WASTEWATER TECHNOLOGY

NSF/ANSI Standard 40 - *Residential Wastewater Treatment Systems*
Final Report:
Aquaklear, Inc.
AK500C Wastewater Treatment System
04/03/2015/060

NSF International
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Final Evaluation Report:
Aquaklear, Inc.
AK500C Wastewater Treatment System

Under the provisions of NSF/ANSI Standard 40
Residential Wastewater Treatment Systems

November 2005

EXECUTIVE SUMMARY

Testing of the AK500C was conducted under the provisions of NSF/ANSI Standard 40 for Residential Wastewater Treatment Systems (November 2004). NSF/ANSI Standard 40 was developed by the NSF Joint Committee on Wastewater Technology.

The performance evaluation was conducted at the Gulf Coast Test Facility located in Baton Rouge, Louisiana, using wastewater diverted from a lift station servicing a residential neighborhood in Ascension Parish. The Gulf Coast Test Facility is a Standard 40 subcontractor to NSF. The evaluation consisted of sixteen weeks of dosing at design flow, seven and one half weeks of stress testing and two and one half weeks of dosing at design flow. Sampling started in the summer and continued into the winter, covering a range of operating temperatures.

The Aquaklear AK500C produced an effluent that successfully met the performance requirements established by NSF/ANSI Standard 40 for Class I effluent:

> The maximum 7-day arithmetic mean was 27 mg/L for $CBOD_5$ and 27 mg/L for total suspended solids, both below the allowed maximums of 40 and 45 mg/L respectively. The maximum 30-day arithmetic mean was 17 mg/L for $CBOD_5$ and 23 mg/L for total suspended solids, both below the allowed maximums of 25 and 30 mg/L respectively.

Over the course of the evaluation, the average effluent $CBOD_5$ concentration was 10 mg/L, ranging between <2 and 41mg/L, and the average effluent total suspended solids concentration was 11 mg/L, ranging between <2 and 56 mg/L. The effluent pH during the entire evaluation ranged between 6.1 and 8.2, within the required range of 6.0 to 9.0. The plant also met the requirements for noise levels (less than 60 dbA at a distance of 20 feet) and color, threshold odor, oily film and foam.

PREFACE

Performance evaluation of residential wastewater treatment systems is achieved within the provisions of NSF/ANSI Standard 40: Residential Wastewater Treatment Systems (November 2004), prepared by the NSF Joint Committee on Wastewater Technology and adopted by the NSF Board of Trustees.

Conformance with the Standard is recognized by issuance of the NSF Mark. This is not to be construed as an approval of the equipment but rather a certification of the data provided by the test and an indication of compliance with the requirements expressed in the Standard.

Plants conforming to Standard 40 are classified as Class I or Class II plants according to the quality of effluent produced by the plant during their performance evaluation. Class I plants must also demonstrate performance consistent with the effluent color, odor, oily film and foam requirements of the Standard. Class I plants must meet the requirements of the EPA Secondary Treatment Guidelines[1] for five day carbonaceous biochemical oxygen demand, total suspended solids and pH.

Permission to use the NSF Mark is granted only after the equipment has been tested and found to perform satisfactorily, and all other requirements of the Standard have been satisfied. Continued use of the Mark is dependent upon evidence of compliance with the Standard and NSF General and Program Specific Policies as determined by periodic reinspection of the equipment at the factory, distributorships and reports from the field.

NSF Standard 40 requires the testing laboratory to provide the manufacturer of a residential wastewater treatment system a report including significant data and appropriate commentary relative to the performance evaluation of the plant. NSF policy specifies provision of performance evaluation reports to appropriate state regulatory agencies at publication. Subsequent direct distribution of the report by NSF is made only at the specific request of or by permission of the manufacturer.

The following report contains results of the entire testing program, a description of the plant, its operation and key process control equipment, and a narrative summary of the test program, including test location, procedures and significant occurrences. The plant represented herein reflects the equipment authorized to bear the NSF Mark.

CERTIFICATION

NSF International has determined by performance evaluation under the provisions of NSF/ANSI Standard 40 (November 2004) that the AK500C wastewater treatment system manufactured by Aquaklear, Inc., has fulfilled the requirements of NSF/ANSI Standard 40. The Aquaklear AK500C has therefore been authorized to bear the NSF Mark so long as Aquaklear, Inc. continues to meet the requirements of Standard 40 and NSF General and Program Specific Policies.

General performance evaluation and stress tests were performed at the Wastewater Technology Site, located at the Gulf Coast Test Facility in Baton Rouge, Louisiana. The raw wastewater used in the test was primarily domestic wastewater, with a small commercial component. The characteristics of the wastewater during the test are included in the tabulated data of this report.

The observations and analyses included in this report are certified to be correct and true copies of the data secured during the performance tests conducted by NSF on the wastewater treatment system described herein. The manufacturer has agreed to present the data in this certification in its entirety whenever it is used in advertising, prospectuses, bids or similar uses.

Thomas J. Bruursema
General Manager
Wastewater Treatment Unit Program

Thomas Stevens
Manager
Federal Programs

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1.0 PROCESS DESCRIPTION

The Aquaklear AK500C uses extended aeration and activated sludge processes to achieve treatment. In the activated sludge process, microorganisms remove soluble contaminants from the wastewater, utilizing them as a source of energy for growth and production of new microorganisms. The organisms tend to be flocculent and form clumps, or floc, that physically entrap particulate organic matter. The organic matter is attacked by extracellular enzymes that solubilize the solids to make them available to the microorganisms as a food source. The conversion of the organic matter from soluble to biological solids allows for removal of the organic matter by settling of the solids in the treatment process.[1]

Extended aeration is a modification of the activated sludge process in which the microorganisms are allowed to remain in the treatment process for long periods of time. The large inventory of biological solids in the process provides a buffer for shock loading of organic matter. The long aeration period allows for the organisms in the system to consume themselves, reducing the total amount of solids produced by the treatment process.

The organisms primarily responsible for the degradation of the organic matter are aerobic bacteria. As such, the transfer of oxygen into the wastewater by an aeration system is critical to the treatment process. The aeration system also provides for the mixing of the wastewater and organisms to provide contact between the organic contaminants in the wastewater and the organisms that provide for removal of the contaminants. For this reason, an activated sludge process is referred to as a suspended growth system.

2.0 PERFORMANCE EVALUATION

2.1 Description of Plant Evaluated

The Aquaklear AK500C plant tested in this evaluation has a rated capacity of 500 gallons per day (gpd). Plant specifications and drawings are included in Appendix A.

The system achieves treatment by a flow through process. Wastewater enters directly into the aeration chamber, which has a hydraulic capacity of 510 gallons. Aeration is provided by a diffused air system that operates continuously. Settling is accomplished in a clarification chamber (hydraulic capacity of 180 gallons) following the aeration chamber. Treated wastewater exits the plant through an effluent outlet assembly.

The aeration chamber provides a retention time of 24.5 hours at design flow. Aeration is achieved by release of air through a fine bubble air diffuser located near the bottom of the tank under the inlet. The release of air causes the wastewater to rise in the chamber, establishing a circulation pattern. The diffused air provides oxygen for the aerobic bacteria, as well as mixing of the wastewater with the bacteria.

From the aeration chamber, the wastewater passes by hydraulic displacement into the clarification chamber through a slot in the bottom of the wall dividing the clarification chamber from the aeration chamber. Initial separation of solids takes place in the clarification chamber. The quiescent design of the clarification

chamber allows gravity settling of the solids. The bottom of the wall under the outlet in the clarifier is sloped to help direct settled solids back towards the opening between the two chambers. The hydraulic roll created by the air system helps to draw settled solids from the bottom of the clarifier back into the aeration chamber. Floatable solids are returned to the aeration chamber by means of a skimmer. The skimmer operates by way of an airlift. The air for the skimmer is split off the plant aeration system and runs on a timer for 15 minutes every 24 hours.

2.2 Test Protocol

NSF/ANSI Standard 40, Section 8 - Performance Testing and Evaluation is included in Appendix B. Start up of the plant is accomplished by filling one-third of the plant volume with raw wastewater and the remainder of the volume with fresh water. The plant is then dosed at the design loading rate (500 gpd). Plant dosing occurs during three dosing periods:

6 a.m. to 9 a.m. - 35 percent of daily rated capacity
11 a.m. to 2 p.m. - 25 percent of daily rated capacity
5 p.m. to 8 p.m. - 40 percent of daily rated capacity

After a start up period (up to three weeks at the manufacturer's discretion), the plant is subjected to the following loading sequence:

Design loading	-	16 weeks
Stress loading	-	7.5 weeks
Design loading	-	2.5 weeks

During the design loading periods, 24-hour composite samples are collected of the influent and effluent five times per week. The influent samples are analyzed for five-day biochemical oxygen demand and total suspended solids concentrations. The effluent samples are analyzed for carbonaceous five-day biochemical oxygen demand, and total suspended solids concentrations. On-site determinations of the influent and effluent temperature, pH and dissolved oxygen are made five times per week. In plant measurements of aeration chamber temperature, pH, dissolved oxygen, and 45 minute settleable solids are also made during the evaluation.

Stress testing is designed to evaluate how the plant performs under non-ideal conditions, including high and low hydraulic loadings, and electrical or mechanical system failure. The test sequence includes (1) Wash Day stress, (2) Working Parent stress, (3) Power/Equipment Failure stress, and (4) Vacation stress. Detailed descriptions of the stress sequences are provided in Appendix B.

During the stress test sequences, 24-hour composite samples are collected before and after each stress dosing pattern. The analyses and on-site determinations completed on the samples are the same as described for the design load testing. Each stress is followed by seven consecutive days of dosing at design rated capacity before beginning the next stress test. Sample collection is initiated twenty-four hours after completion of

wash day, working parent, and vacation stresses to allow the plant to recover from the stress. Samples are collected beginning 48 hours after completion of the power failure stress.

In order for the plant to achieve Class I effluent it is required to produce an effluent, which meets the EPA guidelines for secondary effluent discharge[2]:

- $CBOD_5$: Each 30-day average of effluent samples shall not exceed 25 mg/L and each 7-day average of effluent samples shall not exceed 40 mg/L.

- Total Suspended Solids: Each 30-day average of effluent samples shall not exceed 30 mg/L and each 7-day average of effluent samples shall not exceed 45 mg/L.

- pH: Individual effluent values remain between 6.0 and 9.0.

Requirements are also specified for effluent color, odor, oily film and foam, as well as maximum noise levels allowed from the plant.

2.3 Test Chronology

The system was installed by a contractor on May 13, 2004 under the direction of the manufacturer. The infiltration/exfiltration test was completed on May 14, 2004. The plant was filled with two-thirds fresh water and one-third wastewater and dosing, at the rate of 500 gpd, as well as sampling was started on August 29, 2004. The stress test sequence was started on December 20, 2004 and ended on February 9, 2005, and testing was completed on February 25, 2005.

3.0 ANALYTICAL RESULTS

3.1 Summary

Chemical analyses of samples collected during the evaluation were completed using the procedures in *Standard Methods for the Examination of Water and Wastewater*[3]. Copies of the data generated during the evaluation are included in Appendix C. The results of the all chemical analyses and on-site observations and measurements made during the evaluation are summarized in Table I.

