PLEASE QUOTE

FILE 23 600 401

GOVERNMENT OF THE NORTHWEST TERRITORIES
CANADA

Department of Indian & Northern Affairs
Northern Operations Branch
JUL 30 1979
WATER MANAGEMENT
YELLOWKNIFE, N.W.T.

N3L 405 79

NORTHWEST TERRITORIES
WATER BOARD
AUG 1 1979
YELLOWKNIFE, N.W.T.

Mr. Bob Hale,
Controller,
N.W.T. Water Board,
P.O. Box 1500,
YELLOWKNIFE, N.W.T.
X1A 2R3.

Dear Mr. Hale:

Re: Application for Water Licence
Hamlet of Aklavik

The following information is presented as an update to the original water licence application dated January 25, 1977. Please consider this application as being jointly submitted by the Hamlet and by the G.N.W.T. since the latter is responsible for the capital cost and the O/M of the water/sewer infrastructure. The Water Licence should reflect the joint nature of this application.

Water Supply:

A description of the existing water supply system and the planned changes to this system is included in the enclosed report entitled "Aklavik Water Supply" dated February, 1979 (only one copy is available at this time). Briefly, the planned changes entail the installation of a permanent intake to the Peel Channel of the Mackenzie River, a package "water boy" treatment plant and a flocculator/tube settler. The "Water Boy" unit has already been installed and is operating satisfactorily. Scheduled completion date for installation of the permanent intake and the flocculator/tube settler is late September of this year. Hamlet approval of this system, which enables year round pumping from the River, is shown in the attached Council minutes dated February 6, 1979. Continued use of the summer distribution lines is being considered.

A copy of the engineering drawings entitled "Modifications to Water Treatment Plant and Intake Installation, Project No. 77-038" dated April, 1979 is also included for your use. Sepias of these drawings will be forwarded within one week.

Waste Disposal:

Sewage pumpout and honeybags are disposed of at the

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dump located just northwest of the end of the airstrip on the west side of the road. Current plans are for the construction of improved sewage treatment/disposal facilities during 1981 and 1982, subject to availability of funding. Studies regarding these improvements will be forwarded to you when available.

Please contact this office if presentation to either the Technical Committee or the Water Board is required in support of the application. Any other response by your offices concerning this application should also be directed to the Water and Sanitation Section. The one exception to this is that Ron Yaworski, D.P.W., should be contacted regarding any further technical information required. His phone number is 873-7835.

Yours truly,

V. Christensen,
Head,
Water & Sanitation Section,
Town Planning & Lands Division,
Department of Local Government.

Attachment

c.c.: Mr. Ron Yaworski,
Department of Public Works.

c.c.: Secretary Manager,
Hamlet of Aklavik,
AKLAVIK, N.W.T.

THE MUNICIPALITY OF THE HAMLET OF AKLAVIK

NSL 4 0 5 5 0

REGULAR MEETING

Tuesday, February 6, 1979

Present: Mayor Tornow, Councillors McLeod, T. Arey, B. Storr, R. Arey F. Elanik.

Absent: Deputy Mayor Hansen and Councillor Carmichael

Minutes: Moved by Councillor McLeod that the minutes of meeting #3/79 be adopted as circulated.

Seconded by Councillor R. Arey Carried #21/79

Requests, Complaints & Delegations:

- Fred James from D.P.W. talked with Council on the water system in Aklavik. The present summer lake is contaminated and definately cannot be used this summer.

Ways were studied on the best summer water system. The most economical way was to put in a filtering system in the new treatment plant and pump from the river year round. Council were all in favor of pumping from the river year round.

The next problem will be to get the filtering system to Inuvik. Here was mentioned then from Inuvik to Aklavik was no problem as the winter road could be used. The filtering system will have to be in before spring as the river plant will have to be used.

Fred James said that a letter should be in in about 10 days with an answer on wether or not the filtering system will be able to get to Inuvik.

- Joan Woodside addressed Council on behalf of the alcohol committee. There is funding available for a member on the committee to take training on alcohol councilling. She requested a letter be written supporting the proposal also she asked for office space for this person.

Moved by Councillor T. Arey that a letter be written to Al Wilson to support the proposal of the Aklavik Alcohol committee to send someone for trainging to be an alcohol councillor.

Seconded by Councillor Storr Carried #22/79

Moved by Councillor McLeod that a letter be written to D.P.W. asking for the use of the old court worker's office.

Seconded by Councillor Storr Carried #23/79

Sports Recreation Directors report was reviewed by Council.

Letters Letter from school principal on damages caused by people using the gym on sports nights. Council decided that the Drop In Centre person help the recreation director to watch the school.

AKLAVIK

WATER

SUPPLY

PROJECT 77-038

R.A. Yaworsky
Engineering Division
Dept. of Public Works
Government of the N.W.T.
February 1979

INTRODUCTION

Aklavik, located at the junction of the Enock, Pokiak and Peel Channels of the Mackenzie River, is approximately 180 km north of the Arctic Circle and 80 km south of Mackenzie Bay on the Beaufort Sea. As such, the settlement is in the west central portion of the Mackenzie Delta which is one of the largest deltas in the world extending 230 km from its head at Point Separation to its mouth at the Arctic Ocean, and at its widest point measuring some 160 km. The delta itself is a maze of river channels, islands and lakes. On one side the Mackenzie is bordered by a range of hills and on the other side the Richardson Mountains.

The settlement of Aklavik is approximately 80 km north of Fort McPherson and 55 km west of Inuvik, extending about 1.8 km along the bank of the Peel Channel

POPULATION

During the 1920's and 1930's Aklavik was the main centre of activity north of the Arctic Circle and experienced its greatest growth during this period of time. During the 1950's government decision created the new Town of Inuvik to act as the governmental and transportation centre for this area of the Mackenzie Delta. Since people in Aklavik were paid to relocate elsewhere the population decreased slightly during this period. The population in 1958 was 700 and by 1961 was 670. Since 1962 there has been a slow increase in population, partly due to natural increase and partly to the return of families from the new Town of Inuvik. There has been a general trend of native population returning to Aklavik as they became disenchanted and unhappy in the larger, faster moving Town of Inuvik with its urban problems of growth. Present population (Jan. 1979) is 797. Future population and water demand forecasts are listed in Table 1 and 1 (a); also refer to Figure 2.

New development is slated to follow the southwest bank of the Peel Channel. (See Figure 1) 72 new lots have been planned in this area; this should be sufficient for 8 - 10 years.

SOILS

The townsite of Aklavik is about 3.5 m above summer water level and 10 m above sea level which has resulted in occasional flooding of the Hamlet. The townsite is composed of relatively recent alluvial deposit. This material consists of silts and fine sands of considerable thickness. Permafrost is continuous throughout the settlement at a depth of .31 m to .92 m depending upon the location and combines with the alluvial soils to present drainage, building and erosion problems.

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TABLE 1: Present and Future: Population & Demand

Year	Population	Per Capita Demand L/day (a)		
		Fully Trucked (b)	Piped/Trucked (c)	Fully Piped (d)
1978	797	35		
1983	891	90	136	454
1988	996	114	149	454
1993	1113	117	153	454
1998	1245	120	156	454
2003	1392	123	160	454
2008	1557	126	167	454

NOTES: (a) from Local Government guidelines
(b) trucked water delivery and sewage disposal
(c) piped water services and trucked sewage disposal
(d) piped water delivery and sewage disposal

TABLE 1 (a): Total Daily Demand

Year	Per Capita Demand L/day		
	Fully Trucked (a)	Piped/Trucked (b)	Fully Piped (b)
1978	34,500		
1983	103,100	121,200	404,500
1988	144,400	148,900	452,200
1993	165,300	169,800	505,300
1998	189,800	194,300	565,200
2003	217,900	222,900	632,000
2008	250,200	260,100	706,900

NOTES: (a) calculated by taking the total weekly consumption and dividing by 5.5 - the number of days per week water is delivered.
(b) strictly daily demand. Since water is delivery by piped 7 days per week.

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CLIMATE

The climate of Aklavik is characterized by long cold winters (late September to end of May) and short cool summers (mid June to end of August). Spring and autumn are very short. Winter temperatures are quite cold, with monthly mean temperatures of below 0°C for eight months, with December to February being extremely cold months. Monthly mean temperatures drop to -25°C to -26°C. The monthly mean temperatures rise to 4°C from the months of June, July and August, however, only in July and August does the mean reach 10°C.

The low level of precipitation of 23 cm per year does not prohibit vegetation due to the slow thawing out period and light evaporation. Precipitation is quite seasonal and usually results from an influx of warm moist southern air. The months with the highest precipitation are July, August, October and November.

VEGETATION

The northern portion of the Mackenzie Delta is north of the tree line of the boreal forest and although Aklavik is within the boreal forest, the areas inland of the tree-lined channel banks are covered by a marshy vegetation or muskeg. The chief species are white spruce on higher ground with willows and alder occupying the low lying areas. The southern portion of the delta has balsam, poplar and some black spruce on high ground, and willow and alder tickets in lowland meadows.

PRESENT WATER SYSTEM

The Hamlet of Aklavik is presently serviced by a winter intake from the Peel Channel and summer intake from Pump Lake. A new water treatment building (7.6 m square) was constructed in 1977. Complaints have been voiced by residents regarding the summer water quality - i.e. foreign debris has been findings its way into the drinking water system (fish,etc.). Two tanks, each with a capacity of 227,000 L are present by the new treatment building. The existing water system is shown on Figure 3. The Council has written and described the problem, in their view. See Appendix III.

During spring and summer months the Peel Channel has a high silt content; however, in the winter the water quality is generally good. Pump Lake becomes turbid in spring months when it is flooded from the river. Results from water analysis from Pump Lake indicate very high iron, at all times of the year, as well as high Manganese, Calcium and Magnesium. High color and turbidity becomes a problem in spring and summer months, from both the Peel Channel and Pump Lake. The water is also some what hard. Complete analysis results are presented in Appendix I.

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PRESENT WATER SYSTEM cont'd

Data from the report "Mackenzie River Input to the Beaufort Sea" is also presented in Appendix I. This includes sediment loading and grain size analysis of the Peel Channel.

INSTALLATION OF PACKAGE TREATMENT PLANT

In orer to meet water quality standards, and future demand levels, an upgrading of the present temporary arrangement of a dual source must be considered. In addition, the existing facilities (winter/summer intake and distribution system) are nearing the end of their useful life. In order to adequately treat high levels of turbidity, iron and other minerals present at certain times of the year; a package treatment plant would be installed in the new water treatment building by the river. This would be used in conjunction with the 13,600 L storage tank (backwash) and the two exterior 227,000 L tanks (total of 454,000 L exterior storage). A properly sized and operated "Water Boy" type treatment plant would be able to handle river water at all times of the year. (Reference Appendix II, letter from Neptune Microfloc.) In fact, more problems would be encountered treating the lake water. Thus, a package plant and permanent intake into the river would enable a year round supply source. In terms of high silt content, increased alum treatment is recommended. The new treatment plant building is quite close to the water's edge; hence the intake would be about 200 m in length.

One or both of the 227,000 L storage tanks could act as settlement tanks and reduce the alum required. However, the problem of tube settlers should be investigated; they would no doubt be much more effective. They could also provide emergency storage in case the plant was inoperative as well as community fire protection storage. It is reported that one of the tanks leak. This, combined with their age, may make insulating the tanks unadvisable.

There are several alternatives to the sizing of the package plant itself. Presently there are available several models of Water Boy plants. They are: WB-133 (375 L/min, capacity), WB-82 (225L/min. capacity) and WB-27 (75 L/min. capacity). Normally, approximately 2% of the daily flow is used for filter, however, up to 30% of the flow may be required for backwash in times of high turbidity.

If one WB-133 was installed, this would be adequate to meet 30 year trucked and piped - trucked demands.

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INSTALLATION OF PACKAGE TREATMENT PLANT cont'd

If one WB-82 was installed, in conjunction with the existing 18,000 L storage tank, this would be adequate to meet 1985 demands (fully trucked). If one of the 227,000 L tanks were insulated and heated, 30 year demands could be met for trcuked and piped/trucked systems. The plant would then be running constantly; running at night to provide water for peak day periods. If, at a future date, a fully piped system was constructed, the only way demand could be met would be by installation of a WB-133 and provision of a 370,000 L storage.

Presently, during periods of high silt content in the river (spring break-up), and in summer months, a temporary intake and supply line from Pump Lake is utilized. However, the quality of water is not acceptable from this shource in several categories: excessive hardness, iron, manganese, colour, turbidity, and perhaps most alarming, coliform counts. There have also been reports from users as to organic matter present in the drinking water. Treatment is most certainly recommended.

If Pump Lake is utilized for a supply source, there are several alternatives for improving the quality of this source:

a) Construction of a dyke across the narrows of the lake. This would prevent the high silt content from the Peel Channel from entering the lake. However, the lake would have to be recharged via pumping or some type of control structure. The lake would be recharged in fall months once water quality has improved. An access road would be required to the dyke site of approximately 440 m in length. Unfortunately, no soils or detailed topographical information exists of the area. It is estimated the dyke would be approximately 2.5 m high by 60 m in length. A timber control structure would regulate the water inflow.

A permanent intake, wet well and summer line to the treatment plant could be considered. Presently, only a fire hose is used, with pumps suspended on a tripod. This would require about 50 m of intake, a pumphouse building, and approximately 510 m of supply line. In addition, about 310 m of new smaller diameter line would be required to run back to the old treatment plant and tie into an existing summer pressure distribution system.

The above alternatives, i.e. the dyke and permanent intake and pumping facilities, were discussed in reference to Pump Lake. These same options could be applied to the lake west of Pump Lake.

A dyke could also be constructed across the narrows of the west lake. This would impound less water than a Pump Lake dyke, however, it may be slightly easier to construct, although again no soils or topographic information exists. It appears the dyke would be about 3 m high by

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INSTALLATION OF PACKAGE TREATMENT PLANT cont'd

60 m long. An access road of approximately 460 m in length would be required. Replenishment would be via control structure, flooding the lake in fall months, or pumping. Water quality is unknown, but, since the lake is flooded from the Peel Channel floods, it is expected to be similar to Pump Lake. This lake has the advantage of being further from town, from a contamination standpoint, but also further to run pipelines. Again, a permanent intake, wet well, and pipeline could be constructed at the west lake. An 1160 m supply line to the treatment plant would be required, as well as a 310 m long small diameter line to the summer distribution system.

