish Creek is presently in poor condition. Contamination of waterfowl and impacts to the food chain fears genetic mutations; damage to livestock.

R - Comment noted.

C - Continued discharge to Badfish Creek would mean continued chemical damage to the stream and would prevent its use for recreation.

R - The present discharge to Badfish Creek is substantially improved, compared to the effluent of past years. This results from the increased secondary treatment capacity already on line from the Fifth Addition. Additional improvements will result from the advanced waste treatment indicated by the EIS. Ammonia and pathogens will be reduced to safe levels for warm water fishery and full body contact. In addition, an industrial pretreatment program will be used to control many substances before they reach the municipal treatment facility.

C - Pollutants may contaminate the groundwater during flooding.

R - If wells are properly designed and installed as required by the State of Wisconsin, there should be no contamination of wells during flooding. Future effluent will receive a much higher degree of treatment than it has in the past, as well. Advanced waste treatment will keep the nitrate/nitrite concentration at safe levels.

C - The environmental impacts may have high costs; afraid of the situation and its impacts to health.

R - The quality of effluent proposed is near the state-of-the-art level in wastewater treatment, in order to improve stream conditions and protect public health.

C - The Draft EIS is difficult to understand; it hides the truth from the public.

R - The layered Draft EIS format was necessary to condense the eight volumes of background facilities planning information and to be compatible with our EIS preparation resources. While all of its cross-references can make for choppy reading, it is not intentionally designed to be confusing. We will be glad to help clarify items within it. The Final EIS uses an issue-oriented format to focus on the most important new developments.

9. Chris Beebe, Cooksville, Wisconsin resident

C - Badfish Creek borders his property; foul water; never freezes; little stream life.

R - Comment noted.

C - Effluent would certainly be higher quality if it had to be discharged to one of the Madison lakes; the problem is being shunted downstream; a false economy.

R - Streams can assimilate wastewater more readily than lakes. This is because lakes trap buildups of nutrients, resulting in greater water quality problems. Lake discharge is generally unadvisable if there is a stream alternative and was prohibited many years ago for Madison. In recent years a great deal of effort has gone into examining and expanding the hydraulic capacity and sludge handling facilities at Madison, improvements which are now being built or are in operation. This EIS seeks to resolve the advanced wastewater treatment issues in order to complete necessary improvements at Madison. The planning is necessary to spend Federal and local funds on the necessary improvements in the most effective way.

C - The stream is channelized in Dane County; natural meanders are in Rock County.

R - Channelization and agricultural drainage programs were initiated on Badfish Creek within Dane County in the early 1900's. Additional widening to accommodate the new volume of flow, occurred after the effluent diversion in the 1950's.

10. Mr. Gutknecht

C - Could the thermal pollution in Badfish Creek be a problem like with nuclear power plants.

R - Higher water temperatures are a result of alterations of the natural condition of the stream. This has arisen from removal of streambank vegetation, channelization and the input of treated effluent. Since diversion, water temperature has increased 5.5 C upstream and 1.5 C at the mouth of Badfish Creek.

One of the greatest problems from thermal pollution from power plants arises when the warm water source fluctuates on and off, so that the stream is alternately warm and cool. This change makes it difficult to maintain the biological population. Since wastewater flow occurs every day, though, the temperature changes in the stream will not be rapid.

In addition, the new treatment measures proposed in this EIS increase water detention time at the plant. This should bring the effluent one to two degrees closer to the ambient air temperature, resulting in more natural stream temperatures after discharge.

11. Mr. Beebe

C - What is the condition of the effluent from the Oregon treatment plant; what is its impact to the Badfish.

R - The Village of Oregon has a 0.4 MGD activated sludge-trickling filter wastewater treatment plant. Its discharge permit's secondary effluent limits of 30 mg/l biochemical oxygen demand (BOD) and 30 mg/l suspended solids (SS). In recent years the facility has generally met these limits. Upgrading may be planned to meet future, stricter requirements.

The Oregon Branch of Badfish Creek flows discontinUously, so the Oregon effluent can be a major part of the stream flow. It has a comparatively low volume of effluent compared to Madison (0.4 MGD vs. 36 MGD and so has little influence on water quality once the Madison flow enters Badfish Creek.

12. Carl Larson - Cooksville, Wisconsin resident

C - Erosion problem along the Badfish in Rock County; no maintenance provided like in Dane County.

R - The meandering pattern is the natural configuration of the stream. This involves a shifting of the channel within the stream's floodplain, over a period of many years. This shifting occurs by erosion along the outside curves and deposition of the eroded sediments along the inside curves. The increased flow of Badfish Creek has accelerated this natural process.

C - Effluent from Madison is aggravating the erosion problem.

R - See above. The downstream channel will enlarge to accommodate the increased flow.

13. Norbert Humland, Dunn Township resident

C - His property is adjacent to the discharge ditch; last year herbicides were used along the ditch right-of-way; is there a potential ground water pollution problem.

R - Response given to Mr. Humland's comment letter, Section A.

Chapter 7

FINAL EIS DISTRIBUTION LIST

A. FEDERAL

Les Aspin, U. S. House of Representatives
Robert Kastenmeier, U. S. House of Representatives
Gaylord Nelson, U. S. Senate
William Proxmire, U. S. Senate
Council on Environmental Quality
U. S. Department of Agriculture
    Soil Conservation Service
U. S. Department of Commerce
U. S. Department of Defense
    U. S. Army Corps of Engineers
U. S. Department of Health, Education and Welfare
U. S. Department of Housing and Urban Development
U. S. Department of the Interior
    National Park Service
    U. S. Fish and Wildlife Service
U. S. Department of Labor
U. S. Department of Transportation
    Federal Highway Administration
Water Resources Council

B. STATE

Attorney General
Chamber of Commerce
Department of Health and Social Services
Department of Justice
Department of Local Affairs and Development
Department of Natural Resources
Department of Transportation
Governor, State of Wisconsin
Great Lakes Compact Commission
Public Service Commission
State Clearinghouse
State Historical Society
Soil and Water Conservation Districts Board

C. LOCAL

Jonathan B. Barry, State Representative
Peter Bear, State Senator
David E. Clarenbach, State Representative
Timothy Cullen, State Senator
Harland E. Everson, State Representative
Thomas A. Loftus, State Representative
Marjorie M. Miller, State Representative
Mary Lou Munts, State Representative
Fred A. Risser, State Senator
Carl W. Thompson, State Senator
Wayne W. Wood, State Representative
City of Beloit
City of Janesville
City of Madison
Consolidated Koshkonong Sanitary District
Dane County Health Department
Dane County Public Works Department
Dane County Regional Planning Commission
Janesville Public Library
Madison Public Libraries
Rock County Department of Environmental Protection
Rock County Planning and Zoning Department

D. CITIZENS AND GROUPS

This list is available upon request from USEPA.

List of EIS Preparers

Catherine Grissom Garra
M.R.P. Regional Planning
6 years of EIS preparation experience

Cynthia Wakat
B.S. Biology
9 years of EIS preparation and facilities planning experience

Gene Wojcik
M.S. Water Resources
7 year of EIS preparation and facilities planning experience

Additional technical input and review has been provided by USEPA Region V staff.

☆ U.S. GOVERNMENT PRINTING OFFICE: 1980—750-406/45