Criteria for evaluating the analytical results from the testing are described in Section 8.5 of NSF/ANSI Standard 40. In completing the pass/fail determination for the data, an allowance is made for effluent total suspended solids and $CBOD_5$ during the first month of testing. The 30- and 7-day averages during this time may not equal or exceed 1.4 times the effluent limits required for the rest of the test. The provision recognizes that an immature culture of microorganisms within the system may require additional time to achieve adequate treatment efficiency. Effluent $CBOD_5$ and total suspended solids concentrations from the AK500C during the first calendar month of testing were within the normal limits and did not need to use this provision.

Section 8.5.1.1 of the Standard provides guidance addressing the impact of unusual testing conditions, including sampling, dosing, or influent characteristics on operation of a system under test. Specific data points may be excluded from 7- and 30- day average calculations where test conditions are determined to have an adverse impact on performance of the system, with rationale for the exclusion to be documented in the final report. There were no such conditions during this test.

Sections 3.6 and 8.2.1 of the Standard define influent wastewater characteristics as they apply to testing under the Standard. Typical domestic wastewater is defined as having a 30-day average BOD_5 concentration between 100 and 300 mg/L and a 30-day average total suspended solids concentration between 100 and 350 mg/L. The 30-day average influent strength remained inside this specified range for the duration of this test.

TABLE I. SUMMARY OF ANALYTICAL RESULTS

	Average	Std. Dev.	Minimum	Maximum	Median	Interquartile Range
Oxygen Demand (mg/L)						
Influent (BOD_5)	150	39	81	280	150	130-170
Effluent ($CBOD_5$)	10	7	<2	41	8	6-12
Total Suspended Solids (mg/L)						
Influent	130	43	63	300	120	100-150
Effluent	11	10	<2	56	8	5-13
Volatile Suspended Solids (mg/L)						
Influent	85	25	38	180	86	64-98
Effluent	8	6	<2	32	5	3-9
pH						
Influent	-	-	6.1	7.8	7.3	7.1-7.4
Effluent	-	-	6.1	8.2	7.6	7.3-7.9
Temperature (°C)						
Influent	22	2	15	26	22	20-24
Effluent	22	2	16	26	21	20-24
Dissolved Oxygen (mg/L)						
Effluent	4.9	1.7	2.2	8.2	5.1	3.1-6.1

Notes: The median is the point where half of the values are greater and half are less.
The interquartile range is the range of values about the median between the upper and lower 25 percent of all values.

3.2 Biochemical oxygen demand

The five-day biochemical oxygen demand (BOD_5) and carbonaceous five-day biochemical oxygen demand ($CBOD_5$) analyses were completed using EPA Method 405.1. Results of the analyses completed on the samples collected during the testing are shown in Figure 1.

Influent BOD_5:

The influent BOD_5 ranged from 81 to 280 mg/L during the evaluation, with an average concentration of 150 mg/L and a median concentration of 150 mg/L.

Effluent $CBOD_5$:

The effluent $CBOD_5$ concentrations ranged from <2 to 41 mg/L over the course of the evaluation, with an average concentration of 10 mg/L. The median effluent $CBOD_5$ concentration was 8 mg/L.

Standard 40 requires that over the course of the evaluation, the effluent $CBOD_5$ not exceed 40 mg/L on a 7-day average or 25 mg/L on a 30-day average. Table II shows the 7- and 30-day average effluent $CBOD_5$ concentrations and the 30-day average influent $CBOD_5$ concentrations.

The 7-day average effluent $CBOD_5$ ranged from 4 to 27 mg/L. The 30-day average ranged from 6 to 17 mg/L. As shown in Table II, the AK500C met the requirements of NSF/ANSI Standard 40 for effluent $CBOD_5$.

BOD_5 Loading:

Over the course of the evaluation the influent $CBOD_5$ loading averaged 0.62 lbs/day. The AK500C achieved an average reduction of 0.58 lbs/day.

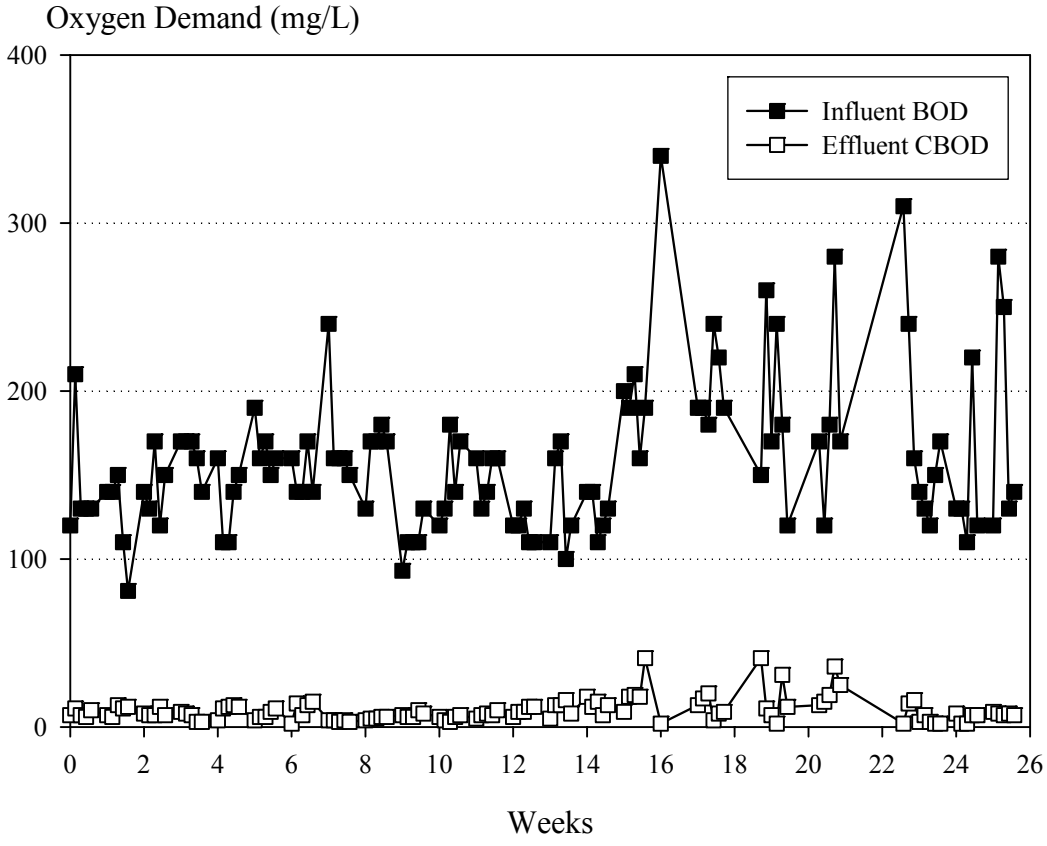


Figure 1. Biochemical Oxygen Demand

3.3 Total suspended solids

Total suspended solids and volatile suspended solids analyses were completed using Methods 209C and 209D of *Standard Methods*. The results of the suspended solids analyses over the entire evaluation are shown in Figure 2. The data from both analyses are summarized in Table I.

Influent total suspended solids:

The influent total suspended solids ranged from 63 to 300 mg/L during the evaluation, with an average concentration of 130 mg/L. The median influent total suspended solids concentration during the evaluation was 120 mg/L.

Effluent total suspended solids:

The effluent total suspended solids concentration ranged from <2 to 56 mg/L during the evaluation, with an average concentration of 11 mg/L and a median concentration of 8 mg/L.

Over the course of the evaluation, NSF/ANSI Standard 40 requires that the effluent total suspended solids not exceed 45 mg/L on a 7-day average or 30 mg/L on a 30-day average. Table III shows the 7- and 30-day total suspended solids averages.

The 7-day average total suspended solids ranged from 4 to 27 mg/L and the 30-day averages ranged from 5 to 23 mg/L. As shown in Table III, the AK500C met the requirements of NSF/ANSI Standard 40 for effluent total suspended solids.

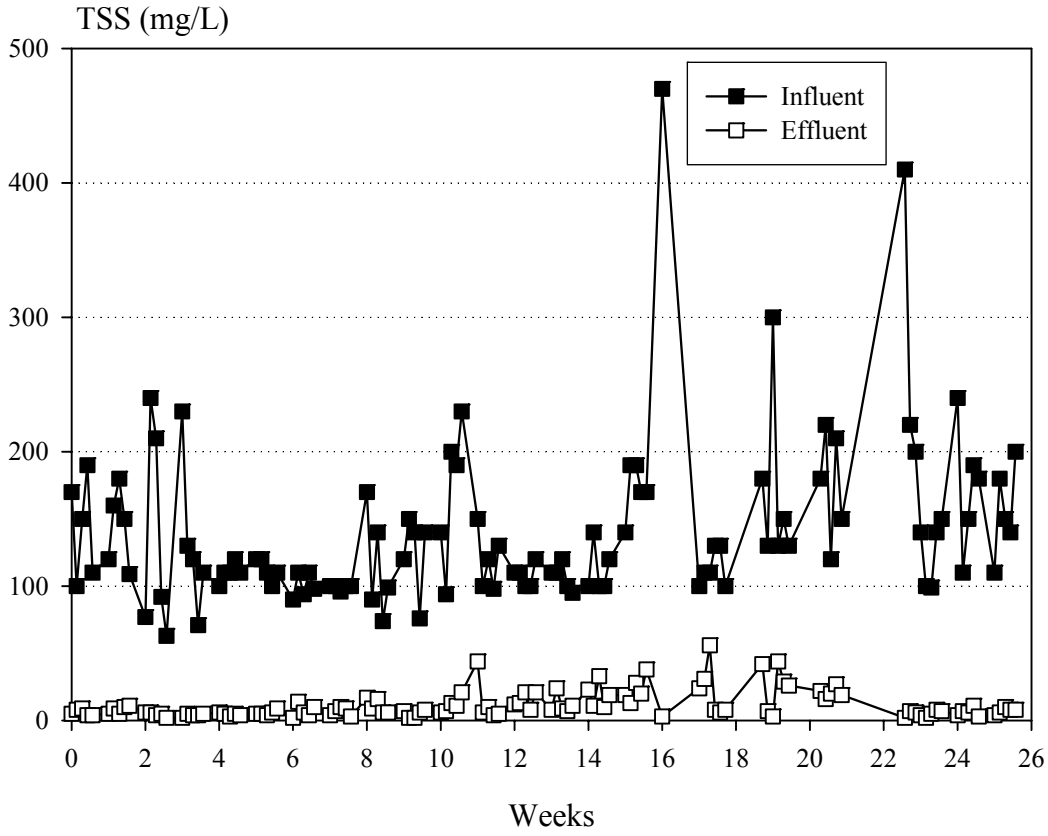


Figure 2. Total Suspended Solids

Table II. 7- and 30-day Average Effluent $CBOD_5$ and 30-day Average Influent BOD_5

Month	Week	7-day Average Effluent $CBOD_5$ (mg/L)	30-day Average Effluent $CBOD_5$ (mg/L)	30-day Average Influent BOD_5 (mg/L)
1	1	8	8	140
	2	10		
	3	8		
	4	6		
2	5	10	8	160
	6	7		
	7	12		
	8	4		
3	9	5	7	130
	10	7		
	11	5		
	12	7		
	13	10		
4	14	11	15	150
	15	13		
	16	15		
	17	24		
5	18	14	17	190
	19	19		
	20	13		
	21	13		
	22	27		
6	23	11	7	160
	24	4		
	25	5		
	26	8		

Table III. 7- and 30-day Average Total Suspended Solids

Month	Week	7-day Average Effluent TSS (mg/L)	30-day Average Effluent TSS (mg/L)	30-day Average Influent TSS (mg/L)
1	1	6	6	140
	2	8		
	3	5		
	4	4		
2	5	5	7	110
	6	6		
	7	8		
	8	7		
3	9	11	11	130
	10	5		
	11	12		
	12	14		
	13	15		
4	14	12	18	130
	15	19		
	16	20		
	17	27		
5	18	32	23	160
	19	19		
	20	21		
	21	21		
	22	22		
6	23	6	6	160
	24	6		
	25	6		
	26	7		

3.4 pH

Over the entire evaluation period, the influent pH ranged from 6.1 to 7.8 (median of 7.3) while the aeration chamber pH ranged from 6.3 to 8.1 (median of 7.2). The effluent pH ranged from 6.1 to 8.2 during the evaluation (median of 7.6), within the 6.0 to 9.0 range required by NSF/ANSI Standard 40. The pH data for the evaluation are shown in Appendix C.