ESTIMATED COSTS

Alternative A

Installation of one WB-133 package plant and permanent intake.

Purchase of WB-133	$ 40,000.00
Freight	2,050.00
Installation	25,000.00
Outfall line (see below)	86,200.00
Intake (see below)	102,000.00
	$255,250.00
Engineering and contingency 25%	63,750.00
TOTAL	$319,000.00

Alternative B

Installation of one WB-82 package plant, insulation of one tank, and permanent intake.

Freight (WB-82 from Ft. Simpson)	$ 1,400.00
Installation	20,000.00
Outfall (see below)	86,200.00
Intake (see below)	102,000.00
Tank insulation & heating (or tube settlers)	30,000.00
	$239,600.00
Engineering and contingencies 25%	60,000.00
TOTAL	$299,600.00

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Intake detailed costs:

River intake	200m x $250.00/m	$ 50,000.00
Wetwell, pumps, piping		50,000.00
Supply line	20 m x $100.00/m	2,000.00
	TOTAL	$102,000.00

NOTE: Riprap from outfall costs utilized for intake construction also.

Outfall detail costs:

200 m - 200 mm pipe @ $250/m	$ 50,000.00
Plant connection and piping	6,200.00
Riprap (1500 m^3 @ 19.50/m^3)	30,000.00
	$ 86,200.00

Should the treatment plant prove unable to handle high silted spring river water, then the summer lake source should be improved. This will involve the following expenditures:

ALTERNATIVE 1 Pump Lake Improvements

Dyke construction 150 m^3 x $15.00/$m^3$	$ 2,250.00
Control structure	15,000.00
Road 440 m x $100.00/m	44,000.00
Intake 50 m x $250.00/m	12,500.00
Pumphouse building, pumps, etc.	75,000.00
Summer supply line 510 m x $50.00/m	30,000.00
Summer distribution line 310 m x $50.00/m	15,500.00
	$194,850.00
Engineering and contingencies 25%	48,700.00
TOTAL	$243,550.00

ALTERNATIVE II West Lake Improvements

Dyke 180 m^3 x $15.00/$m^3$	$ 2,700.00
Control structure	15,000.00
Road 460 m x $100.00/m	46,000.00
Intake 50 m x $250.00/m	12,500.00
Pumphouse	75,000.00
Summer supply line 1160 m x $60.00/m	69,600.00
Summer distribution line 310 m x $50.00/m	15,500.00
	$236,300.00
Engineering and contingencies 25%	59,075.00
TOTAL	$295,375.00

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DISCUSSION

Thus, it can be seen that in order to utilize either of the two lakes as a supply source, it will require a minimum expenditure of $243,550.00. This would be in addition to the treatment plant work. The disadvantages of the lakes include poor water quality, and with the possibility of town encroachment, the water quality could deteriorate further.

Since the supplier recommends treatment of river water year round, it is suggested that this approach be pursued.

The recommended alternative is the installation of a package treatment plant and year round intake into the Mackenzie River. With proper plant operation, year round operation should be feasible. However, pre-settling the river water in the spring months would aid in the operation of the plant, thus, tube settlers should be investigated. The condition of the tanks should also be carefully assessed, and, if reasonable life could be expected, then it should be insulated. It is also recommended that water samples be obtained this spring from the river, these analysis would aid in the plant set up and determining optimum chemical dosages. Applications should also be made for water board approval of the plant effluent discharge (backwash waste) outfall line.

The 1978/79 budget of $10,000.00 with the addition of the 1979/80 budget of $275,000.00 is not quite sufficient for Alternative B. However, it is within 10%, and it is recommended Alternative B be pursued - the total estimated costs of $299,600.00.

If design is undertaken immediately; tender documents could be ready by late March. Barge dates for Aklavik are June 1, June 27, July 26 and final sailing August 28 (from Hay River).

Therefore the recommended schedule is:

mid February - engage consultant
late March - tender documents complete
mid April - advertise tender
late May - contract award
late June - water boy from Ft. Simpson on barge to Aklavik
early Sept. - contractor should be able to demobilize equipment via last barge.

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SUMMARY OF RECOMMENDATIONS

It is recommended Alternative B be implimented - i.e. installation of the WB-82, from Fort Simpson; installation of intake/outfall and provision of storage. Specifically the project is as follows (for a guide to consultants):

Preliminary Sitework & Engineering

This phase will involve at least one site visit to gather design information as river depth profiles at intake/outfall location; water sampling at spring breakup and water temperature measurement at intake depth. The existing tanks should be evaluated for useful life. Tube settling devices should be investigated and assessed.

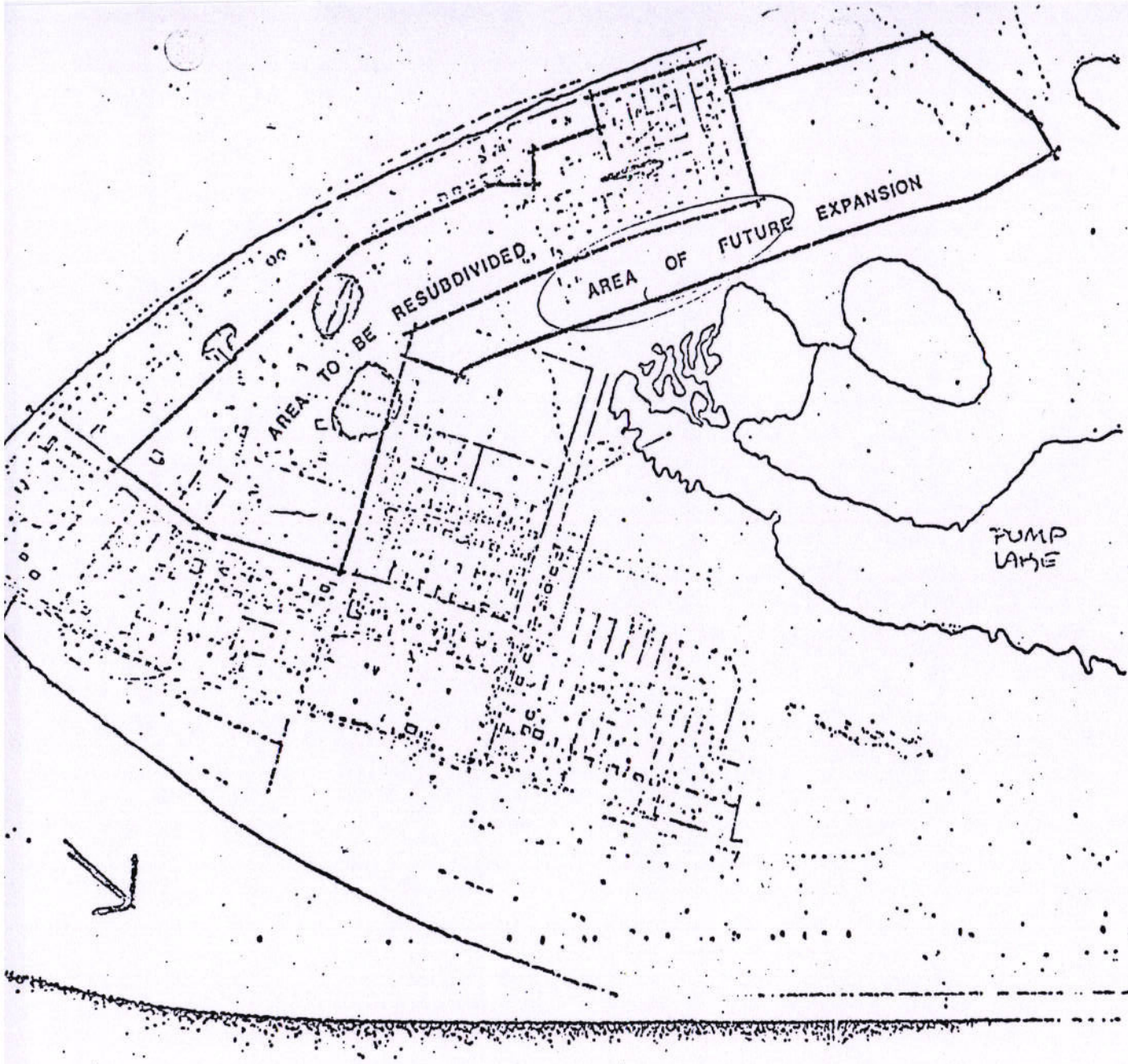
Design & Tender Documents

a) Intake/outfall: An inclined shaft type intake is preferred. All required piping and electrical work. Intake/outfall to be protected from ice damage; perhaps by running them through culverts covered with riprap. 1500 m^3 of riprap will be stockpiled during the winter of 1979; for use in this project.

b) Installation of WB-82: The plant is to be shipped from Fort Simpson; all mechanical and electrical work as required. The existing tanks should be piped so as to use for storage. If feasible, the one tank should be insulated and used for active storage. A hook-up for the summer distribution system is required. Tube settlers, if practical and economic, to be installed.

c) Services during construction: This phase would include periodic advice from designers during construction, site visits if required, preparation of as-built drawings and O & M manuals.

d) Resident Supervision: It is doubtfull whether a job of this magnitude would warrant a full time resident inspector.

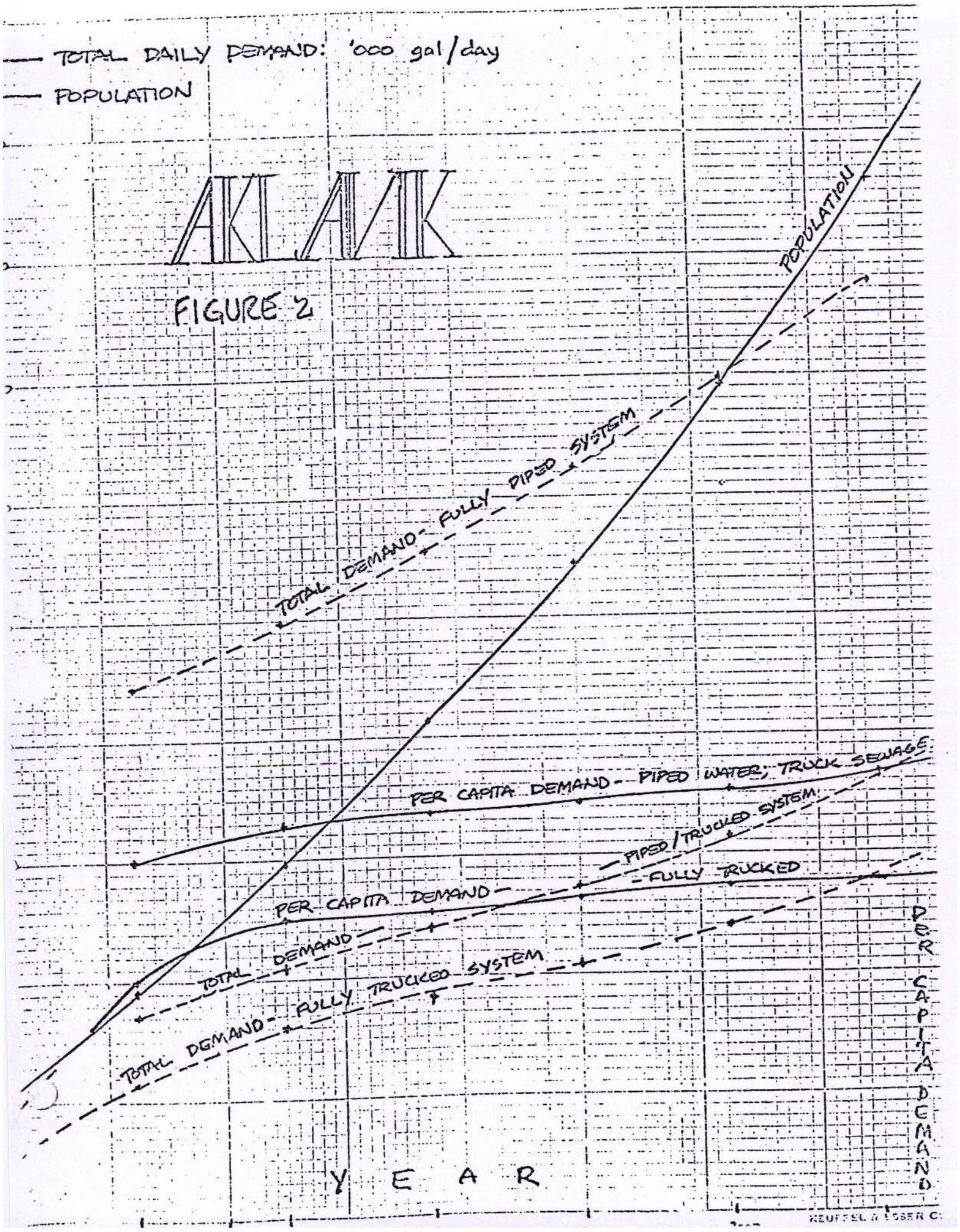


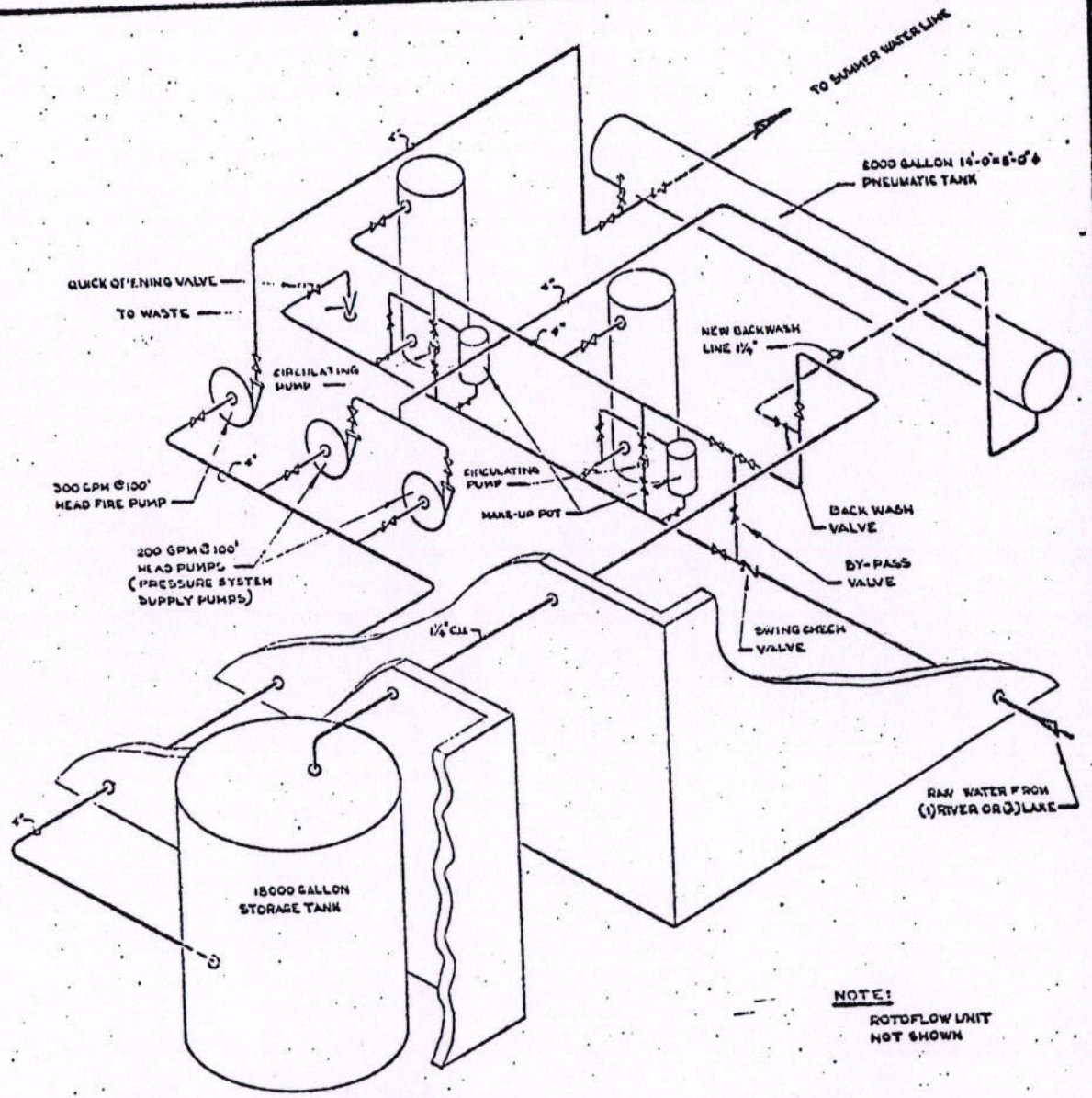
development plan

AKLAVIK N.W.T.

FIGURE 1

FUTURE EXPANSION AREA


TOTAL DAILY DEMAND: '000 gal/day
POPULATION
AKLAK
FIGURE 2
POPULATION
TOTAL DEMAND - FULLY PIPED SYSTEM
PER CAPITA DEMAND - PIPED WATER; TRUCK SEWAGE
PER CAPITA DEMAND - PIPED/TRUCKED SYSTEM
FULLY TRUCKED
TOTAL DEMAND
TOTAL DEMAND - FULLY TRUCKED SYSTEM
PER CAPITA DEMAND
YEAR



SCHEMATIC OF WATER TREATMENT AT AKLAVIK

APPENDIX I

WATER ANALYSIS

PUMP LAKE

PEEL CHANNEL

stituents In mg/l	Mackenzie River Peel Channel			Water Supply Lake			
	July 27, 1949	Jan.15, 1961	Sept.9, 1958	July 27, 1949	May 27, 1968	June, 1968	Sept. 1968
	7.6	7.7	8.1	7.3	-	7.2	8.6
dness as $CaCO_3$	141.4	196.6	184.0	120.0	-	210.0	96.0
nolphthalein Alk-inity as $CaCO_3$	0	0	0	0	-	0	4.0
l Alk. as $CaCO_3$	105.0	148.0	136.0	120.0	-	184.0	88.0
(Fe)(Total)	0.5	<0.05	0.29	0.3	-	1.14	0.3
anese (Mn)(Total)	-	0	-	-	-	0.22	-
r (Units)	30	<5.0	<5.0	15	5	175.0	10.0
idity (Units)	Heavy Silt	<0.1	15.5	Present Colloidal	12	50.0	2.0
nto Nitrogen (N)	0.082	0.18	-	0.041	-	0.16	-
ite Nitrogen (N)	Trace	<0.001	-	0	-	<0.001	-
Ammonia Nitrogen)	Negligible	0.02	-	Negligible	-	0.28	-
minoid Nitrogen (N)	0.017	0.03	-	0.13	-	0.52	-
ium (Ca)	38.5	51.2	53.9	37.2	-	49.8	20.8
esium (Mg)	11.0	16.7	12.0	11.1	-	20.7	10.7
um (Na)	2.5	2.8	-	3.0	-	8.7	-
sium (K)							
rbonate as CO_3	63.0	88.8	81.6	72.0	-	110.4	48.0
onate (CO_3)	0	0	0	0	-	0	4.8
e (SO_4)	39.6	49.4	-	22.3	-	31.6	-
e (Cl)	0.6	5.0	-	1.4	-	8.0	-
ate (NO_3)	0.35	0.8	-	0.2	-	0.7	-
ride (F)	Negligible	0.17	-	0.05	-	N.D.	-
ca (SiO_2)	7.4	9.6	-	2.6	-	7.4	-
rable Residue on ing at 105°C	192.0	232.4	228.0	190.0	-	330.4	140.0
	8.0	7.7	7.7	7.9	-	7.7	8.3
lity Index	-0.4	0	+0.4	-0.6	-	-0.5	+0.3

- None Detected

sts: F.E. Artlett and R. Holowaty.

...tituents In mg/l	Mackenzie River Peel Channel			Water Supply Lake			
	July 27, 1949	Jan. 15, 1961	Sept. 9, 1968	July 27, 1949	May 27, 1968	June, 1968	Sept. 1968
	7.6	7.7	8.1	7.3	-	7.2	8.6
...ness as $CaCO_3$	141.4	196.6	184.0	120.0	-	210.0	96.0
...olphthalein Alk- ...linity as $CaCO_3$	0	0	0	0	-	0	4.0
...l Alk. as $CaCO_3$	105.0	148.0	136.0	120.0	-	184.0	88.0
... (Fe)(Total)	0.5	<0.05	0.29	0.3	-	1.14	0.3
...anese (Mn)(Total)	-	0	-	-	-	0.22	-
...r (Units)	30	<5.0	<5.0	15	5	175.0	10.0
...idity (Units)	Heavy Silt	<0.1	15.5	Present Colloidal	12	50.0	2.0
...ate Nitrogen (N)	0.082	0.18	-	0.041	-	0.16	-
...ite Nitrogen (N)	Trace	<0.001	-	0	-	<0.001	-
... Ammonia Nitrogen ...)	Negligible	0.02	-	Negligible	-	0.28	-
...minoid Nitrogen (N)	0.017	0.03	-	0.13	-	0.52	-
...lum (Ca)	38.5	51.2	53.9	37.2	-	49.8	20.8
...esium (Mg)	11.0	16.7	12.0	11.1	-	20.7	10.7
... (Na)	2.5	2.8	-	3.0	-	8.7	-
...ssium (K)							
...rbonate as CO_3	63.0	88.8	81.6	72.0	-	110.4	48.0
...te (CO_3)	0	0	0	0	-	0	4.8
... (SO_4)	39.6	49.4	-	22.3	-	31.6	-
...ride (Cl)	0.6	5.0	-	1.4	-	8.0	-
...ate (NO_3)	0.35	0.8	-	0.2	-	0.7	-
...ride (F)	Negligible	0.17	-	0.05	-	N.D.	-
...ca (SiO_2)	7.4	9.6	-	2.6	-	7.4	-
...rable Residue on ...ing at 105°C	192.0	232.4	228.0	190.0	-	330.4	140.0
)	8.0	7.7	7.7	7.9	-	7.7	8.3
...ility Index	-0.4	0	+0.4	-0.6	-	-0.5	+0.3

- None Detected

...ists: F.E. Artlett and R. Holowaty.

DEPARTMENT OF NATIONAL HEALTH AND WELFARE
PUBLIC HEALTH ENGINEERING DIVISION

CHEMICAL ANALYSIS OF WATER

Aklavik, N.W.T. — Date Sampled: 1. Feb. 19, 1971. 2. May 10, 1971.

ying Marks: Pump Lake — Sampled By: T.A. Roy

ed By: J.W. Grainge — Date Received In Lab.: 1. Mar. 16, 1971. 2. May 20, 1971.

nstituents, in Milligrams per Liter	Sample No. 1	Sample No. 2	Sample No.	Max Permiss.
	7.7	7.3	7.7	6.5→8.3
e				
s (Total) as $CaCO_3$ — HARD	588	900	140	200 max 120
hthalein Alkalinity as $CaCO_3$	Nil	Nil	Nil	
lkalinity as $CaCO_3$	592	934	140	30→200
e) (Total) — WOW!	10.08	6.68	1.4	<.3 accept .05 obj
se (Mn) (Total) — HIGH	1.24	3	0.8	.05 accept .81 obj
Units) — HIGH	60	95	15	15 accept
r (Units) — HIGH	64	1100		5
trogen (N)	1.12	0.56	0.01	10
monia Nitrogen (N)	0.66	2.6	0.1	
old Nitrogen (N)				
(Ca)	136.1	211.6	32	200 accept <75 obj.
um (Mg)	60.2	90.2	21	150 accept <50 obj
(Na) - Calculated	18.5	34.7		
nate as CO_3	355.2	560.4		
te (CO_3)	Nil	Nil	Nil	
(SO_4)	13	2.6	21	<250
e (Cl)	16	26	10	<250
e (F)	0.37	0.34	0.2	1.2
l lved Solids - Determined	720.5	1091.5	100	500

brief [illegible]

RESULTS OF LABORATORY ANALYSIS

LICENSEE AKLAVIK DATE 28-6-77 SAMPLED BY D.M.N.D.

LICENCE NO. 4571-1-1 LOCATION

STATION NUMBER		1	2				
LABORATORY NUMBER		70278	70279				
pH	(units)	7.1	8.0				
Sp. Conductance	(umho/cm)	219	536				
Dissolved Oxygen							
Turbidity	(JTU)	2.0					
Colour		(20)	(100)				
Suspended Solids		25					
TDS, Residue		2.0	4.0				
Oil & Grease							
Total Coliform	(ent/100 ml)	>2750	$>1 \times 10^6$				
Faecal Coliform	(" ")	<1.0	$>1 \times 10^5$				
Faecal Strep.	(" ")						
BOD_5							
COD							
Carbon, IC							
Carbon, TOC							
Calcium		31.7	36.3				
Magnesium							
Total Hardness	$CaCO_3$	115.0	(154)				
Total Alkalinity	$CaCO_3$	92.5	228				
Sodium							
Potassium							
Total Cyanide							
Chloride							
Sulphate							
Sulphide							
Ammonia Nitrogen	N	0.2					
Nitrate/Nitrite	N	<0.01	.173				
Total Kjeldahl N	N	0.31	29.5				
Phosphorus O-P	P						
Phosphorus Total	P	.046	0.13				
Silica Reactive	SiO_2						
Arsenic	T						
	E						
Cadmium	T						
	E						
Copper	T						
	E						
Iron	T						
	E						
Lead	T						
	E						
Mercury	T						
	E						
Nickel	T						
	E						
Zinc	T						
	E						

All results are expressed in mg/l except as indicated in brackets ( ). O-P = ortho phosphate; TDS = total dissolved solids and is the filterable residue, dried at 105°C; T = Total; E = Extractable; IC = Inorganic carbon; TOC = total organic carbon.

1. Summer lake.
2. Camp outfall upstream where outflow into Peel Channel.

Computed by _____ Date _____

Checked by _____ Date _____

DEPARTMENT OF THE ENVIRONMENT

INLAND WATERS BRANCH WATER SURVEY OF CANADA

SUMMARY OF SUSPENDED SEDIMENT ANALYSIS RESULTS FOR YEAR 19 75

Stream Mackenzie River Peel Channel Location above Aklavik

Date	Time	Water Level	Temperature °C	Sample Location	River Depth	Sample Depth	Type of Sample	Sample Number DA	Volume Sample (l)	Total Sample Dry Weight (gm)	Total Concentration (mg/l)	Total Sample D_{50} (mm)	% Sand 2mm to 0.1mm	% Silt 0.1mm to 0.01mm	% Clay 0.01 mm	Percent Sands (mg/l)
June																
17	1640		11.0		37.0		D.I.	100142	855	.5052	597	.0077	3	57	40	128
23	1400		16.0		38.0		"	100215	625	.1950	317	.0067	3	55	42	134
July								[illegible]								155
17	1950		20.5	275	9.3		D.I.	100145	669	.0579	81					193
17			"	224	13.8		"	04	505	.0367	90					181
17			"	156	22.6		"	05	642	.0606	93					151
17			"	105	41.0		"	06	801	.1591	199					173
17			20.5	57	28.9		"	07	633	.1910	302					

Computed by _____ Date _____

Checked by _____ Date _____

DEPARTMENT OF THE ENVIRONMENT
INLAND WATERS BRANCH–WATER SURVEY OF CANADA

Particle-size analyses of suspended sediment at Mackenzie River, Peel Channel above Aklavik Station No. 10MC003 for year 19 75

(Methods of analysis: B, bottom withdrawal tube; P, pipette; S, sieve; N, in native water; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; V, visual accumulation tube)

Date of Collection	Time	Discharge Meas't (cfs)	Water temperature (°C)	Suspended sediment: Concentration of sample mg/l	Suspended sediment: Concentration of suspended sediment mg/l	Suspended sediment: Percent less than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.063	0.125	0.250	0.500	1.000	Methods of analysis
June 17/75	1640		11.0	597		22	35	51	72	91	99	100				B.N.W.
June 23/75	1400		16.0	317		25	36	55	76	93	99	100				B.N.W.