3.5 Temperature

Influent temperatures over the evaluation period ranged from 15 to 26ºC (with an average of 21ºC and a median of 22ºC), while the aeration chamber temperature ranged from 15 to 26ºC (with an average of 22ºC and median of 23ºC) and the effluent temperatures ranged between 16 and 26ºC (with an average of 22 ºC and median of 23ºC). The temperature data are shown in Appendix C.

3.6 Dissolved oxygen

Dissolved oxygen (DO) was measured in the aeration chamber and effluent during the evaluation. The aeration chamber DO ranged between 0.1 and 8.3 mg/L (averaging 0.8 mg/L, with a median of 0.2 mg/L), while the effluent DO ranged between 2.2 and 8.2 mg/L (averaging 4.9 mg/L, with a median of 5.1 mg/L). All dissolved oxygen data are shown in Appendix C.

3.7 Color, threshold odor, oily film, foam

Three samples of the effluent were analyzed for color, odor, oily film and foam as prescribed in NSF Standard 40. The effluent was acceptable according to the requirements in NSF Standard 40, with color less than 15 units, non-offensive threshold odor, no visible evidence of oily film and no foam.

3.8 Noise

A reading of the noise level at a distance of 20 feet from the plant was taken while the plant was in operation, using a hand-held decibel meter. The reading was below the 60 dbA required under NSF/ANSI Standard 40.

4.0 REFERENCES

1. Grady, Jr., C.P., and H.C. Lim, Biological Wastewater Treatment: Theory and Applications, Marcel Dekker Publishers, New York, 1980.

2. "Environmental Protection Agency Guidelines for Secondary Treatment", Federal Register, Volume 28, No. 159, 1973.

3. APHA, AWWA, WPCF, Standard Methods for the Examination of Water and Wastewater, 20th Edition, American Public Health Association, Washington, D.C.

4. U.S. EPA, Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, Washington, D.C.

APPENDIX A

PLANT SPECIFICATIONS

PLANT SPECIFICATIONS

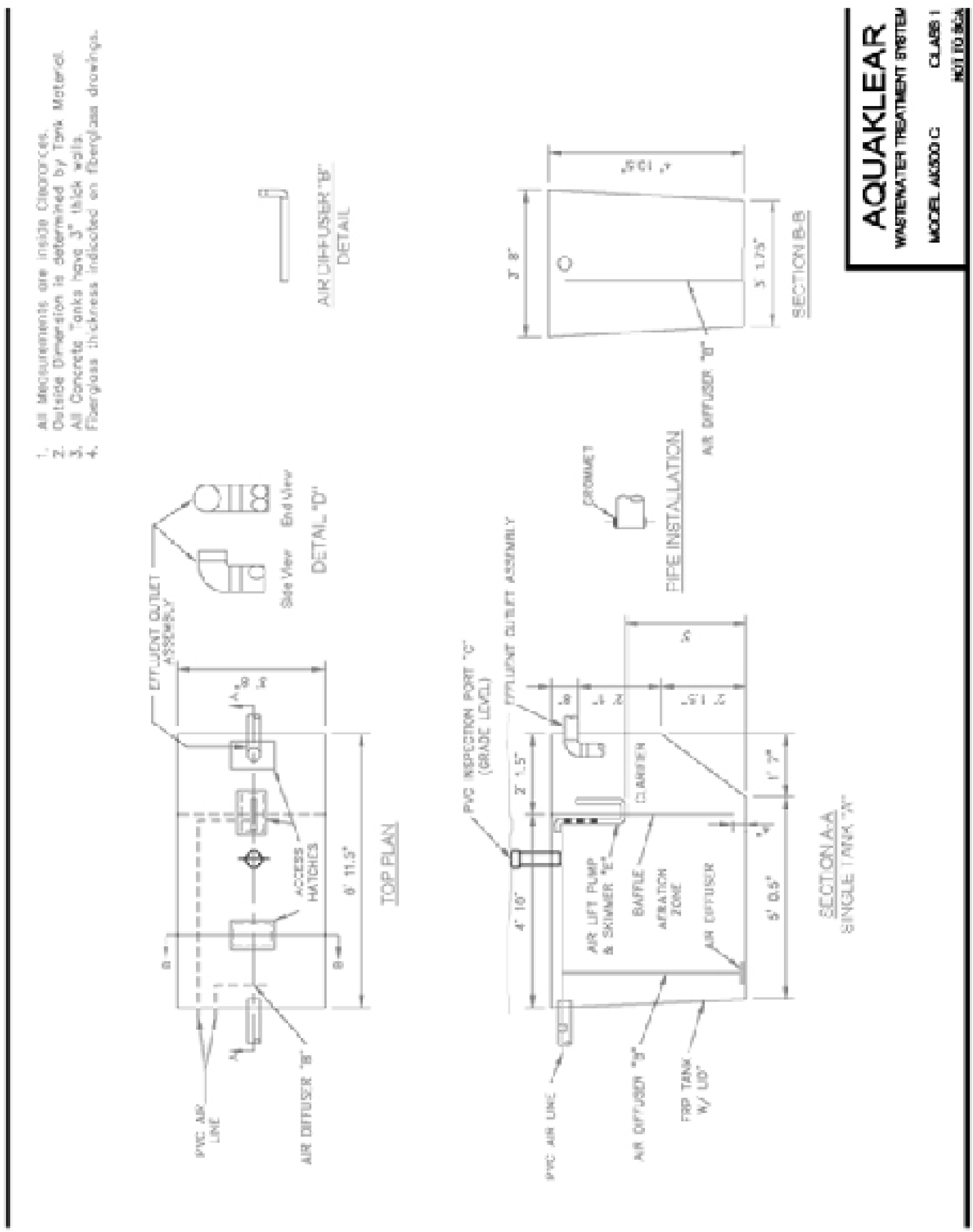
Aquaklear AK500C

Plant Capacity

Design Flow	500 gpd
Plant Hydraulic Capacity	
Aeration Chamber	510 gallons
Clarifier	180 gallons
Total	690 gallons
Hydraulic Retention Time (at Design Flow)	
Aeration Chamber	24.5 hours
Clarifier	8.6 hours
TOTAL	33 hours

Plant Components

Compressor	HIBLOW HP-50W
Air Diffuser	HIBLOW MD# T-300 Type TP-250
Control/Alarm Panel	BIO500 AK


1. All Measurements are inside Clearances.
2. Outside Dimension is determined by Tank Material.
3. All Concrete Tanks have 3" thick walls.
4. Fiberglass thickness indicated on fiberglass drawings.
TOP PLAN
DETAIL "D"
AIR DIFFUSER "B" DETAIL
PIPE INSTALLATION
SECTION A-A
SINGLE TANK "A"
SECTION B-B
AQUAKLEAR
WASTEWATER TREATMENT SYSTEM
MODEL AK500 C
CLASS I

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APPENDIX B

NSF STANDARD 40 PERFORMANCE EVALUATION METHOD AND REQUIREMENTS

8 Performance testing and evaluation

This section describes the methods used to evaluate the performance of residential wastewater treatment systems. Systems shall be designated as Class I or Class II. The performance classification shall be based upon the evaluation of effluent samples collected from the system over a six-month period.

8.1 Preparations for testing and evaluation

8.1.1 The system shall be assembled, installed, and filled in accordance with the manufacturer's instructions.

8.1.2 The manufacturer shall inspect the system for proper installation. If no defects are detected and the system is judged to be structurally sound, it shall be placed into operation in accordance with the manufacturer's start-up procedures. If the manufacturer does not provide a filling procedure, ⅔ of the system's capacity shall be filled with water and the remaining ⅓ shall be filled with residential wastewater.

8.1.3 The system shall undergo design loading (see 8.2.2.1) until testing and evaluations are initiated. Sample collection and analysis shall be initiated within 3 weeks of filling the system and, except as specified in 8.5.1.2, shall continue without interruption until the end of the evaluation period.

8.1.4 If conditions at the testing site preclude installation of the system at its normally prescribed depth, the manufacturer shall be permitted to cover the system with soil to achieve normal installation depth.

8.1.5 Performance testing and evaluation of systems shall not be restricted to specific seasons.

8.1.6 When possible, electrical or mechanical defects shall be repaired to prevent evaluation delays. All repairs made during the performance testing and evaluation shall be documented in the final report.

8.1.7 The system shall be operated in accordance with the manufacturer's instructions. However, routine service and maintenance of the system shall not be permitted during the performance testing and evaluation period.

NOTE – The manufacturer may recommend or offer more frequent service and maintenance of the system but for the purpose of performance testing and evaluation, service and maintenance shall not be performed beyond what is specified in this Standard.

8.2 Testing and evaluation conditions, hydraulic loading, and schedules

8.2.1 Influent wastewater characteristics

The 30-d average BOD_5 concentration of the wastewater delivered to the system shall be between 100 mg/L and 300 mg/L.

The 30-d average TSS concentration of the wastewater delivered to the system shall be between 100 mg/L and 350 mg/L.

8.2.2 Hydraulic loading and schedules

The performance of the system shall be evaluated for 26 consecutive weeks. During the testing and evaluation period, the system shall be subjected to 16 weeks of design loading, followed by 7.5 weeks (52 days) of stress loading, and then an additional 2.5 weeks (18 days) of design loading.