Tabulated by _____ Checked by _____ Date Aug. 26/75

DEPARTMENT OF THE ENVIRONMENT
INLAND WATERS BRANCH–WATER SURVEY OF CANADA

Particle-size analyses of suspended sediment at Mackenzie River, Peel Channel above Aklavik Station No. 10MC003 for year 19 74

(Methods of analysis: B, bottom withdrawal tube; P, pipette; S, sieve; N, in native water; W, in distilled water; C, chemically dispersed; M, mechanically dispersed; V, visual accumulation tube)

Date of Collection	Time	Discharge Meas't (cfs)	Water temperature (°C)	Suspended sediment: Concentration of sample mg/l	Suspended sediment: Concentration of suspended sediment mg/l	Suspended sediment: Percent less than indicated size, in millimeters: 0.002	0.004	0.008	0.016	0.031	0.063	0.125	0.250	0.500	1.000	Methods of analysis
						DEPTH INTEGRATED										
July 12	1115	33000 H	13.5	536 K		21	37	46	61	73	85	97	100			B.N.W.
Aug. 1	2100	39300	15.0	302 K		29	63	80	95	99	100					B.N.W.
Aug. 15		45500 H	13.5	757 K		38	45	65	55	91	98	99	100			B.N.W.

H – Daily Mean Discharge
K – Sample collected from a single vertical
K – Sample collected from several verticals

Tabulated by _____ Checked by _____ Date Feb. 13/75

MACKENZIE RIVER (PFEL CHANNEL) ABOVE AKLAVIK - STATION NO. 10MC003

SUSPENDED SEDIMENT FOR 1974

DAY	APR TEMP. (C)	APR DAILY DISCHARGE (CFS)	APR MEAN CONCENTRATION (MG/L)	APR TONS PER DAY	MAY TEMP. (C)	MAY DAILY DISCHARGE (CFS)	MAY MEAN CONCENTRATION (MG/L)	MAY TONS PER DAY	JUN TEMP. (C)	JUN DAILY DISCHARGE (CFS)	JUN MEAN CONCENTRATION (MG/L)	JUN TONS PER DAY	DAY
1										83600	329	74300	1
2										87200	402	94600	2
3										91600	488	121000	3
4										96900	575	151000	4
5										104000	665	187000	5
6										104000	677	190000	6
7										93300	574	152000	7
8										91100	479	116000	8
9										84400	395	90000	9
10										73000	326	68700	10
11										71900	269	52200	11
12									6.1	66500	222 S	39900	12
13										61900	168	31200	13
14										57200	177	27300	14
15										53400	184	26500	15
16										50600	205	28000	16
17										47900	245	31700	17
18										45600	300	36900	18
19										43400	350	41000	19
20										41700	405	45800	20
21										40600	457	50100	21
22										39600	504	53900	22
23										38900	547	57500	23
24										38300	578	59800	24
25										37900	603	61700	25
26										37400	611	61700	26
27										37000	607	60800	27
28										37100	601	60200	28
29										36600	594	58700	29
30										36500	589	58000	30
31													31
TOTAL										1636700		2169100	TOTAL
MEAN										61300		73000	MEAN

MACKENZIE RIVER (PEEL CHANNEL) ABOVE AKLAVIK - STATION NO. 10MC003

SUSPENDED SEDIMENT FOR 1974

DAY	JUL TEMP. (C)	JUL DAILY DISCHARGE (CFS)	JUL MEAN CONCENTRATION (MG/L)	JUL TONS PER DAY	AUG TEMP. (C)	AUG DAILY DISCHARGE (CFS)	AUG MEAN CONCENTRATION (MG/L)	AUG TONS PER DAY	SEP TEMP. (C)	SEP DAILY DISCHARGE (CFS)	SEP MEAN CONCENTRATION (MG/L)	SEP TONS PER DAY	DAY
1		37200	585	59200	15.6	39400 A	349 S	37100		33600	161	14600	1
2		36900	584	58200		38000 E	246	25200		33000	164	14600	2
3		36900	579	57700		34500 E	180	17700		33900	185	16900	3
4		35200	575	57100		35500 E	132	12700		33600	166	15100	4
5		36100	570	55600		34300 E	104	9630		32300	137	11900	5
6		35400	565	54000		34000 E	85	7800		30800	119	9900	6
7		35000	559	52700		34800 E	82	7700		29400	112	8590	7
8		34600	554	51800	16.1	35300 A	107 S	10200		28000	106	8010	8
9		34700	549	51400		37800	179	18300	7.2	27000	99 S	7220	9
10		34400	545	50600		40000	281	30300		25900	91	6360	10
11		34000	540	49600		41200	394	43800		24700	83	5540	11
12	13.3	33500	536 E	48600		42300 A	510	58200		23800	75	4820	12
13		33400	521	47000		43500 E	624	73300		23200	67	4200	13
14		33500	477	43100		44500 E	719	86400		22400	60	3630	14
15		32700	366	32500	13.3	45500 E	749 S	92000		21600	52	3030	15
16		31500	214	18200		46000 E	693	86100		20900	44	2480	16
17		30400	110	9030		47000 E	681	86400		20000	37	2000	17
18	18.9	29400	71 S	5640		50000 E	759	102000	6.1	19500 B	33 S	1740	18
19		29200	63	5120		52000 E	866	122000		19400 B	33	1730	19
20		29700		5050		54000 E	904	132000		19100 B	34	1750	20
21		29700	62	4970		54000 E	815	119000		18900 B	32	1630	21
22		29300	61	4830		52000 E	707	99300		19900 B	53	2850	22
23		29100	60	4750		50000 E	599	80900		19900 B	44	2360	23
24		29900	64	5170		48500 E	500	65500		19400 B	41	2150	24
25		31000	110	9210		47000 E	413	52400		18700 B	35	1970	25
26		32700	209	18100		45000 E	332	40300		18100 B	37	1810	26
27		34900	316	29800		42500 E	270	31000		17500 B	34	1610	27
28		37100	425	42600		40000 E	232	25100		17000 B	32	1470	28
29		38500	531	55200	10.9	37600 A	193 S	19600		16400 B	30	1360	29
30		39400	584	62100		36400	173	17000		17800 B	38	1830	30
31		39600	487	52100		34800	169	15900					31
TOTAL		1047000		1101270		1319400		1624830		706100		163700	TOTAL
MEAN		33800		35500		42600		52400		23500		5460	MEAN

APPENDIX II

WATER BOY INFORMATION

TELEPHONE: (416) 259-4601
TELEX 06-967703

neptune microfloc 3526 LAKESHORE BLVD. W., TORONTO, ONTARIO. CANADA M8W 1N7

November 29, 1978

Government of the Northwest Territories
Project Management, Eng.Division
Department of Public Works
Yellowknife, N.W.T.
X1A 2L9

Attention: Mr.R.Yaworsky
Project Officer

Dear Sir:

RE: Aklavik Water Analysis

We have reviewed the water analysis forwarded to us with your letter of October 27, 1978, and would advise as follows.

For the Mackenzie River water we would recommend the use of a Microfloc Water Boy rated at normal capacity. Although we have no direct experience with the treatment of Mackenzie River water, after reviewing the water analysis submitted, we are sure that it will offer no resistence to conventional chemical treatment and mixed media filtration.

For the water supply lake for which the water analysis was submitted, we would recommend the use of a Microfloc SWB unit. This unit is recommended due to the high colour referenced in the analysis. The SWB offers greater retention time and higher solids handling capabilities which, we feel, is required for this water. The SWB is available in packaged plant sizes ranging from nominal flow handling capabilities of 25,000 - 250,000 U.S. gallons per day.

I am enclosing some information in reference to the Recla-Mate SWB unit and trust you will find this of some value. We would be pleased to review appropriate equipment selection for this project at your earliest convenience. Our representative in your area is Mr.Ray McManus of B & D Engineering Sales, 70th Avenue S.E., Calgary, telephone 259-5358 (Area Code 403). Mr.McManus may be contacted should you require additional information, or, you may contact me directly.

I trust this information will help you in your review for equipment selection on this project.

1-2% daily flow backwash.
- backwash once/day.

Yours truly,

NEPTUNE MICROFLOC LIMITED

Treat silt with Alum.

George Reddom
Applications Specialist

GR/ir encls.

Technical Data Sheet

WATER BOY WB-82

Neptune
/microfloc
P.O BOX 612 • 1965 AIRPORT ROAD
CORVALLIS, OREGON 97330
Telephone (503) 752-5501

General Data

≈ 265 l/min

Nominal Flow: 60 gpm. Maximum Flow: 70 gpm.

Inlet Pressure Required @ Shutoff: 10 psig.

Effluent Pressure Available @ Rated Flow: 10 ft. of water (from base of unit).

Overall Shipping Dimensions:
Length: 8 ft. 9 in. Width: 7 ft. 10 in. Height: 6 ft. 10 in.

Weights:
Shipping weight: 8,000 lbs. Operating weight: 24,000 lbs.

Equipment Included with Basic Unit (See Drawing M-292)

Influent Rate Set Valve: 2 in.
Rapid Mix Chamber: 24 ft^3 volume.
Flocculator: 80 ft^3 volume. Drive: 1/4 hp, 12 rpm.
Tube Settler: 81 ft^3 volume. Overflow Rate: 300 gpd/ft^2.
Filter Area: 12 ft^2. Media Type: MF-162. Underdrain: Header and Lateral.
Pumps: Effluent - 1-1/2 hp, 60 gpm.
Backwash - 5 hp, 216 gpm; flooded suction required.

Controls:
Plant flow rate is set manually by an adjustable influent float valve. Another float valve on the effluent pump discharge maintains constant filter level to match incoming flow. A low filter level protection switch is provided for effluent pump protection. The control panel provides automatic backwash initiated by preset filter headloss or by manual pushbutton. Return to service is automatic. Load center and motor starters for pumps also provided and mounted on unit.

Finish: Interior - 6 mils dry film thickness vinyl. Color: Aqua.
Exterior - 4.5 mils dry film thickness vinyl. Color: Aqua.

Chemical Feed:
Alum - 50 gal. tank, 60 gpd pump, max. feed 100 ppm.
Hypochlorite - 50 gal. tank, 60 gpd pump, max. feed 4 ppm.
Polyelectrolyte - 50 gal. tank, 24 gpd pump, max. feed 1 ppm, 1/3 hp mixer.
Soda Ash (optional) - 50 gal. tank, 60 gpd pump, max. feed 35 ppm.

Installation Data

WATER BOY is designed for indoor installation.
Base Pad Design: 600 lbs. per ft^2.
Electrical Supply (to load center on unit): 120/240 V, 3 phase, 30 amp circuit.

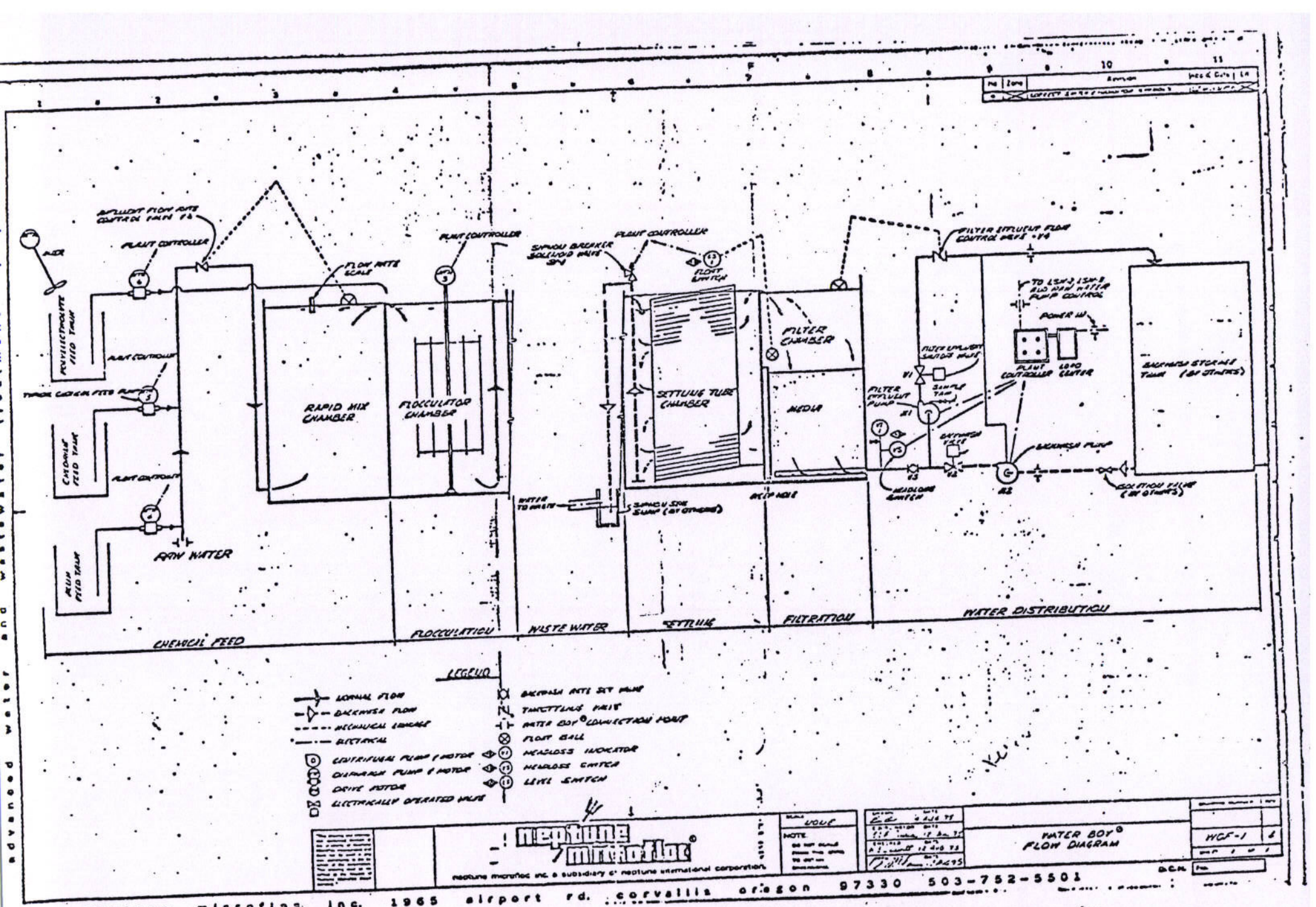
Pipe Connections:
Inlet - 2 in.
Effluent - 2 in.
Backwash - 4 in.
Waste Line for Backwash Flow - 8 in.