8.2.2.1 Design loading

The system shall be dosed 7 days a week with a wastewater volume equivalent to the daily hydraulic capacity of the system. The following schedule shall be adhered to for dosing:

Time frame	% rated daily hydraulic capacity
6:00 a.m. to 9:00 a.m.	approximately 35
11:00 a.m. to 2:00 p.m.	approximately 25
5:00 p.m. to 8:00 p.m.	approximately 40

8.2.2.2 Stress loading

Stress loading is designed to evaluate a system's performance under four non-ideal conditions. Systems shall be subjected to each stress condition once during the 6-month testing and evaluation period, and each of the four stress conditions shall be separated by 7 days of design loading (see 8.2.2.1).

8.2.2.2.1 Wash-day stress

The wash day stress shall consist of 3 wash days in a 5-day period. Each wash day shall be separated by a 24-h period. During a wash-day, the system shall be loaded at times and capacities similar to those delivered during design loading (see 8.2.2.1), however during the first two dosing periods per day, the design loading shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

8.2.2.2.2 Working-parent stress

For 5 consecutive days, the system shall be subjected to a working-parent stress. During this stress, the system shall be dosed with 40% of its daily hydraulic capacity between 6:00 a.m. and 9:00 a.m. Between 5:00 p.m. and 8:00 p.m., the system shall be dosed with the remaining 60% of its daily hydraulic capacity, which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

8.2.2.2.3 Power/equipment failure stress

The system shall be dosed with 40% of its daily hydraulic capacity between 5:00 p.m. and 8:00 p.m. on the day the power/equipment failure stress is initiated. Power to the system shall then be turned off at 9:00 p.m. and dosing shall be discontinued for 48 hours. After 48 hours, power shall be restored and the system shall be dosed over a 3- h period with 60% of its daily hydraulic capacity, which shall include 1 wash load (1 wash cycle and 2 rinse cycles).

8.2.2.2.4 Vacation stress

On the day that the vacation stress is initiated, the system shall be dosed at 35% of its daily hydraulic capacity between 6:00 a.m. and 9:00 a.m. and at 25% between 11:00 a.m. and 2:00 p.m. Dosing shall then be discontinued for 8 consecutive days (power shall continue to be supplied to the system). Between 5:00 p.m. and 8:00 p.m. of the ninth day, the system shall be dosed with 60% of its daily hydraulic capacity, which shall include 3 wash loads (3 wash cycles and 6 rinse cycles).

8.2.3 Dosing volumes

The 30-d average volume of the wastewater delivered to the system shall be within 100% ± 10% of the system's rated hydraulic capacity.

NOTE – All dosing days, except those with dosing requirements less than the daily hydraulic capacity, shall be included in the 30-d average calculation.

8.2.4 Color, odor, foam, and oily film assessments

During the 6-month testing and evaluation, a total of 3 effluent samples shall be assessed for color, odor, foam, and oily film. The assessments shall be conducted on effluent composite samples selected randomly during the first phase of design loading (weeks 1 – 16), the period of stress loading (weeks 17 – 23.5), and the second phase of design loading (weeks 23.5 – 26).

8.3 Sample collection

8.3.1 General

8.3.1.1 A minimum of 96 data days shall be required during system performance testing and evaluation. No routine service or maintenance shall be performed on the system whether the time period to achieve the 96 data days falls within or exceeds 6 months.

8.3.1.2 All sample collection methods shall be in accordance with APHA's *Standard Methods for the Examination of Water and Wastewater* unless otherwise specified.

8.3.1.3 Influent wastewater samples shall be flow-proportional, 24-h composites obtained during periods of system dosing. Effluent samples shall be flow-proportional, 24-h composites obtained during periods of system discharge.

8.3.2 Design loading

During periods of design loading, daily composite effluent samples shall be collected and analyzed 5 days a week.

8.3.3 Stress loading

During stress loading, influent and effluent 24-h composite samples shall be collected on the day each stress condition is initiated. Twenty-four hours after the completion of washday, working-parent, and vacation stresses, influent and effluent 24-h composite samples shall be collected for 6 consecutive days. Forty-eight hours after the completion of the power/equipment failure stress, influent and effluent 24-h composite samples shall be collected for 5 consecutive days.

8.4 Analytical descriptions

8.4.1 pH, TSS, BOD_5, and $CBOD_5$

The pH, TSS, and BOD_5 of the collected influent and the pH, TSS and $CBOD_5$ of the collected effluent 24-h composite samples shall be determined with the appropriate methods in APHA's *Standard Methods for the Examination of Water and Wastewater*.

8.4.2 Color, odor, oily film, and foam

8.4.2.1 General

The effluent composite samples shall be diluted 1:1000 with distilled water. Three composite effluent samples shall be tested during the 6-month evaluation period.

8.4.2.2 Color

The apparent color of the diluted effluent samples shall be determined with the visual comparison method described in APHA's *Standard Methods for the Examination of Water and Wastewater*.

8.4.2.3 Odor

A panel consisting of at least 5 evaluators shall qualitatively rate 200 mL aliquots of the diluted effluent samples as offensive or non offensive when compared to odor-free water prepared in accordance with APHA's *Standard Methods for the Examination of Water and Wastewater*.

8.4.2.4 Oily film and foam

Diluted effluent sample aliquots shall be visually evaluated for the presence of an oily film or foaming.

8.5 Criteria

8.5.1 General

8.5.1.1 If conditions during the testing and evaluation period result in system upset, improper sampling, improper dosing, or influent characteristics outside of the ranges specified in 8.2.1, an assessment shall be conducted to determine the extent to which these conditions adversely affected the performance of the system. Based on this assessment, specific data points may be excluded from the 7-d and 30-d averages of effluent measurements. Rationale for all data exclusions shall be documented in the final report.

8.5.1.2 In the event that a catastrophic site problem not described in this Standard including, but not limited to, influent characteristics, malfunctions of test apparatus, and acts of God, jeopardizes the validity of the performance testing and evaluation, manufacturers shall be given the choice to:

1) Perform maintenance on the system, reinitiate system start-up procedures, and restart the performance testing and evaluation; or

2) With no routine maintenance performed, have the system brought back to pre-existing conditions and resume testing within 3 weeks after the site problem has been identified and corrected. Data collected during the system recovery period shall be excluded from 7-d and 30-d averages of effluent measurements.

NOTE – Pre-existing conditions shall be defined as the point when the results of 3 consecutive data days are within 15% of the previous 30-d average(s).

8.5.1.3 A 7-d average discharge value shall consist of a minimum of 3 data days. If a calendar week contains less than 3 data days, sufficient data days may be transferred from the preceding calendar week to constitute a 7-d average discharge value. If there are not sufficient data days available in the preceding calendar week, the transfer of data days may take place from the following calendar week to constitute a 7-d average discharge value. No data day shall be included in more than one 7-d average discharge value.

8.5.1.4 A 30-d average discharge value shall consist of a minimum of 50% of the regularly scheduled sampling days per month. If a calendar month contains less than the required number of data days, sufficient data days may be transferred from the preceding calendar month to constitute a 30-d average discharge value. If there are not sufficient data days available in the preceding calendar month, the transfer of data days may take place from the following calendar month to constitute a 30-d average discharge value. No data day shall be included in more than one 30-d average discharge value.

8.5.1.5 During the stress loading sequence, consisting of wash-day, working-parent, power/equipment failure, and vacation stress loading periods, data shall be collected from a minimum of ⅔ of the total scheduled sampling days and from at least 2 of the scheduled sampling days during any single stress loading period.

8.5.2 Class I systems

The following criteria shall be met in order for a system to be classified as a Class I residential wastewater treatment system.

All requirements for each parameter shall be achieved except as provided for in 8.5.2.2.

8.5.2.1 EPA secondary treatment guideline parameters

8.5.2.1.1 $CBOD_5$

The 30-d average of $CBOD_5$ concentrations of effluent samples shall not exceed 25 mg/L.

The 7-d average of $CBOD_5$ concentrations of effluent samples shall not exceed 40 mg/L.

8.5.2.1.2 TSS

The 30-d average of TSS concentrations of effluent samples shall not exceed 30 mg/L.

The 7-d average of TSS concentrations of effluent samples shall not exceed 45 mg/L.

8.5.2.1.3 pH

The pH of individual effluent samples shall be between 6.0 and 9.0.

8.5.2.2 Effluent concentration excursions

System performance shall not be considered outside the limits established for Class I systems if, during the first calendar month of performance testing and evaluation, 7-d average and 30-d average effluent $CBOD_5$ and TSS concentrations do not equal or exceed 1.4 times the effluent limits specified in 8.5.2.1.

NOTE – The technology utilized in many residential wastewater treatment systems is biologically based. The allowance of excursions from the effluent limits established in this Standard during the first calendar month of performance testing and evaluation reflects the fact that an immature culture of microorganisms within the system may require additional time to achieve adequate treatment efficiency.

The value of 1.4 is based on the USEPA Technical Review Criteria for Group I Pollutants, including $CBOD_5$ and TSS.

8.5.2.3 Color, odor, oily film, and foam

8.5.2.3.1 Color

The color rating of each of the 3 diluted composite effluent samples shall not exceed 15 units.

8.5.2.3.2 Odor

The overall rating of each of the three diluted composite effluent samples shall be non offensive.

8.5.2.3.3 Oily film and foam

Oily films and foaming shall not be visually detected in any of the diluted composite effluent samples.

8.5.3 Class II systems

The following criteria shall be met in order for a system to be classified as a Class II residential wastewater treatment system.

8.5.3.1 $CBOD_5$

Not more than 10% of the effluent $CBOD_5$ values shall exceed 60 mg/L.

TSS
Not more than 10% of the effluent TSS values shall exceed 100 mg/L.