≈ 8700 l

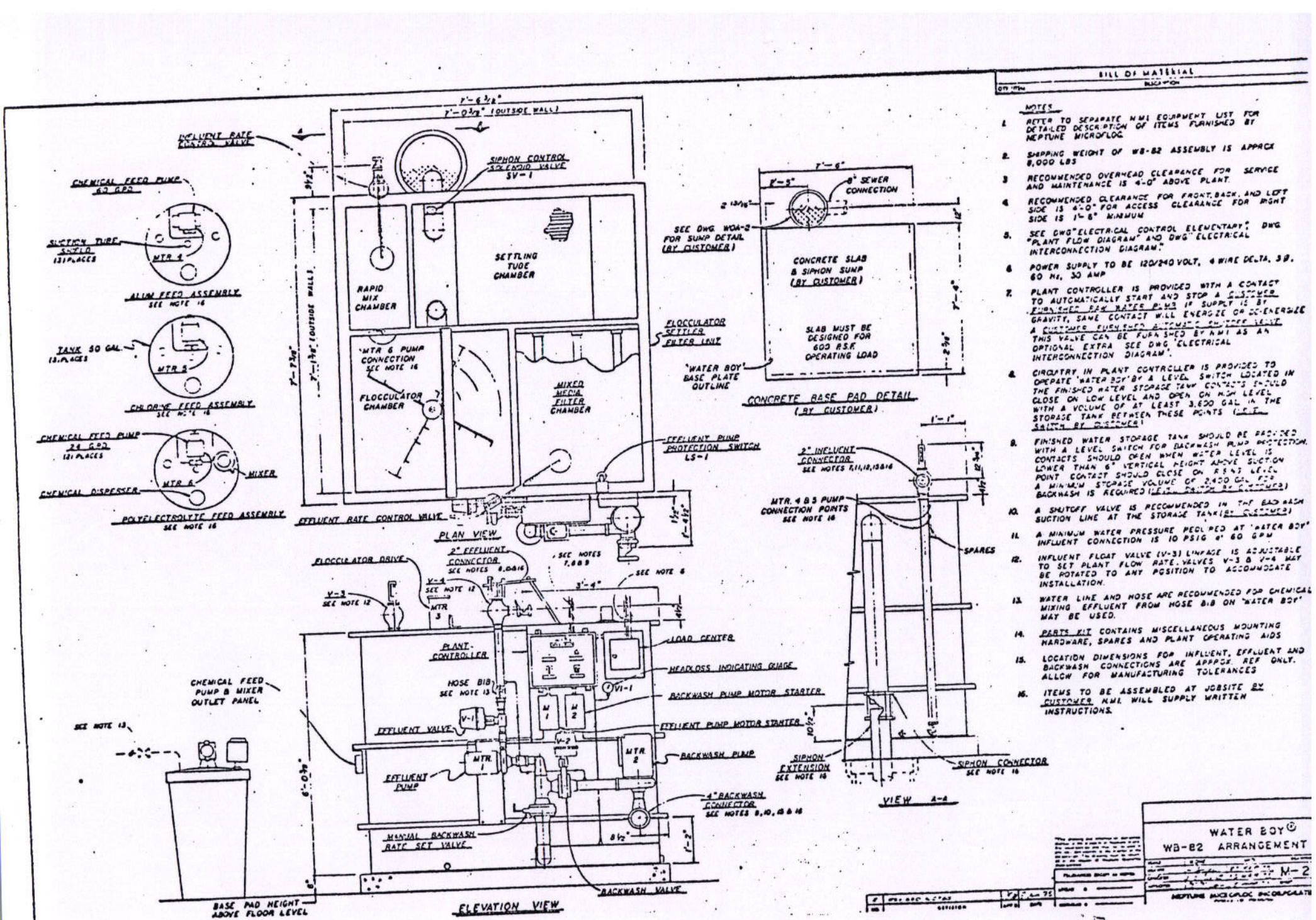
Minimum Backwash Water Storage Required: 2,400 gallons.

Overhead Clearance Required: 4 ft. 0 in.

KS 5.38-3
Rev. 7-72


RAPID MIX CHAMBER
FLOCCULATOR CHAMBER
SETTLING TUBE CHAMBER
MEDIA
FILTER CHAMBER
RAW WATER
CHEMICAL FEED
FLOCCULATION
WASTE WATER
SETTLING
FILTRATION
WATER DISTRIBUTION
LEGEND
NORMAL FLOW
BACKWASH FLOW
MECHANICAL LINKAGE
ELECTRICAL
CENTRIFUGAL PUMP & MOTOR
DIAPHRAGM PUMP & MOTOR
DRIVE MOTOR
ELECTRICALLY OPERATED VALVE
BACKWASH ANTI SIPHON VALVE
THROTTLING VALVE
WATER BOY® CONNECTION POINT
FLOAT BALL
HEADLOSS INDICATOR
HEADLOSS GAUGE
LEVEL SWITCH
neptune microflo
neptune microflo inc. a subsidiary of neptune international corporation
WATER BOY® FLOW DIAGRAM
HCF-1
neptune microflo inc. 1965 airport rd. corvallis oregon 97330 503-752-5501

EFFLUENT PUMP CONTROL
BACKWASH INITIATE
BACKWASH PUMP CONTROL
PLANT CONTROL
AERATOR
CHEMICAL FEEDERS
EFFLUENT VALVE
BACKWASH VALVE
BACKWASH SLOW SOLENOID VALVE
INFLUENT WATER LEVEL CONTROL
EFFLUENT PUMP MOTOR STARTER
BACKWASH PUMP MOTOR STARTER
BACKWASH PUMP
FLOCCULATION WATER
CHLORINE FEED
CUSTOMER'S INFLUENT PUMP STARTER CONTACT OR VALVE
CAM TIMED CTI CONTACT DEVELOPMENT
CTI-1
CTI-2
CTI-3
CTI-4
CTI-5
CTI-6
CTI-7
CTI-8
TIME IN MINUTES
DENOTES LENGTH OF TIME CONTACT IS CLOSED
NO & NC ARE CONTACT DESIGNATIONS ONLY AND DO NOT NECESSARILY INDICATE SWITCH FUNCTION.
MOTOR STARTER WIRING DIAGRAM
MOTOR STARTER WIRING DIAGRAM
MOTOR STARTER WIRING DIAGRAM
PUMP MOTOR
NOTES:
SELECTOR:
EFFLUENT PUMP MOTOR STARTER
BACKWASH PUMP MOTOR STARTER
CONTROL RELAY
BACKWASH CAM TIMER
SELECTOR SWITCH
MANUAL INITIATE BACKWASH PUSHBUTTON
FUSE IN FLOCCULATOR CIRCUIT
MOTOR-OPERATED VALVE
TERMINAL STRIP TERMINAL NO.
SOLENOID VALVE
neptune microflo
neptune microflo inc. a subsidiary of neptune electrosystems corporation
WATERBOY ELECTRICAL CONTROL ELEMENTARY
WOE-1
neptune microflo inc. 1965 airport rd. corvallis oregon 97330 503-752-5501



BILL OF MATERIAL

QTY	ITEM	BASIC NO.

NOTES

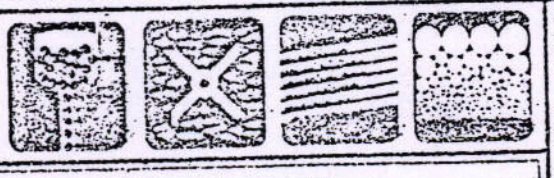
1. REFER TO SEPARATE NMI EQUIPMENT LIST FOR DETAILED DESCRIPTION OF ITEMS FURNISHED BY NEPTUNE MICROFLOC
2. SHIPPING WEIGHT OF WB-82 ASSEMBLY IS APPROX 8,000 LBS
3. RECOMMENDED OVERHEAD CLEARANCE FOR SERVICE AND MAINTENANCE IS 4'-0" ABOVE PLANT.
4. RECOMMENDED CLEARANCE FOR FRONT, BACK, AND LEFT SIDE IS 4'-0" FOR ACCESS CLEARANCE FOR RIGHT SIDE IS 1'-6" MINIMUM
5. SEE DWG "ELECTRICAL CONTROL ELEMENTARY," DWG "PLANT FLOW DIAGRAM" AND DWG "ELECTRICAL INTERCONNECTION DIAGRAM."
6. POWER SUPPLY TO BE 120/240 VOLT, 4 WIRE DELTA, 3Ø, 60 Hz, 30 AMP
7. PLANT CONTROLLER IS PROVIDED WITH A CONTACT TO AUTOMATICALLY START AND STOP A CUSTOMER FURNISHED RAW WATER PUMP IF SUPPLY IS BY GRAVITY, SAME CONTACT WILL ENERGIZE OR DE-ENERGIZE A CUSTOMER FURNISHED AUTOMATIC ON-OFF VALVE. THIS VALVE CAN BE FURNISHED BY NMI AS AN OPTIONAL EXTRA SEE DWG "ELECTRICAL INTERCONNECTION DIAGRAM".
8. CIRCUITRY IN PLANT CONTROLLER IS PROVIDED TO OPERATE "WATER BOY" BY A LEVEL SWITCH LOCATED IN THE FINISHED WATER STORAGE TANK CONTACTS SHOULD CLOSE ON LOW LEVEL AND OPEN ON HIGH LEVEL WITH A VOLUME OF AT LEAST 3,600 GAL IN THE STORAGE TANK BETWEEN THESE POINTS (BY CUSTOMER)
9. FINISHED WATER STORAGE TANK SHOULD BE PROVIDED WITH A LEVEL SWITCH FOR BACKWASH PUMP PROTECTION. CONTACTS SHOULD OPEN WHEN WATER LEVEL IS LOWER THAN 6" VERTICAL HEIGHT ABOVE SUCTION POINT CONTACT SHOULD CLOSE ON RISE LEVEL A MINIMUM STORAGE VOLUME OF 2,400 GAL FOR BACKWASH IS REQUIRED (BY CUSTOMER)
10. A SHUTOFF VALVE IS RECOMMENDED IN THE BACKWASH SUCTION LINE AT THE STORAGE TANK (BY CUSTOMER)
11. A MINIMUM WATER PRESSURE REGULATED AT "WATER BOY" INFLUENT CONNECTION IS 10 PSIG @ 60 GPM
12. INFLUENT FLOAT VALVE (V-3) LINKAGE IS ADJUSTABLE TO SET PLANT FLOW RATE. VALVES V-3 & V-4 MAY BE ROTATED TO ANY POSITION TO ACCOMMODATE INSTALLATION.
13. WATER LINE AND HOSE ARE RECOMMENDED FOR CHEMICAL MIXING EFFLUENT FROM HOSE BIB ON "WATER BOY" MAY BE USED.
14. PARTS KIT CONTAINS MISCELLANEOUS MOUNTING HARDWARE, SPARES AND PLANT OPERATING AIDS
15. LOCATION DIMENSIONS FOR INFLUENT, EFFLUENT AND BACKWASH CONNECTIONS ARE APPROX. REF ONLY. ALLOW FOR MANUFACTURING TOLERANCES
16. ITEMS TO BE ASSEMBLED AT JOBSITE BY CUSTOMER NMI WILL SUPPLY WRITTEN INSTRUCTIONS.

WATER BOY®
WB-82 ARRANGEMENT
M-2

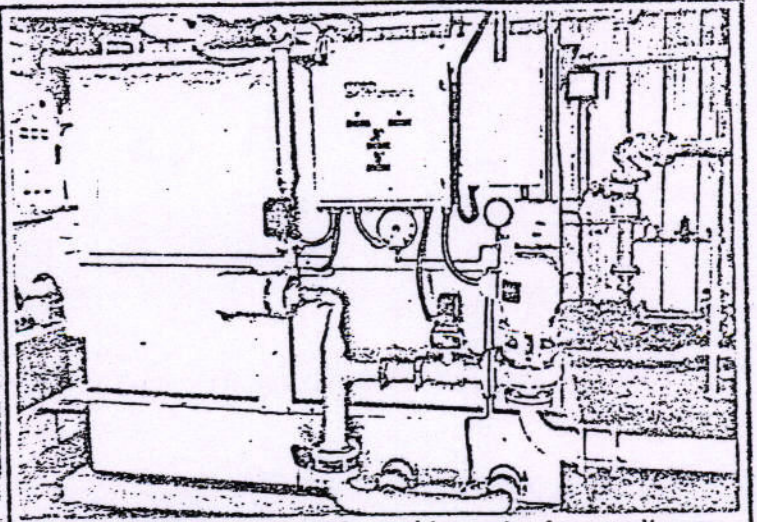
Neptune Microfloc

water boy

Self-contained Water Treatment Plants for Small Communities, Industries, Parks & Recreational Areas



- Automatic Operation
- Advanced Microfloc Technology
- Factory Assembly
- Easy Installation
- Compact Design



This 60 GPM Water Boy 82 provides water for an oil company campsite in Alaska. Ten, 20, and 100 GPM units are also available.

WATER BOY is a compact, complete factory-built water treatment plant. The complete water treatment process—coagulation, flocculation, clarification, and filtration—has been integrated into one small steel package designed to permit either permanent or portable installation. WATER BOY requires a minimum of operation skill and attention, yet provides optimum trouble-free service.

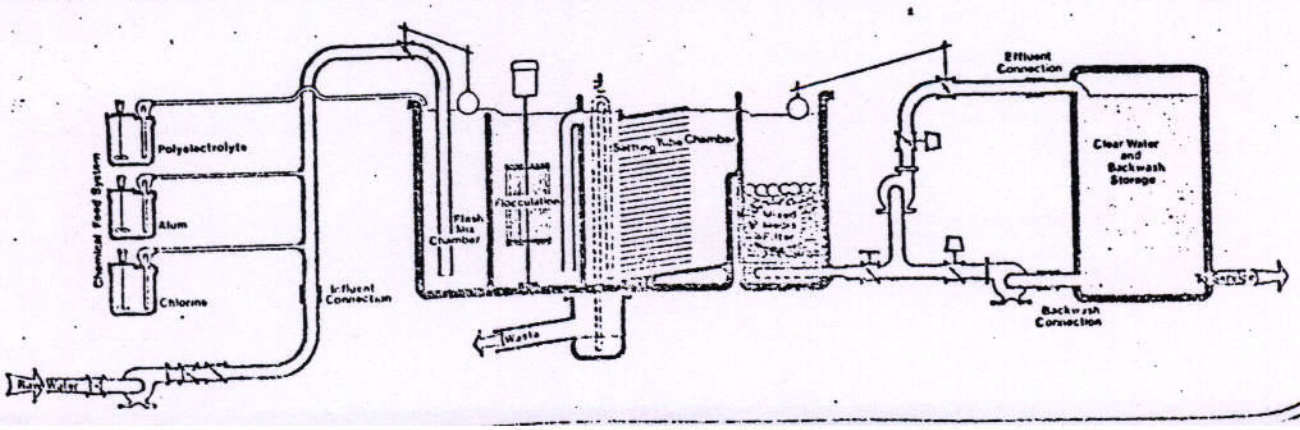
WATER BOY is applied on surface supplies, for removal of turbidity, color, and associated suspended matter, and on groundwaters for removal of iron and manganese. The raw water source is always a prime consideration. Raw water temperature and the amounts of suspended matter, color, etc., to be removed are important. At design flow, the WATER BOY will handle 400 units of turbidity at temperatures of 50 degrees or more. Higher applied turbidities and/or lower temperatures suggest derating the plant in proportion to the amount of turbidity. Similarly, favorable raw water conditions and temperatures would allow the operation of these package units at maximum hydraulic capacity.

WATER BOY generally will use alum (aluminum sulfate) for coagulation, a polymer as a coagulant aid, and chlorine for disinfection. In some cases, pH correction may be required. This can be done by adding soda ash or lime. For taste and odor problems, WATER BOY can utilize either powdered activated carbon or a strong oxidant such as potassium permanganate. For iron and manganese removal, chlorine and/or potassium permanganate and a polymer coagulation aid would be suggested.

Generally, highest quality effluent must be maintained for both industrial and municipal services. Usually, this means effluent turbidity of less than 0.5 JTU, and often 0.1-0.2 JTU. This quality is the norm—not the exception—for the WATER BOY.

Here's how WATER BOY works. The required chemicals are introduced as raw water enters the plant. The chemically dosed water then enters the flash mix chamber. Next, the treated water flows over a calibrated weir to a mechanical flocculator, and on to the unique Microfloc tube clarifier.

FLOW DIAGRAM

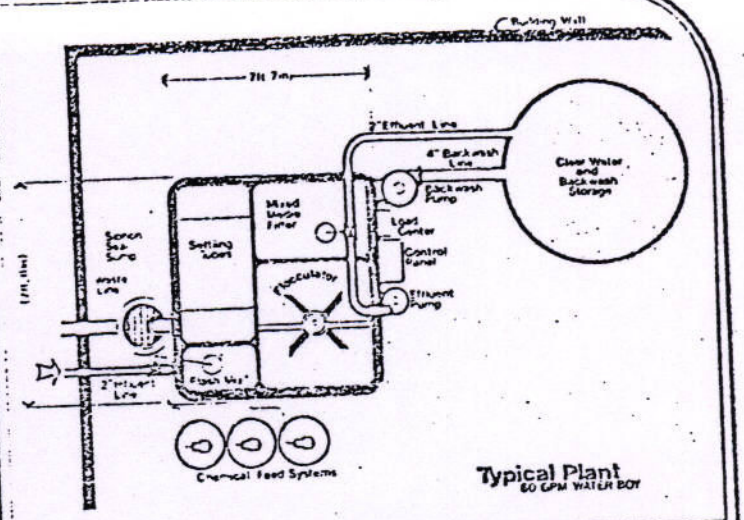


BULLETIN No. KL 4340

water boy

.fied water enters the mixed-media filter chamber and passes through the filter bed to the underdrain system where it's pumped to the combination clearwell and backwash tank.

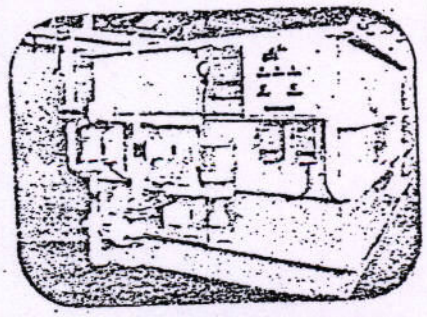
Filter backwash is automatic, initiated on headloss. Positive sludge removal from the tube clarifier is integrated in the backwash, and final backwash water refills the settling chamber, cutting plant downtime and wasted water. All pumps, motors, and controls are mounted integrally. Only load center electrical connections and influent, effluent, backwash and waste pipelines are needed to place the unit in service.



TYPICAL PLANT SCHEMATIC

TYPICAL INSTALLATIONS

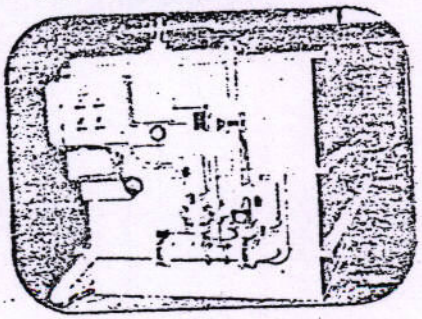
WATER BOY is utilized to provide water for small communities of from 50 to 2000, and serve the domestic water needs of parks and resorts, schools, and various industries. Additional uses are for construction water, tertiary sewage treatment, and water research.



COMMUNITIES

LAKESIDE UTILITIES, OHIO. Two 20 GPM WATER BOYS provide water for a housing development in northern Ohio. A lake provides the raw water source.

ELK CITY, IDAHO. A 100 GPM unit with turbidity monitoring option. The plant provides water for the community of Elk City, Idaho. A river supply is treated.

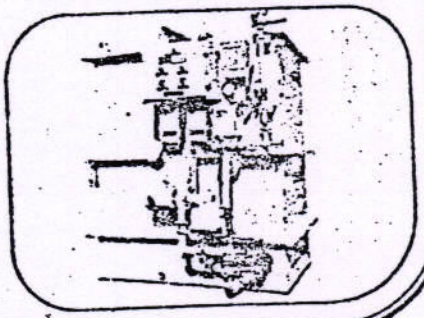


INDUSTRIES

P MILL, ALABAMA. A water supply for pulp mill personnel is provided by a 100 WATER BOY. The water source is a river.

AIR FORCE, THAILAND. SIX 100 GPM WATER BOY units purchased for an Air Force base in Thailand. The units were transported by air to a remote installation.

POWER PLANT, PENNSYLVANIA. The water supply for power plant personnel is provided by a 100 GPM WATER BOY. Raw water source is a river high in manganese as well as other contaminants.



PARKS

MEMALOOSE STATE PARK, OREGON. A campground operated by the State of Oregon located on the Columbia River utilizes a 20 GPM WATER BOY.

DALE HOLLOW RESERVOIR, TENNESSEE. This Corps of Engineers project uses WATER BOYS for serving the recreation areas.

neptune/microfloc

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Telephone: (503) 752-
A subsidiary of
Neptune International

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modular aquarius

Water Treatment Plants for Communities and Industry

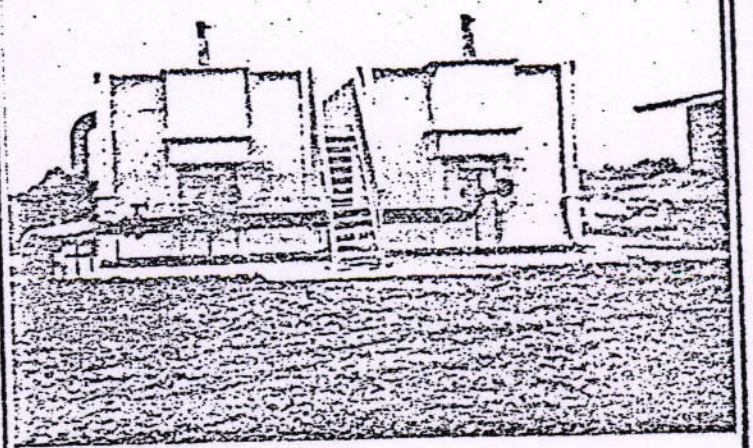
Complete Treatment

Automatic Operation

Compact Design

Easy Installation

Low Costs



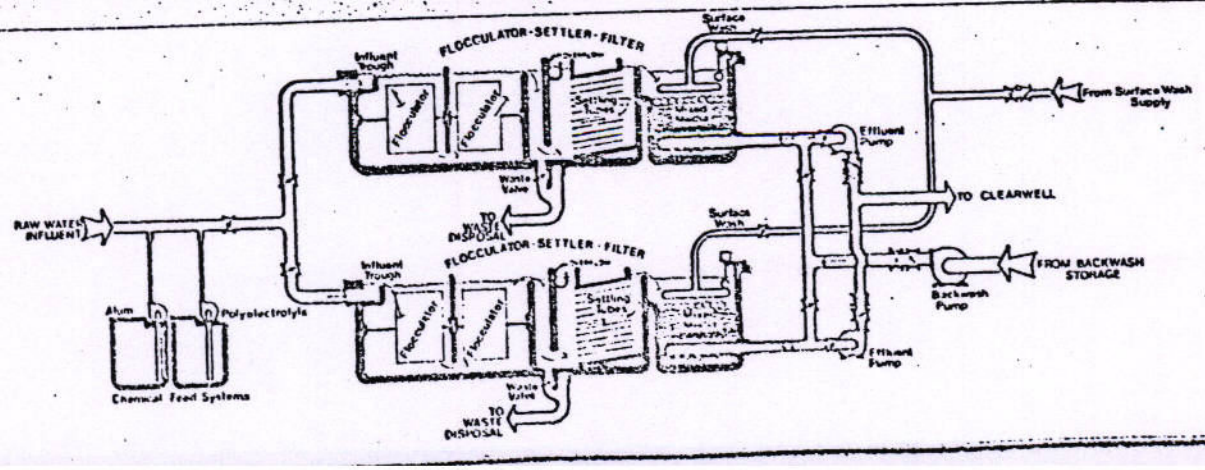
AQ 300 treats 2 MGD.

Neptune Microfloc's Modular Aquarius is a unique water treatment plant for communities of 1,000 to 50,000 people and for industry. Modular Aquarius provides complete water treatment — flocculation, settling and filtration — in a compact, economical design which absolutely minimizes capital and operating costs. Five standard models in steel construction are offered: 200, 350, 560, 700 and 1000 gpm. Designs in concrete are available for capacities of 2 to 5 MGD. The advantages offered by Modular Aquarius have made it the choice of consulting engineers, communities and industry in over 100 installations ranging from the United States to South America, Canada, the Caribbean and Australia.

Modular Aquarius offers several unique and important advantages over conventional equipment. Most importantly, Modular Aquarius includes complete water treatment capability. Modular Aquarius provides full mechanical flocculation, tube settling, and Mixed Media filtration. Complete treatment is imperative in the smaller applications where full time, well trained operators are seldom available. Modular Aquarius also offers simple, automatic operation. Constant rate operation based on water level in the filter chamber, automatic sludge removal and automatic backwash initiated on high headloss make the operator's task less complicated, leaving more time for running chemical tests and monitoring treated water quality. A fail-safe turbidity monitoring package which shuts the plant down on high finished water turbidity is also available.

A typical flow schematic for a Modular Aquarius plant, either in concrete or steel, is illustrated. The raw water is either pumped or flows by gravity to the treatment system. Influent flow is set at a fixed, but adjustable, rate with the flow started or stopped by clearwell level. Coagulating and sterilizing chemicals are added upstream of the influent flow control system. The chemically treated water then passes to a mechanical flocculator designed to rapidly form a highly settleable floc. The flocculated water flows

FLOW DIAGRAM

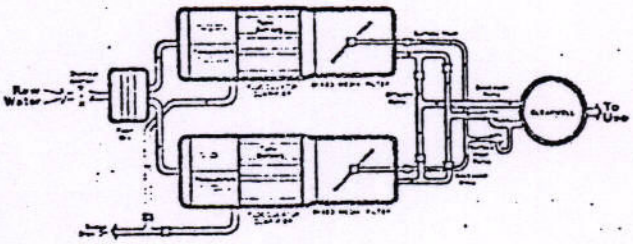


modular aquarius

to sedimentation chambers equipped with Neptune Microfloc's unique settling tubes. The overflow rate based on the surface area of the settling tubes is less than 100 gpd per square foot. The tube settlers remove and store sediment for later wasting from the system.

The clarified water passes over a submerged weir to the Mixed Media filter chamber. The Mixed-Media filter is composed of three materials, each of different size and density. The water passes through the Mixed-Media filter, collects in the pipe lateral underdrain system, and is passed to the clearwell. Backwash of a settler/filter unit is initiated by a pressure switch on the effluent line or by a manual initiation switch on the control panel. The settler/filter is operated as a unit. Each time the filter backwashes, the tube settling section dumps to waste, providing positive sludge removal. The free-falling water surface scours the settling tubes clean.

Modular Aquarius features a compact modular design which lowers capital cost and facilitates future expansion. A complete Modular Aquarius plant fits into the space required for conventional clarification equipment alone, saving ⅓ to ½ of the total plant space required for other systems. Low profile minimizes building height. Installation costs are kept low with easily handled, factory assembled modules shipped directly to the jobsite. Expansion is easily accommodated by adding more modules as additional capacity is required.



TYPICAL PLANT LAYOUT

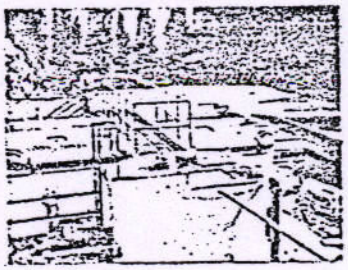
Modular Aquarius can be applied to either surface supplies or ground water for removal of turbidity, color, iron and manganese, and for partial softening. Generally, alum, polymer (as a coagulant aid), and chlorine are used, with powdered activated carbon and potassium permanganate being applied for taste and odor control.