APPENDIX C

ANALYTICAL RESULTS

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: August 29, 2004 Plant Code: CK A1

Weeks Into Test: 1

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	4.9	7.1	2.8	2.5	2.9
	effluent	6.7	6.5	6.3	6.1	6.5
Temperature (C)	influent	25	25	26	26	25
	aeration chamber	25	25	26	25	26
	effluent	25	25	26	25	25
pH	influent	7.5	7.6	7.7	7.4	7.5
	aeration chamber	7.5	8.1	7.5	7.6	7.4
	effluent	8.2	7.7	7.9	8.0	7.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	120	210	130	130	130
	effluent ($CBOD_5$)	7	11	7	6	10
Suspended Solids (mg/L)	influent	170	100	150	190	110
	aeration chamber	660	1500	1700	1300	940
	effluent	5	8	9	4	4
Volatile Suspended Solids (mg/L)	influent	83	81	120	130	89
	aeration chamber	400	690	980	920	720
	effluent	4	5	4	3	3
45 Minute Settleable Solids (mL/L)	aeration chamber	175	200	150	275	190

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: September 5, 2004 Plant Code: CK A1

Weeks Into Test: 2

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	2.1	3.1	5.3	5.1	4.7
	effluent	5.9	7.3	7.8	7.7	7.3
Temperature (C)	influent	25	25	25	25	24
	aeration chamber	24	25	25	25	24
	effluent	24	24	25	25	25
pH	influent	7.4	7.5	7.3	7.3	7.6
	aeration chamber	7.6	7.7	7.4	7.8	7.4
	effluent	8.0	8.2	8.1	8.2	7.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	130	140	150	110	81
	effluent ($CBOD_5$)	7	6	13	11	12
Suspended Solids (mg/L)	influent	120	160	180	150	110
	aeration chamber	1100	1300	1400	740	1100
	effluent	5	9	5	10	11
Volatile Suspended Solids (mg/L)	influent	95	100	140	64	96
	aeration chamber	940	540	1100	290	390
	effluent	4	6	5	6	9
45 Minute Settleable Solids (mL/L)	aeration chamber	250	200	275	325	300

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: September 12, 2004 Plant Code: CK A1

Weeks Into Test: 3

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	4.7	0.6	1.0	2.3	2.7
	effluent	6.6	7.8	5.7	8.1	7.6
Temperature (C)	influent	24	25	25	25	25
	aeration chamber	25	25	25	24	24
	effluent	25	24	25	25	24
pH	influent	7.5	7.6	7.4	7.4	7.4
	aeration chamber	7.6	7.4	7.4	7.4	7.4
	effluent	8.1	8.0	8.1	7.9	7.8
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	140	130	170	120	150
	effluent ($CBOD_5$)	8	7	7	12	7
Suspended Solids (mg/L)	influent	77	240	210	92	63
	aeration chamber	1400	1500	1400	1500	1000
	effluent	6	6	4	5	2
Volatile Suspended Solids (mg/L)	influent	53	150	140	63	49
	aeration chamber	580	420	480	240	380
	effluent	5	6	2	4	2
45 Minute Settleable Solids (mL/L)	aeration chamber	350	375	425	325	275

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: September 19, 2004 Plant Code: CK A1

Weeks Into Test: 4

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.2	3.8	0.2	5.0	0.2
	effluent	5.6	5.9	5.3	6.2	6.9
Temperature (C)	influent	24	24	23	24	25
	aeration chamber	25	25	24	24	25
	effluent	25	24	24	24	25
pH	influent	7.4	7.5	7.5	7.5	7.8
	aeration chamber	7.4	7.6	7.6	7.6	7.4
	effluent	8.0	8.2	7.6	8.0	8.1
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	170	170	170	160	140
	effluent ($CBOD_5$)	9	8	7	3	3
Suspended Solids (mg/L)	influent	230	130	120	71	110
	aeration chamber	2700	2900	2900	2600	3500
	effluent	2	5	4	4	5
Volatile Suspended Solids (mg/L)	influent	180	110	100	54	91
	aeration chamber	1800	2000	2100	1800	2300
	effluent	3	4	2	3	4
45 Minute Settleable Solids (mL/L)	aeration chamber	750	325	775	275	825

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: September 26, 2004 Plant Code: CK A1

Weeks Into Test: 5

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.1	1.2	0.2	0.4	0.2
	effluent	7.8	8.2	6.1	4.0	5.1
Temperature (C)	influent	24	25	23	25	25
	aeration chamber	25	25	24	24	24
	effluent	25	25	24	24	24
pH	influent	7.4	7.5	7.3	7.3	7.3
	aeration chamber	7.5	7.4	7.3	7.4	7.3
	effluent	8.1	7.9	7.8	7.9	7.8
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	160	110	110	140	150
	effluent ($CBOD_5$)	4	11	12	13	12
Suspended Solids (mg/L)	influent	100	110	110	120	110
	aeration chamber	4400	2600	2900	3600	3600
	effluent	6	5	3	5	4
Volatile Suspended Solids (mg/L)	influent	68	80	96	100	93
	aeration chamber	2400	1700	1800	2300	2100
	effluent	6	4	5	5	4
45 Minute Settleable Solids (mL/L)	aeration chamber	775	525	750	675	700

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 3, 2004 Plant Code: CK A1

Weeks Into Test: 6

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.1	1.2	0.1	0.2	0.1
	effluent	6.2	7.0	5.8	6.7	5.9
Temperature (C)	influent	24	23	23	23	23
	aeration chamber	25	24	24	24	23
	effluent	25	24	24	24	24
pH	influent	7.2	7.5	7.3	7.3	7.3
	aeration chamber	7.4	7.4	7.3	7.3	7.3
	effluent	7.8	7.6	7.7	7.9	7.8
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	190	160	170	150	160
	effluent ($CBOD_5$)	4	6	6	9	11
Suspended Solids (mg/L)	influent	120	120	110	100	110
	aeration chamber	3400	3000	3500	4200	6900
	effluent	5	5	4	6	9
Volatile Suspended Solids (mg/L)	influent	84	84	69	71	79
	aeration chamber	2300	1800	2500	2800	4600
	effluent	3	4	3	3	6
45 Minute Settleable Solids (mL/L)	aeration chamber	720	700	700	730	700

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 10, 2004 Plant Code: CKA1

Weeks Into Test: 7

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

			Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)			500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	a	0.2	0.2	0.2	0.2	
	effluent	a	2.2	6.8	5.7	6.0	
Temperature (C)	influent	a	21	19	21	19	
	aeration chamber	a	21	20	22	19	
	effluent	a	21	20	22	19	
pH	influent	a	7.3	6.9	7.2	6.9	
	aeration chamber	a	7.2	6.9	7.3	6.9	
	effluent	a	7.8	7.6	7.7	7.9	
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	a	140	140	170	140	
	effluent ($CBOD_5$)	a	14	7	13	15	
Suspended Solids (mg/L)	influent	a	110	94	110	98	
	aeration chamber	a	3200	4200	3400	2600	
	effluent	a	14	6	4	10	
Volatile Suspended Solids (mg/L)	influent	a	67	70	91	77	
	aeration chamber	a	2200	2600	2300	1900	
	effluent	a	12	4	3	10	
45 Minute Settleable Solids (mL/L)	aeration chamber	a	755	700	700	525	

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: No sample on 10/11 due to laboratory error.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 17, 2004 Plant Code: CKA1

Weeks Into Test: 8

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.1	0.4	0.2	0.2	0.2
	effluent	6.0	5.1	6.1	6.0	5.9
Temperature (C)	influent	23	25	24	23	24
	aeration chamber	23	25	25	24	24
	effluent	23	26	25	24	25
pH	influent	7.0	7.4	7.2	7.3	7.4
	aeration chamber	7.2	7.4	7.3	7.2	7.3
	effluent	7.6	7.9	7.9	7.8	7.8
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	240	160	160	160	150
	effluent ($CBOD_5$)	4	4	3	4	3
Suspended Solids (mg/L)	influent	100	100	96	100	100
	aeration chamber	2800	3600	3300	3300	2900
	effluent	4	7	10	9	3
Volatile Suspended Solids (mg/L)	influent	78	61	54	62	65
	aeration chamber	2000	2400	2200	2200	2000
	effluent	5	6	10	7	5
45 Minute Settleable Solids (mL/L)	aeration chamber	600	750	590	620	600

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 24, 2004 Plant Code: CKA1

Weeks Into Test: 9

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.2	0.2	0.1	0.3	0.1
	effluent	5.9	5.8	6.0	6.1	6.2
Temperature (C)	influent	24	22	23	22	22
	aeration chamber	24	23	24	23	23
	effluent	25	23	24	23	23
pH	influent	7.4	7.3	7.3	7.3	7.5
	aeration chamber	7.3	7.3	7.2	7.3	7.4
	effluent	7.8	7.8	7.8	7.9	7.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	130	170	170	180	170
	effluent ($CBOD_5$)	4	5	5	6	6
Suspended Solids (mg/L)	influent	170	90	140	74	99
	aeration chamber	1200	2100	1700	2600	4200
	effluent	17	9	16	6	6
Volatile Suspended Solids (mg/L)	influent	97	38	88	48	77
	aeration chamber	540	700	490	920	580
	effluent	9	6	7	3	4
45 Minute Settleable Solids (mL/L)	aeration chamber	600	575	600	605	600

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: October 31, 2004 Plant Code: CKA1

Weeks Into Test: 10

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.2	0.3	8.3	0.2	0.2
	effluent	7.4	6.8	6.5	6.8	7.0
Temperature (C)	influent	23	24	22	22	19
	aeration chamber	24	23	23	23	20
	effluent	24	23	23	23	20
pH	influent	7.6	7.5	6.1	7.3	7.0
	aeration chamber	7.4	7.4	6.3	7.2	7.0
	effluent	6.6	8.0	6.1	7.8	7.3
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	93	110	110	110	130
	effluent ($CBOD_5$)	7	6	6	10	8
Suspended Solids (mg/L)	influent	120	150	140	76	140
	aeration chamber	3000	4400	4300	1400	1400
	effluent	7	<2	2	6	8
Volatile Suspended Solids (mg/L)	influent	64	80	110	59	94
	aeration chamber	620	1600	960	1100	1000
	effluent	5	<2	<2	3	3
45 Minute Settleable Solids (mL/L)	aeration chamber	770	750	725	730	600

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: November 7, 2004 Plant Code: CK A1

Weeks Into Test: 11

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.2	0.2	0.1	0.2	0.1
	effluent	3.1	2.8	2.7	3.0	5.3
Temperature (C)	influent	23	24	24	23	22
	aeration chamber	23	24	24	24	22
	effluent	23	24	24	24	23
pH	influent	7.2	7.4	7.4	7.4	7.3
	aeration chamber	7.4	7.1	7.3	7.2	7.5
	effluent	7.8	7.7	7.9	7.8	7.7
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	120	130	180	140	170
	effluent ($CBOD_5$)	6	4	3	6	7
Suspended Solids (mg/L)	influent	140	94	200	190	230
	aeration chamber	2500	1400	4000	2500	3700
	effluent	6	7	13	11	21
Volatile Suspended Solids (mg/L)	influent	63	52	110	120	92
	aeration chamber	990	1100	570	670	620
	effluent	3	3	8	5	18
45 Minute Settleable Solids (mL/L)	aeration chamber	700	725	750	750	780

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: November 14, 2004 Plant Code: CK A1

Weeks Into Test: 12

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.1	0.4	0.2	0.2	0.2
	effluent	4.6	6.1	6.7	6.1	6.0
Temperature (C)	influent	23	24	22	24	21
	aeration chamber	23	24	22	23	22
	effluent	24	24	23	23	22
pH	influent	7.5	7.6	7.3	7.2	7.2
	aeration chamber	7.3	7.4	7.4	7.5	7.3
	effluent	7.6	7.8	7.9	8.0	7.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	160	130	140	160	160
	effluent ($CBOD_5$)	5	7	8	7	10
Suspended Solids (mg/L)	influent	150	100	120	98	130
	aeration chamber	4300	4700	1600	2100	2400
	effluent	44	6	10	4	5
Volatile Suspended Solids (mg/L)	influent	120	110	100	79	100
	aeration chamber	720	640	1000	1400	1600
	effluent	32	3	8	4	5
45 Minute Settleable Solids (mL/L)	aeration chamber	850	650	720	775	750

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: November 21, 2004 Plant Code: CK A1