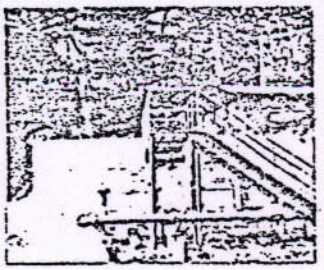
COMPLETE DESIGN PACKAGE

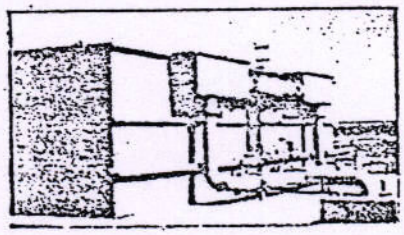
A pre-engineered design package including drawings and specifications is available to consulting engineers. The package covers the steel Modular Aquarius plants in a no-frills, yet complete, steel building with all essential internal equipment and facilities. Layout, mechanical and electrical drawings, and recommended specifications are included in the design package.

SOME TYPICAL INSTALLATIONS

Mulgrave, Nova Scotia – 1972	AQ-70
Shelburne, Nova Scotia – 1972	AQ-70
Inco (Ontario) – 1972	AQ-40
Falconbridge Mines (Ontario) – 1974	AQ-70
Lumsden, Newfoundland – 1973	AQ-40
Farmer's Dairy (N.S.) – 1975	AQ-40
Mitchell's Bay, Ontario – 1976	AQ-40
Shubenacadie, Nova Scotia – 1976	AQ-40
Lac Du Bonnet, Manitoba – 1976	AQ-50
Enfield, Nova Scotia – 1976	AQ-40
Aylmer, Quebec – 1969	Concrete
Windsor Mills, Quebec – 1971	Concrete
Labatts (Quebec) – 1974	Concrete
St. Georges, Quebec – 1975	Concrete
Ste. Marie, Quebec – 1975	Concrete







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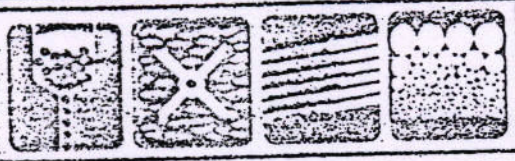
neptune microfloc

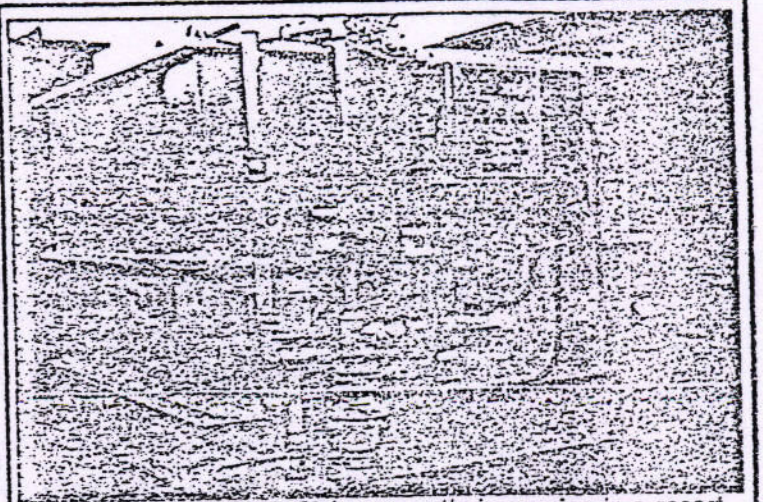
recla-mate SWB

Tertiary Treatment for Small Communities, Industry, and Parks and Recreational Areas



- Automatic Operation
- Efficient Performance
- Advanced Microfloc Technology
- Compact Layout
- Easy Installation

Neptune Microfloc's Recla-Mate SWB provides a solid answer for those wastewater treatment plant operators today who face unreliable plant processes and rising state and regional discharge standards. Recla-Mate SWB is a compact tertiary treatment system specifically designed to fill the gap—to supplement new or existing secondary treatment facilities and provide an economic way to gain consistent performance and upgrade effluent quality. The SWB can treat a wide range of domestic and industrial effluents—aerated lagoon, activated sludge, tricking filter—to consistent tertiary levels. Chemical coagulation, in combination with mechanical flocculation, tube clarification and Mixed Media filtration, form the basic SWB process. Lime, alum or other coagulants can be used to achieve high levels of phosphate reduction and removal of BOD and suspended solids at reasonable cost. With proper chemical dosage, the SWB can treat secondary effluents with less than 40 mg/l BOD and 100 mg/l suspended solids to final BOD and suspended solids levels of less than 5 mg/l and turbidity to less than 1.0 JTU. In special cases, where high concentrations of soluble organic contaminants must be removed, powdered carbon can be injected ahead of the filter chamber to improve BOD removal.

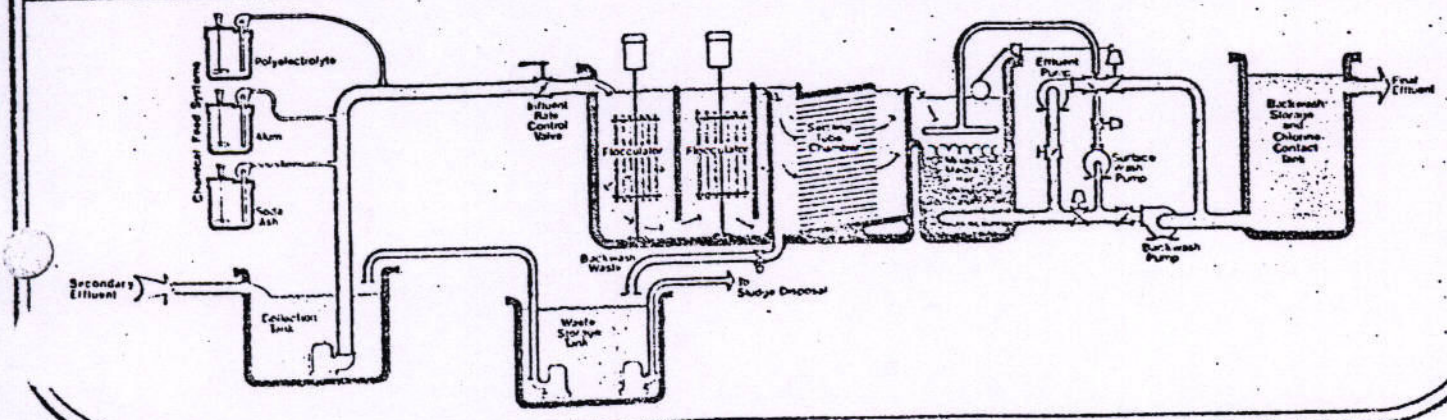


This Recla-Mate SWB-50 is currently in service in a resort area in Pennsylvania. It is used to polish effluent from an extended aeration secondary plant, and treat an average daily flow of 30,000 gpd to a tertiary level.

Recla-Mate SWB can be operated without chemicals if improved reduction of solids only is required and phosphate removal is not necessary. The efficiency of simple settling and filtration without chemicals, of course, will vary with the degree of biological flocculation in the secondary treatment process. When solids in the secondary effluent are not filterable due to excess carry-over or biological upset, chemical treatment can be initiated to maintain a continuously high effluent quality. The amount of chemical treatment can be adjusted to meet the required effluent standard.

Simplicity of operation, low maintenance requirements, and compact size are features of Recla-Mate SWB, as is the fact that its physical-chemical process allows intermittent operation with no sacrifice in efficiency. All plant functions are automatic except for setting the chemical feed rates.

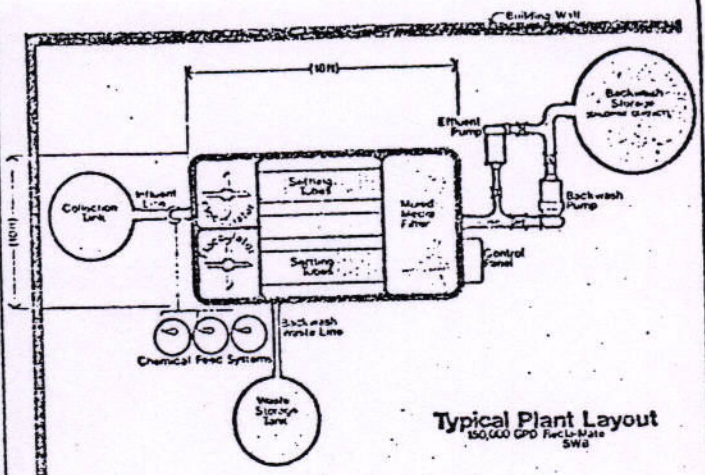
FLOW DIAGRAM



BULLETIN No. KL 444C

recla-mate SWB

stallation is easy, with connection of inlet, effluent, drain backwash piping and power hook-up the only require-s. The SWB process operates as follows: Secondary ent enters the SWB at a constant flow rate, receiving emical treatment before flowing into the two-cell floccu-tor. The flocculated wastewater is next settled in the tube ttlers and filtered through the Mixed Media filter. Filtered ater is then pumped to the backwash storage/chlorine ontact tank from which the final effluent is discharged. he SWB backwashes automatically on headloss across e filter. The tube settler chamber is drained, automatically emoving settled sludge, and flow through the filter is re-ersed. Solids from the tube settler and the filter are drained a waste storage tank. The Recla-Mate SWB is available factory-assembled models in capacities ranging from 2,000 to 75,000 gpd and in modular designs from 100,000 500,000 gpd. The SWB can be skid-mounted if required.



TYPICAL PLANT LAYOUT

TYPICAL INSTALLATIONS

ILL VALLEY
ADAR STATION, CALIFORNIA — TWO SWB-50's

Twin plants treat domestic secondary effluent at this alifornia Air Force Station. SWB effluent is sprayed on djacent land.

AKE MEAD FISH HATCHERY, NEVADA — SWB-250

Modular SWB treats hatchery rearing pond effluent gen-ed when the ponds are cleaned. System features skid ed pumps, valves and controls.

ANDOVER MALL, MARYLAND — SWB-250

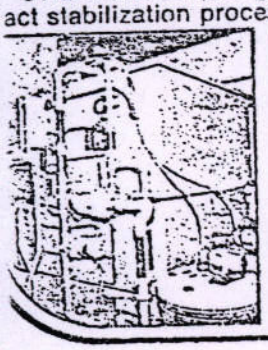
estic wastewater from a suburban Washington, D.C. g center is treated by extended aeration followed by B.

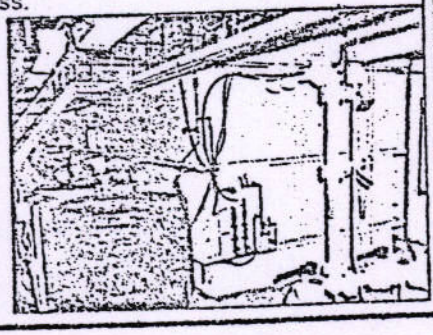
ICHFIELD SPRINGS, NEW YORK — TWO SWB-150's

SWB treats the effluent from an aerated lagoon. System consistently meets effluent requirements of 5 mg/l BOD and uspended solids and 5 mg/l phosphate.

ANSEMOND COUNTY, VIRGINIA — TWO SWB-250's

SWB treats 500,000 gpd of secondary effluent from a con-act stabilization process.





SWB PERFORMANCE

Quality Parameter	Raw Wastewater Influent	Activated Sludge Plant Effluent	Recla-Mate SWB Effluent
COD (Chemical Oxygen Demand) mg/l	200-500	20-60	14-20
BOD (Biological Oxygen Demand) mg/l	250-300	20-40	1-4
Suspended Solids, mg/l	225	60-80	1-4
Phosphorus, mg/l as P	10-15	5.7	0.1-1.0
Turbidity, JTU	100	20-50	0.1-1.0
Color, units	High	High	10-30

neptune microfloc

Neptune Microfloc, Inc.
P.O. Box 612
Corvallis, Oregon 97330
Telephone: (503) 752-5501

A subsidiary of
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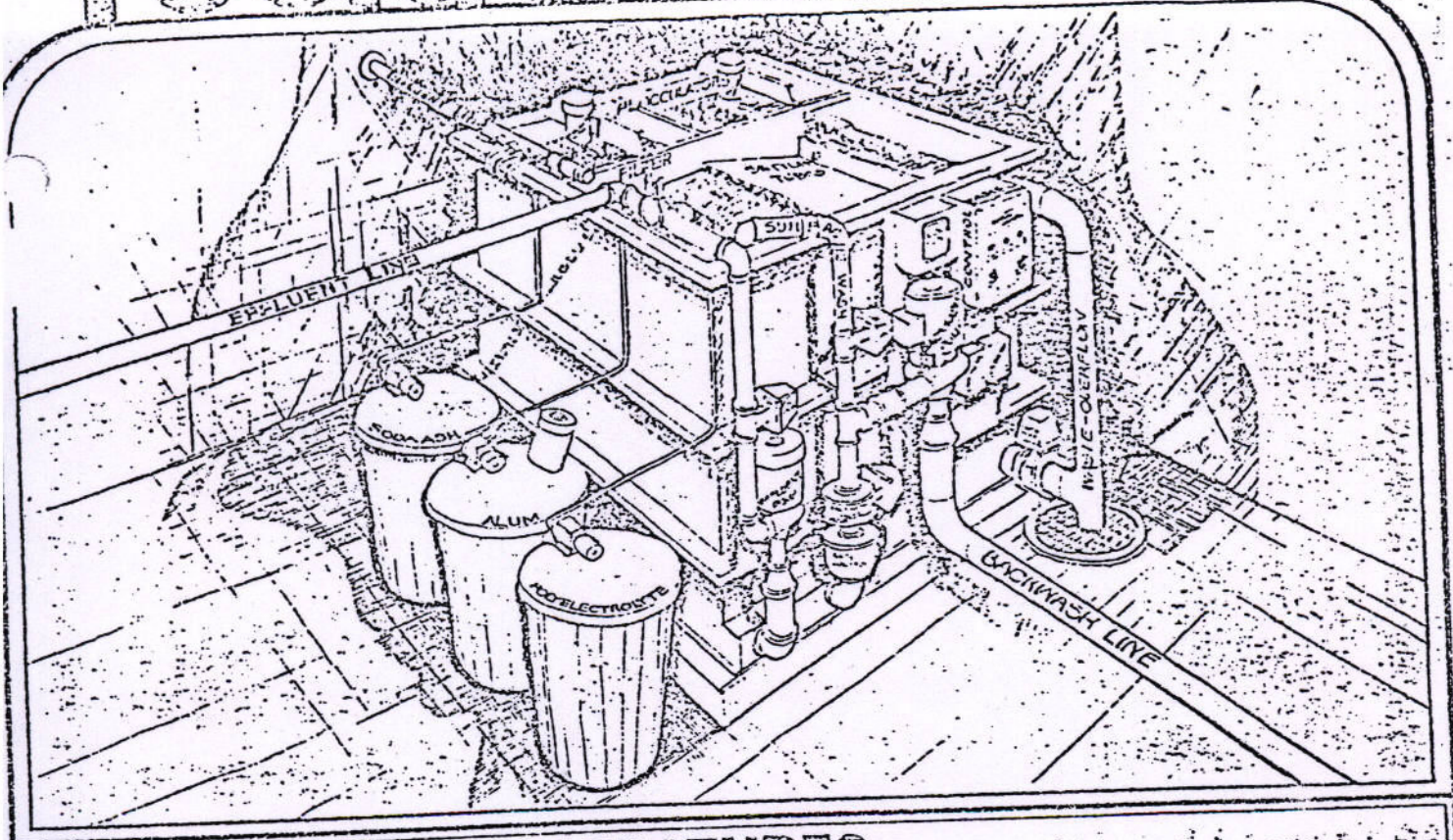