Weeks Into Test: 13

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.2	0.1	0.2	0.1	0.2
	effluent	6.1	5.8	5.6	5.1	5.0
Temperature (C)	influent	23	23	22	21	20
	aeration chamber	24	24	23	22	22
	effluent	24	24	24	21	21
pH	influent	7.2	7.2	7.1	7.1	7.2
	aeration chamber	7.0	7.2	7.1	7.2	7.2
	effluent	7.4	7.6	7.5	7.3	7.4
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	120	120	130	110	110
	effluent ($CBOD_5$)	6	9	9	12	12
Suspended Solids (mg/L)	influent	110	110	100	100	120
	aeration chamber	4200	3500	6000	5600	5900
	effluent	12	13	21	8	21
Volatile Suspended Solids (mg/L)	influent	87	78	73	74	95
	aeration chamber	2300	2200	3300	3500	3600
	effluent	8	8	12	6	17
45 Minute Settleable Solids (mL/L)	aeration chamber	700	625	680	625	650

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: November 28, 2004 Plant Code: CK A1

Weeks Into Test: 14

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.1	0.3	0.1	0.4	0.2
	effluent	4.1	5.6	5.5	5.3	5.1
Temperature (C)	influent	19	23	18	22	17
	aeration chamber	20	23	19	22	17
	effluent	21	24	19	21	18
pH	influent	7.1	7.3	7.0	7.1	7.1
	aeration chamber	7.0	7.4	7.1	7.3	7.2
	effluent	7.5	7.7	7.6	7.6	7.5
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	110	160	170	100	120
	effluent ($CBOD_5$)	5	13	13	16	8
Suspended Solids (mg/L)	influent	110	110	120	100	95
	aeration chamber	4000	4400	3600	2700	3400
	effluent	8	24	9	7	11
Volatile Suspended Solids (mg/L)	influent	51	68	59	49	48
	aeration chamber	2600	3400	2500	1800	2000
	effluent	8	15	4	7	11
45 Minute Settleable Solids (mL/L)	aeration chamber	750	800	625	650	675

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: December 5, 2004 Plant Code: CK A1

Weeks Into Test: 15

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.1	0.1	0.2	0.1	0.1
	effluent	3.9	3.0	3.8	4.6	3.8
Temperature (C)	influent	18	21	21	22	19
	aeration chamber	21	23	21	21	18
	effluent	22	23	22	21	19
pH	influent	7.0	7.3	7.1	7.0	7.0
	aeration chamber	7.1	7.0	7.1	7.0	7.0
	effluent	7.4	7.1	7.2	7.3	7.3
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	140	140	110	120	130
	effluent ($CBOD_5$)	18	12	15	7	13
Suspended Solids (mg/L)	influent	100	140	100	100	120
	aeration chamber	3400	2000	2800	1800	1900
	effluent	23	11	33	10	19
Volatile Suspended Solids (mg/L)	influent	59	88	51	64	59
	aeration chamber	2100	1200	1600	1100	1100
	effluent	16	8	21	8	18
45 Minute Settleable Solids (mL/L)	aeration chamber	700	755	700	725	610

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: December 12, 2004 Plant Code: CK A1

Weeks Into Test: 16

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.2	0.1	0.1	0.2	0.3
	effluent	4.1	3.8	3.7	4.3	4.0
Temperature (C)	influent	19	18	20	19	19
	aeration chamber	20	18	20	19	18
	effluent	21	19	20	19	18
pH	influent	7.0	7.1	7.2	7.2	7.1
	aeration chamber	7.1	7.0	7.3	7.0	7.3
	effluent	7.3	7.3	7.6	6.9	7.4
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	200	190	210	160	190
	effluent ($CBOD_5$)	9	18	19	18	41
Suspended Solids (mg/L)	influent	140	190	190	170	170
	aeration chamber	4200	3100	3100	2700	2500
	effluent	19	13	28	20	38
Volatile Suspended Solids (mg/L)	influent	73	82	130	68	100
	aeration chamber	230	390	580	580	580
	effluent	12	8	17	11	22
45 Minute Settleable Solids (mL/L)	aeration chamber	400	610	450	425	475

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: December 19, 2004 Plant Code: CK A1

Weeks Into Test: 17

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber		a					
	effluent		a					
Temperature (C)	influent		a					
	aeration chamber		a					
	effluent		a					
pH	influent		a					
	aeration chamber		a					
	effluent		a					
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)		a					
	effluent ($CBOD_5$)		a					
Suspended Solids (mg/L)	influent		a					
	aeration chamber		a					
	effluent		a					
Volatile Suspended Solids (mg/L)	influent		a					
	aeration chamber		a					
	effluent		a					
45 Minute Settleable Solids (mL/L)	aeration chamber		a					

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Wash day stress 12/20 through 12/24.
No samples on 12/20 due to frozen sampler lines.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: December 26, 2004 Plant Code: CK A1

Weeks Into Test: 18

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber		0.2	0.2	0.2	0.2	0.1	0.1
	effluent		4.8	4.0	4.9	4.5	3.9	3.9
Temperature (C)	influent		15	17	17	18	20	15
	aeration chamber		15	17	18	19	20	19
	effluent		16	18	18	19	21	20
pH	influent		7.0	7.0	7.0	7.0	6.9	7.0
	aeration chamber		7.0	7.1	7.1	7.1	7.0	7.1
	effluent		7.4	7.3	7.3	7.3	7.2	7.3
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)		190	190	180	240	220	190
	effluent ($CBOD_5$)		13	17	20	4	8	9
Suspended Solids (mg/L)	influent		100	110	110	130	130	100
	aeration chamber		2300	2200	1700	2000	1600	4500
	effluent		24	31	56	8	6	8
Volatile Suspended Solids (mg/L)	influent		38	78	86	95	110	38
	aeration chamber		1200	1400	1000	1400	1200	2000
	effluent		17	22	24	5	4	4
45 Minute Settleable Solids (mL/L)	aeration chamber		600	550	575	600	510	600

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Working Parent Stress started on 1/1/05.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: January 2, 2005 Plant Code: CK A1

Weeks Into Test: 19

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber							0.3
	effluent							3.4
Temperature (C)	influent							19
	aeration chamber							19
	effluent							18
pH	influent							7.2
	aeration chamber							7.0
	effluent							7.4
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)							150
	effluent ($CBOD_5$)							41
Suspended Solids (mg/L)	influent							180
	aeration chamber							1800
	effluent							42
Volatile Suspended Solids (mg/L)	influent							90
	aeration chamber							920
	effluent							26
45 Minute Settleable Solids (mL/L)	aeration chamber							725

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Working Parent Stress completed on 1/5.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: January 9, 2005 Plant Code: CK A1

Weeks Into Test: 20

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	500	500	500	325	0
Dissolved Oxygen (mg/L)	aeration chamber	0.4	0.4	0.2	0.3	0.2		
	effluent	3.0	2.8	3.0	3.1	2.9		
Temperature (C)	influent	19	19	19	20	19		
	aeration chamber	19	19	20	21	20		
	effluent	19	19	20	20	20		
pH	influent	7.1	7.0	6.9	7.1	7.0		
	aeration chamber	7.0	6.8	6.9	7.2	7.0		
	effluent	7.4	7.0	7.3	7.5	7.3		
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	260	170	240	180	120		
	effluent ($CBOD_5$)	11	7	<2	31	12		
Suspended Solids (mg/L)	influent	130	300	130	150	130		
	aeration chamber	1200	1200	1000	1200	1000		
	effluent	7	3	44	29	26		
Volatile Suspended Solids (mg/L)	influent	90	110	89	67	60		
	aeration chamber	530	460	470	580	690		
	effluent	2	2	29	23	17		
45 Minute Settleable Solids (mL/L)	aeration chamber	550	725	700	775	700		

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Power/Equipment Failure Stress 1/13 through 1/15.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: January 16, 2005 Plant Code: CK A1

Weeks Into Test: 21

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		300	500	500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber				0.2	0.2	0.2	0.3
	effluent				2.8	3.0	2.8	3.4
Temperature (C)	influent				19	18	18	19
	aeration chamber				18	19	19	20
	effluent				18	19	19	20
pH	influent				7.0	7.1	7.2	7.3
	aeration chamber				7.0	6.8	7.0	6.9
	effluent				7.3	7.3	7.2	7.4
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)				170	120	180	280
	effluent ($CBOD_5$)				13	15	19	36
Suspended Solids (mg/L)	influent				180	220	120	210
	aeration chamber				1400	1000	1000	960
	effluent				22	16	20	27
Volatile Suspended Solids (mg/L)	influent				98	92	90	110
	aeration chamber				460	460	510	510
	effluent				13	9	16	19
45 Minute Settleable Solids (mL/L)	aeration chamber				800	750	775	700

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: January 23, 2005 Plant Code: CK A1

Weeks Into Test: 22

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	125	0	0	0	0	0
Dissolved Oxygen (mg/L)	aeration chamber	0.3						
	effluent	3.1						
Temperature (C)	influent	21						
	aeration chamber	20						
	effluent	20						
pH	influent	7.2						
	aeration chamber	7.0						
	effluent	7.4						
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	170						
	effluent ($CBOD_5$)	25						
Suspended Solids (mg/L)	influent	150						
	aeration chamber	900						
	effluent	19						
Volatile Suspended Solids (mg/L)	influent	57						
	aeration chamber	670						
	effluent	14						
45 Minute Settleable Solids (mL/L)	aeration chamber	725						

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Vacation Stress started 1/24 instead of 1/23 due to laboratory error.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: January 30, 2005 Plant Code: CK A1

Weeks Into Test: 23

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		0	0	0	300	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber							0.7
	effluent							3.4
Temperature (C)	influent							20
	aeration chamber							20
	effluent							20
pH	influent							6.9
	aeration chamber							7.3
	effluent							7.6
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)							240
	effluent ($CBOD_5$)							14
Suspended Solids (mg/L)	influent							220
	aeration chamber							1300
	effluent							7
Volatile Suspended Solids (mg/L)	influent							98
	aeration chamber							370
	effluent							4
45 Minute Settleable Solids (mL/L)	aeration chamber							400

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes: Vacation Stress completed on 2/2.

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: February 6, 2005 Plant Code: CK A1

Weeks Into Test: 24

		Sun	Mon	Tue	Wed	Thur	Fri	Sat
Dosed Volume (gallons)		500	500	500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.5	0.2	0.4	0.2	0.2	0.2	
	effluent	3.1	2.8	2.7	3.2	3.0	2.8	
Temperature (C)	influent	19	21	22	22	21	20	
	aeration chamber	21	21	22	22	22	21	
	effluent	20	21	22	22	21	20	
pH	influent	7.0	7.3	7.4	7.0	7.2	7.1	
	aeration chamber	7.2	7.1	7.1	7.2	7.0	6.9	
	effluent	7.6	7.3	7.2	7.4	7.3	7.4	
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	160	140	130	120	150	170	
	effluent ($CBOD_5$)	16	3	7	3	<2	<2	
Suspended Solids (mg/L)	influent	200	140	100	99	140	150	
	aeration chamber	1300	870	1200	820	830	1000	
	effluent	6	4	2	5	8	7	
Volatile Suspended Solids (mg/L)	influent	68	97	63	73	61	86	
	aeration chamber	320	360	670	440	420	510	
	effluent	4	3	2	3	6	4	
45 Minute Settleable Solids (mL/L)	aeration chamber	375	300	325	325	350	275	

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: February 13, 2005 Plant Code: CK A1

Weeks Into Test: 25

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.5	0.3	0.2	0.2	0.2
	effluent	2.7	3.1	2.9	2.8	3.2
Temperature (C)	influent	21	21	21	22	21
	aeration chamber	23	22	23	22	22
	effluent	23	21	22	22	23
pH	influent	7.4	7.4	7.3	7.2	7.3
	aeration chamber	7.0	7.2	7.1	7.0	6.8
	effluent	7.2	7.4	7.5	7.3	7.3
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	130	130	110	220	120
	effluent ($CBOD_5$)	8	<2	<2	7	7
Suspended Solids (mg/L)	influent	240	110	150	190	180
	aeration chamber	880	890	940	1200	930
	effluent	4	7	6	11	3
Volatile Suspended Solids (mg/L)	influent	110	91	95	110	120
	aeration chamber	390	340	490	600	530
	effluent	2	3	5	8	2
45 Minute Settleable Solids (mL/L)	aeration chamber	375	325	350	425	400

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

NSF International
Standard 40 - Residential Wastewater Treatment Systems
Plant Effluent

Week Beginning: February 20, 2005 Plant Code: CK A1

Weeks Into Test: 26

Weekend Dosing: Sunday 500 gallons Saturday 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	0.2	0.2	0.2	0.2	0.2
	effluent	2.6	2.7	2.4	2.5	2.3
Temperature (C)	influent	20	22	21	21	20
	aeration chamber	20	21	22	22	22
	effluent	20	20	22	21	22
pH	influent	7.3	7.1	7.0	7.2	7.0
	aeration chamber	6.8	6.9	6.8	6.9	6.7
	effluent	7.1	7.3	7.1	7.4	6.9
Biochemical Oxygen Demand (mg/L)	influent (BOD_5)	120	280	250	130	140
	effluent ($CBOD_5$)	9	8	7	8	7
Suspended Solids (mg/L)	influent	110	180	150	140	200
	aeration chamber	630	660	760	1200	840
	effluent	4	6	10	8	8
Volatile Suspended Solids (mg/L)	influent	97	94	120	120	100
	aeration chamber	560	520	530	250	640
	effluent	3	4	8	5	5
45 Minute Settleable Solids (mL/L)	aeration chamber	350	425	400	450	425

(a) Site problem
(b) Malfunction of system under test
(c) Weather problem
(d) Other

Notes:

APPENDIX D

OWNER'S MANUAL

AquaKlear

WASTEWATER TREATMENT SYSTEMS

OWNER'S MANUAL
CLASS I

COMMERCIAL & RESIDENTIAL
WASTEWATER TREATMENT SYSTEMS

REVISED 10-01-05

AQUAKLEAR, INC.
876 N. BIERDEMAN ROAD
PEARL, MS 39208
(877) 936-7711

NSF®
Certified to NSF/ANSI Standard 40

PRODUCT DESCRIPTION

The "AquaKlear" Wastewater Treatment system is an economical alternative for use in treating domestic wastewater generated by normal household activities. The system consists of a single tank extended aeration activated sludge system which is capable of producing a clear odorless effluent which meets applicable state discharge standards. This system has been successfully tested and listed by NSF International in accordance with NSF/ANSI Standard 40.

Raw wastewater flows into the aeration zone of the extended aeration system. Here, the oxygen supplied by the aeration system, along with the organic matter in the waste stream, creates an ideal environment for the growth of aerobic micro-organisms. These organisms convert the waste organic materials into gases and additional micro-organism cell material. In addition to supplying oxygen, the aeration system keeps the contents of the aeration zone well mixed to provide optimum exposure to the micro-organisms to the waste material. The action of the beneficial micro-organisms also result in a significant reduction in pathogenic bacteria.

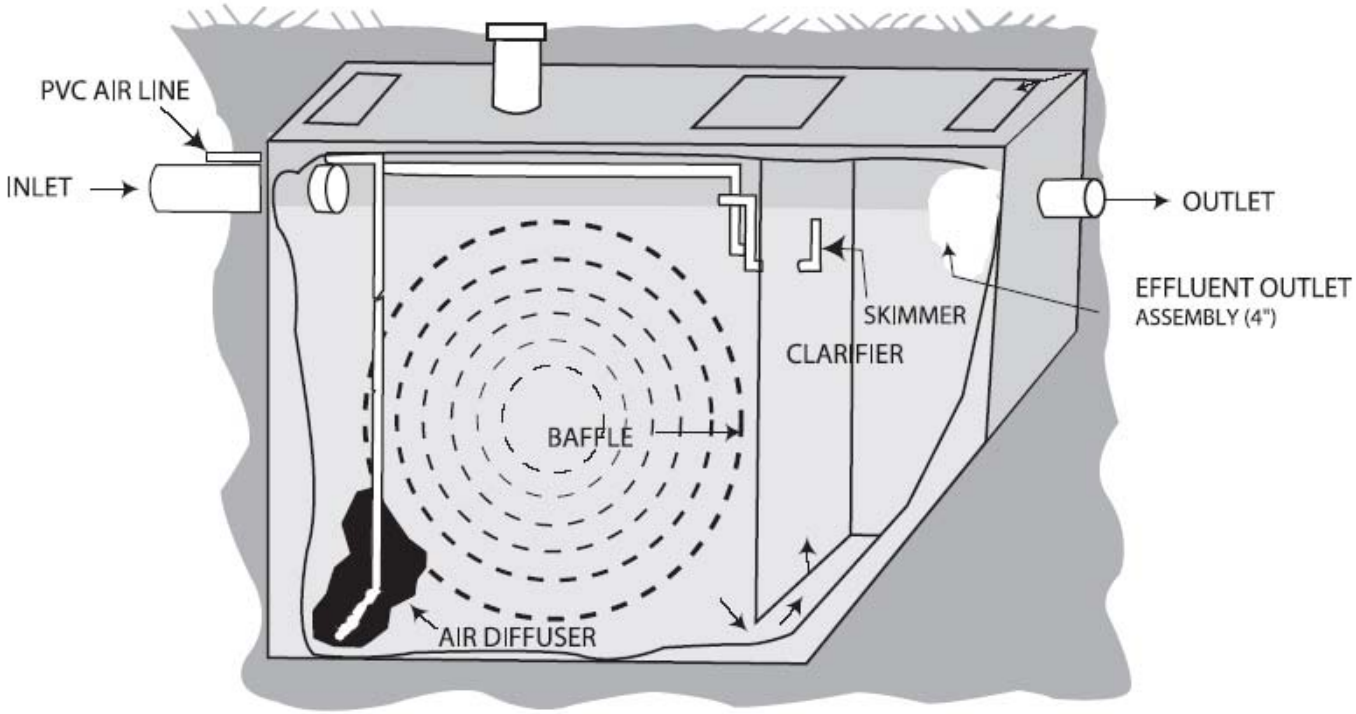
After approximately 24 hours of detection in the aeration zone, the mixture enters the clarifier where quiescent conditions enable separation of the micro-organisms which are returned to the aeration zone and discharge of clear treated wastewater through the launder assembly. At the surface of the clarifier there is a skimmer which removes any floating solids and returns them to the aeration zone automatically, while not disturbing the quiescent conditions of the clarifier. Effluent may be discharged to an accepted discharge point that is in compliance with all state and local laws and regulations.

The "AquaKlear" Wastewater Treatment System exceeds all effluent water quality requirements for Class 1 designation (25 mg/L CBOD5 and 30 mg/L TSS) as set forth by NSF/ANSI Standard 40. The six month daily average for the AquaKlear, Inc. system is 10 mg/L CBOD5 and 11 mg/L TSS.

Model Numbers

- ❑ AK500C
- ❑ AK500CC
- ❑ AK500F
- ❑ AK500FC
- ❑ AK500FF
- ❑ AK500C3P
- ❑ AK5B1
- ❑ AK5B2
- ❑ AK5B3
- ❑ AK600C
- ❑ AK600CC
- ❑ AK600F
- ❑ AK600FF
- ❑ AK600F3P
- ❑ AK600FP5
- ❑ AK750C
- ❑ AK750F
- ❑ AK750FF
- ❑ AK800C
- ❑ AK800F
- ❑ AK800FF
- ❑ AK1000C
- ❑ AK1000F
- ❑ AK1000FF
- ❑ AK1500C
- ❑ AK1500F
- ❑ AK1500FF
- ❑ AK365F

Note: suffix C denotes Concrete
suffix F denotes Fiberglass
suffix FF denotes Fiberglass Flattop
suffix P denotes Trash or Pump Tank
suffix CC denotes Concrete with attached Chlorinator
suffix FC denotes Fiberglass with attached Chlorinator
suffix C3P denotes Concrete with 300 gal attached pretreatment
suffix F3P denotes Fiberglass with 300 gal attached pretreatment
suffix FP5 denotes Fiberglass with 500 gal pump tank



FLOW PATH OF SYSTEM

3

OPERATING INSTRUCTIONS

Once installed, the blower will run continuously and the system will operate with a minimal amount of attention. It will take from 6 to 12 weeks after startup to develop an optimum population of micro-organisms. To insure proper operation and minimize maintenance requirements, the following materials should not be permitted to enter the system.

Items to Avoid

Strong disinfectant or bleaches (other than small amounts normally used in laundry and house cleaning - be conservative).

Oils, greases and chemical waste

Disposable diapers, tampons, sanitary napkins, cigarette butts and similar items.

Discharge from water softener.

The AquaKlear Wastewater Treatment System has been designed and tested to treat common and ordinarily expected wastewater and sewage from commercial and residential sources.