FEATURES

		25	50	75	150	250
NOMINAL FLOW	GPD	25,000	50,000	75,000	150,000	250,000
SHIPPING DIMENSIONS	LENGTH	6 ft. 10 in.	9 ft. 6 in.	13 ft. 4 in.	19 ft. 6 in.	31 ft. 4 in.
	WIDTH	5 ft. 9 in.	8 feet	7 ft. 9 in.	10 feet	10 feet
	HEIGHT	6 ft. 9 in.	6 ft. 10 in.	6 ft. 10 in.	9 feet	9 feet
WEIGHTS	SHIPPING	6,200 lbs.	8,500 lbs.	10,500 lbs.	13,000 lbs.	20,000 lbs.
	OPERATING	15,000 lbs.	28,500 lbs.	39,000 lbs.	100,000 lbs.	165,000 lbs.
BASE PAD DESIGN	POUNDS/FT.²	600	600	600	800	800
BACKWASH VOL.	GALLONS	900	2100	2750	6000	9000
OVERHD. CLEAR.	FEET	4	4	4	4	4
PIPE CONNECTIONS	INLET	1½ inches	2 inches	2 inches	4 inches	6 inches
	EFFLUENT	1½ inches	2 inches	2½ inches	3 inches	4 inches
	BACKWASH	2 inches	4 inches	4 inches	6 inches	8 inches
	WASTE	3 inches	4 inches	6 inches	6 inches	8 inches
	OVERFLOW	—	—	—	6 inches	8 inches
PROCESS COMPONENTS	FLOC. VOL. FT.³	46	115	125	317	584
	TUBE SETTLER OVERFLOW	200 GPD/ft.²	200 GPD/ft.²	200 GPD/ft.²	200 GPD/ft.²	200 GPD/ft.²
	FILTER MEDIA AREA	4 ft.²	9 ft.²	12 ft.²	31.5 ft.²	50 ft.²
	PUMPS — EFFLUENT	½ HP, 20 GPM	¾ HP, 40 GPM	1 HP, 60 GPM	3 HP, 125 GPM	5 HP, 220 GPM
	PUMPS — BACKWASH	1 HP, 75 GPM	3 HP, 175 GPM	5 HP, 230 GPM	10 HP, 630 GPM	15 HP, 850 GPM
	PUMPS — SURFACE WASH	—	—	—	1 HP, 60 GPM	3 HP, 55 GPM
	CONTROLS	Automatic	Automatic	Automatic	Automatic	Automatic
	CHEMICAL FEED — ALUM — TANK	50 Gallon	50 Gallon	100 Gallon	200 Gallon	400 Gallon
	CHEMICAL FEED — ALUM — PUMP	38.5 GPD	120 GPD	120 GPD	22 GPH	22 GPH
	CHEMICAL FEED — ALUM — MIXER	⅓ HP, 115V, 1 Ø	⅓ HP, 115V, 1 Ø	¼ HP, 115V, 1 Ø	¼ HP, 115V, 1 Ø	⅓ HP, 115V, 1 Ø
	CHEMICAL FEED — POLYELECTROLYTE — TANK	30 Gallon	50 Gallon	100 Gallon	100 Gallon	200 Gallon
	CHEMICAL FEED — POLYELECTROLYTE — PUMP	24 GPD	60 GPD	120 GPD	22 GPH	22 GPH
	CHEMICAL FEED — POLYELECTROLYTE — MIXER	⅓ HP, 115V, 1 Ø	⅓ HP, 115V, 1 Ø	¼ HP, 115V, 1 Ø	¼ HP, 115V, 1 Ø	¼ HP, 115V, 1 Ø
	CHEMICAL FEED — SODA ASH — TANK	30 Gallon	50 Gallon	100 Gallon	200 Gallon	400 Gallon
	CHEMICAL FEED — SODA ASH — PUMP	24 GPD	100 GPD	120 GPD	22 GPH	22 GPH
	CHEMICAL FEED — SODA ASH — MIXER				⅓ HP, 115V, 1 Ø	⅓ HP, 115V, 1 Ø
ELECTRICAL	POWER SUPPLY	120/230V, 60 Hz, 1 Ø, 40 Amp	230/460V, 60 Hz, 3 Ø	230/460V, 60 Hz, 3 Ø	230/460V, 60 Hz, 3 Ø	230/460V, 60 Hz, 3 Ø
	PUMPS	115/230V, 60 Hz, 1 Ø			3 CFM @ 80 PSI	3 CFM @ 80 PSI
COMPRESSED AIR						
FINISH	INTERIOR	←	6 MIL VR-3 VINYL			→
	EXTERIOR	←	3 MIL VR-3 VINYL			→

BULLETIN No. KB 5440

SPECIFICATIONS

NERAL
/...r this section of the specification, the contractor shall furnish and install
...-built steel tertiary treatment plant, ... gpd in capacity similar
...t equal to the Recla-Mate model SWB- ... manufactured by Neptune
...ics, Incorporated, 1965 Airport Road, Corvallis, Oregon.
...treatment plant shall include chemical treatment, flocculation, settling,
..., process pumps, automatic process valves, and controls for automatic
...n and backwash. The equipment and materials shall be furnished by a
... supplier, and that supplier's experience must include no less than five
...l-scale plants utilizing the concepts described herein in operation for 1 year
... more. Suppliers other than the above-named company wishing to quote on
...terials and equipment in this section shall submit suitable evidence of experi-
...ce and results with the above concepts to the engineer and obtain his written
...proval to quote at least 10 days prior to bid opening. The contractor shall pay
... royalty or license fees for use of patented devices or systems and shall pro-
...t the owner from patent infringement litigation thereon.

...ANT AUTOMATION
The treatment plant shall be simple to operate and maintain. All functions of
... plant shall be automated with the exception of establishing flow rate, mixing
...emicals, and adjusting chemical feed rates.

...ANT CONSTRUCTION
The major components shall be of the size and shape as shown on the plans,
...mbined in a single tank and fabricated of steel plates suitably braced and sup-
...rted. Pipe fittings necessary for connection to external pipe work shall be
...corporated on plant tankage. The arrangement of the major components,
...xiliary devices, and equipment shall provide ready access for maintenance.

...INTING
Surface preparation and painting shall be performed at the manufacturer's plant
... strict accordance with the paint manufacturer's instructions. Inside surfaces
...all be provided with both prime and finish coats. A minimum of four coats of
...int shall be provided on inside surfaces. The outside surfaces shall include
...e prime coat, ready for finish painting in the field. The outside surface shall
...ceive one finish coat of paint, compatible with the prime coat used by the
...int manufacturer, which shall be applied in the field by the contractor in ac-
...rdance with the treatment plant manufacturer's instructions.

...ECHANICAL FLOCCULATOR
The flocculator shall be a two-chamber unit properly baffled to maximize vol-
...metric efficiency. The flocculator drive shall provide for variable speed opera-
...n to promote optimum flocculation under variable treatment conditions. Speed
...all be variable over a 3:1 range, and maximum paddle tip velocities shall not
...ceed 2 feet per second. Mechanical equipment furnished for the flocculator
...mpartment for installation by contractor shall include flocculator blades and
...aft, bearings, drive mechanism, and drive motor.

...ETTLING CHAMBER
The settling system provided shall have an overflow design rate of less than
...0 gpd per square foot of available settling area. Automatic sludge wasting from
... settling system shall also be included.

...IL...
...al filter area shall be ... square feet. A pipe lateral underdrain
...sy... shall provide uniform distribution of the backwash water. This system
...all be provided for installation by the contractor. A filter surface wash system
...all also be provided.
T... ...r media shall be of the mixed-media separation bed type composed of
...ore materials, each of a different specific gravity and providing a uni-
... distribution from coarse to fine in the direction of flow with particle
...ze ...ging from 1.2 mm to 0.25 mm.
The filter bed shall be type MF 185, 30 inches in depth. Sufficient media sup-
...rt gravel designed for the underdrain system shall be provided. The materials
...all be furnished by the treatment plant manufacturer and shall be shipped in
...gs for installation by the contractor. Both media and gravel shall be installed
...der the technical direction of the treatment plant manufacturer's representative.

...LANT PROCESS PUMPS
The treatment plant manufacturer shall furnish one effluent pump, one back-
...sh pump, and one surface wash pump. The effluent pump shall be rated at
... gpm, ... hp; the backwash pump shall be rated at ... gpm, ... hp; and the surface wash pump shall be rated at ... gpm, ... hp. Pumps to be installed by contractor for SWB-150 and SWB-250, factory-installed on smaller units.

PLANT PROCESS VALVES
The treatment plant manufacturer shall provide the process control valves shown on the plans. Automatic valves shall be provided for filter effluent rate control, backwash waste, and surface wash.

PLANT CONTROL
The treatment plant supplier shall furnish a control panel containing all necessary timers, solenoids, contact switches, and internal wiring completely assembled and mounted in a NEMA 12 enclosure. The control panel shall provide for automatically starting and stopping the plant influent pump and chemical feeders, based on water level in the collection tank, or by manual override. The contractor shall mount the control panel on the Recla-Mate unit and provide all electrical wiring and connections external to the panel.
The control system shall provide means for automatically initiating backwash of the filter by a preset filter headloss sensor. Override of the automatic backwash initiation shall be provided to allow manual backwash of the filter by push-button. The system shall provide for automatically draining the settling system contents to the backwash waste storage tank and control of the sludge and decant pumps after a timed interval.
For the SWB-150 and SWB-250, the plant manufacturer shall furnish for installation by the contractor control devices and equipment as follows: one backwash initiate switch with indicating gauge; one liquid level switch for effluent pump protection; one pneumatic liquid level controller to control the filter effluent flow control valve; one effluent flow indicator for local mounting; and one effluent flow orifice with flanges.

CHEMICAL FEED EQUIPMENT
The plant manufacturer shall provide equipment for mixing and feeding of aluminum sulfate, a polyelectrolyte coagulant aid, and soda ash, as shown on the drawings. This chemical feed equipment shall include mix tank, pump, and mixer. The polyelectrolyte system shall include a disperser mounted on the mix tank.

ELECTRICAL REQUIREMENTS
The plant control panel shall be provided with a 120 volt, 60 hz, single phase power, 60 amp circuit.
Pump motors shall be open drip-proof, either 120 volt, 60 hz, single phase or 230 volt, 60 hz, three phase, with 40 degree rise rating. Chemical feed pump motors shall be 120 volt, 60 hz, single phase. Motor starters, as required, shall be provided by the contractor and mounted as shown on the plans.
All electrical connections between components shall be provided and installed by the contractor.

VALVES AND PIPING
The contractor shall furnish and install all interconnecting piping and wiring and valves not furnished by the plant supplier as shown on the plans. This section to include couplings, check valves, isolation valves, and all other manual valves for pneumatic or hydraulic service for plant control.

PNEUMATIC REQUIREMENTS (SWB-150, SWB-250 ONLY)
The contractor shall provide a dry instrument air compressor system capable of providing 3 scfm at 60 psig. Equipment to include compressor, receiver, and dryer. The system shall be located as shown on the plans. All pneumatic connections shall be provided and installed by the contractor.

PLANT STARTUP AND OPERATOR TRAINING
The treatment plant manufacturer shall provide for 5 days of plant startup and operator training to include placement direction of the filter media, plant checkout, and operator instruction.

OPERATOR'S MANUAL
There shall be furnished with the plant two manuals which shall provide complete instructions for installation, startup, operation, and maintenance.

DRAWINGS
Two sets of drawings shall be provided by the treatment plant manufacturer showing the dimensions of all interconnecting piping and plant flow scheme for the contractor's use.

CASE HISTORIES

...ICHFIELD SPRINGS, NEW YORK

PLANT SIZE: 0.3 MGD
ENGINEER: Standard Engineering
Albany, New York
STARTUP: February, 1973
EQUIPMENT: Two Recla-Mate SWB-250's

COMMENTS: Richfield Springs is a ski resort area which experiences wide variations in waste stream flow and strength due to seasonal population growth. The processes selected for treatment of this variable stream are a two-stage lagoon treatment using diffused aeration followed by two SWB-150's. The second stage lagoon accomplishes nitrification in the system.

The two SWB's operate at a constant rate of 110 gpm and incorporate coagulation, flocculation, tube settling, and mixed-media filtration. Alum and polyelectrolyte are used as coagulants. The mixed-media filters operate at 5 gpm per square foot. All plant functions are automatic.

Plant operating data are given below: Waste Quality Characteristics

	Lagoon Effluent mg/l	Filter Effluent mg/l
COD	54-94	23-34
BOD	15-29	4.2-4.5
SS	31-46	7.5-14
Total P	1.26-2.34	0.3[illegible]-0.54
Turbidity	34-61	0.9[illegible]-3.5
Coliform	31,000-34,000 MPN	20[illegible]-11,100 MPN

Filter Performance	
Run Length	4-5 hours
Filter Rate	4 gpm/ft²
Backwash Usage	11-17 percent
Settled Sludge	1-2 percent
Dewatered Sludge	13 percent