ROUTINE SYSTEM CHECKS

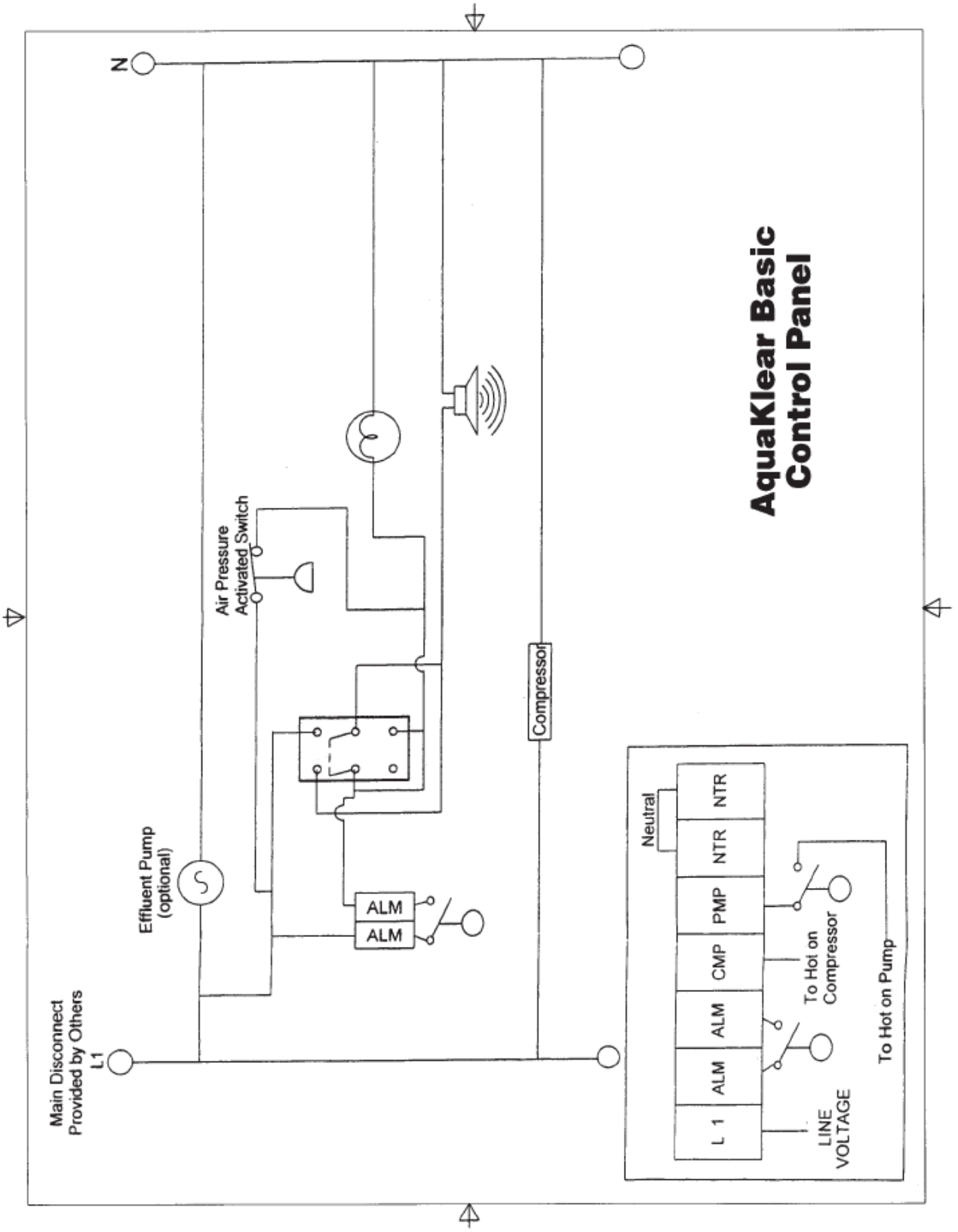
Checking Pump

Check air pump daily to be sure it is operating. Once accustomed to the soft humming sound of a properly operating unit, any unusual noise is an indication of a malfunction. If any unusual noise is detected, or if alarm signals, call dealer for service.

Checking Access Port

Check access port weekly for sour or "rotten egg" odor. If odor develops, call dealer for service. Always reference the system data plate when calling for service.

Checking Inlet Filter	Check inlet filter on air pump every three months and change or wash, if necessary. Filter should be cleaned or changed more often if conditions warrant.
Checking Effluent	Check effluent pipe weekly. Effluent should be clear and odor free. Effluent samples should be collected after treated wastewater has been discharged from the end of the pipe for several minutes. Care should be taken to insure that there is no algae growing in the pipe end which may be collected in the effluent sample.
Residential Removal	While the accumulation of residuals is largely dependent upon the characteristics of the wastewater treated, it is recommended that residuals be removed every 5 years, by a state certified removal service. The service should remove the lower (bottom) 1/2 of the liquor in both chambers and then refill with clear water.
Intermittent Operation	The air pump should always be operating during intermittent use of the treatment system.
Electrical Wiring	An electrical wiring diagram is included in this manual.
Effluent Collection	When collecting an effluent sample, the sample should be taken at the closest point to the clarifier as possible. The water should have been flowing for two minutes before collecting the sample.



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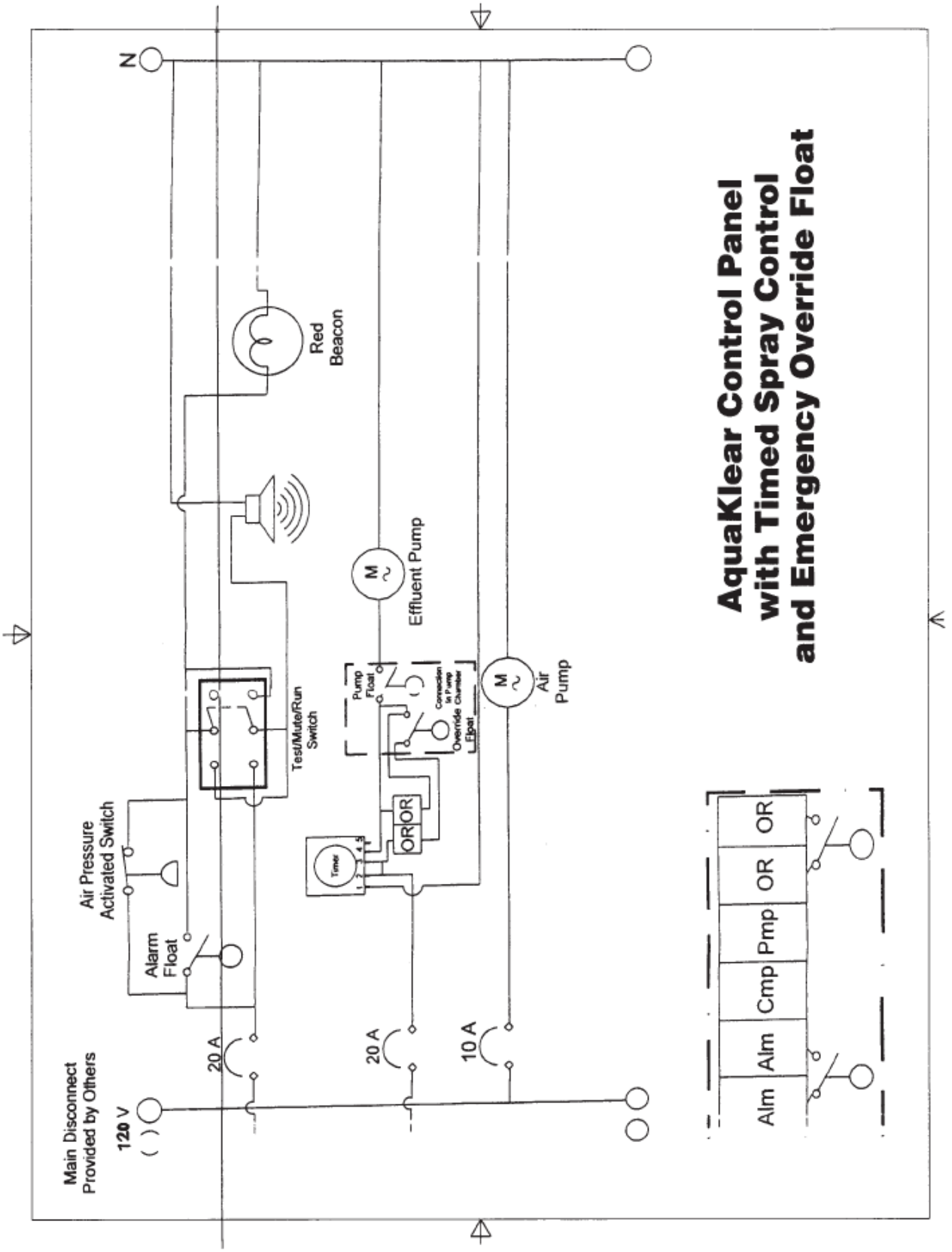

SERVICE POLICY

Service Calls	The purchase price for the system includes an initial two year service policy which includes all service calls as needed due to equipment failures or manufacturers' defect. These service calls will be made by the installing dealer or his authorized representative and shall cover the following:
Adjustment	Adjust and servicing of air pump, including replacement or cleaning of inlet filter if necessary.
Examination	Examination of the aeration zone to detect mixing regime and presence of sour or rotten egg odor.
Notification	Immediate notification of owner in writing of any improper operation observed which cannot be immediately remedied. Notice shall advise owner of problem and if covered by warranty, the estimated date for correction of the problem.
Inspection	The unit is to be inspected every six (6) months during the initial 2 year service policy period. Servicing should include a check of the filter in the air compressor for proper air flow, and inspection of all electrical connections. Check for effluent quality including a visual check for color, turbidity and scum overflow, and check for odors.

If a problem arises or service is required, please reference one of the two system data plates.

REPLACEMENT POLICY

During Warranty	There shall be no charge to the owner for the service calls, nor for repair or replacement of components covered by warranty, during the initial 2 year period.
Post Warranty	A continuing service policy is available from dealer to system owners whose initial service policy has expired.

DIRECTIONS FOR START UP/SHUT DOWN FOR AQUAKLEAR SYSTEMS

Due to the many different situations which give cause for shut down and start up of AquaKlear wastewater treatment systems, the following addresses a worst case situation for both.

Shut Down For Extended Period:
(water supply to building shut off)

The air compressor should be disconnected and removed, air line capped and compressor stored in a safe place (for protection from theft). Unit should be left in this condition (all tanks full) until start up.

Start up Procedures After Extended Shut Down:

Replace and reconnect air compressor, pump empty the aeration zone, clarifying zone, and refill with potable water. Turn air compressor on, check for proper air flow, and allow homeowner to begin using system.

For Intermittent Use:

Unit should be in full operational mode at all times.

LIMITED WARRANTY

AquaKlear, Inc. warrants the parts in each treatment process/device to be free from defects in material and workmanship for a period of three years from the date of installation for treating household wastewater. Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply. Sole obligation under this warranty is as follows: AquaKlear, Inc. shall fulfill this warranty by repairing or exchanging any component part, F.O.B. factory, that in AquaKlear, Inc.'s judgment shows evidence of defects, provided said component part has been paid for and is returned through an authorized dealer, transportation prepaid. The warrantee must also specify the nature of the defect to the manufacturer.

This warranty does not cover treatment processes/devices that have been flooded by external means, or that have been disassembled by unauthorized persons, improperly installed, subjected to external damage or damage due to altered or improper wiring or overload protection.

This warranty applies only to the treatment process/device and does not include any of the house wiring, plumbing, drainage, or disposal system. AquaKlear, Inc. is not responsible for any delay or damages caused by defective components or materials, or for loss incurred because of interruption of service, or for any other special or consequential damages or incidental expenses arising from the manufacture, sale, or use of this process/device.

AquaKlear, Inc. reserves the right to revise, change or modify the construction and design of the treatment process/device for household wastewater or any component part or parts thereof without incurring any obligation to make such changes for modifications in previously sold equipment. AquaKlear, Inc. also reserves the right, in making replacements of component parts under this warranty, to furnish a component part which, in its judgment, is equivalent to the company part replaced.

Under no circumstances will AquaKlear, Inc. be responsible to the warrantee for any other direct or consequential damages, including but not limited to lost profits, lost income, labor charges, delays in production, and/or idle production, which damages are caused by a defect in material and/or workmanship in its parts. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.

This warranty is expressly in lieu of any other expressed or implied warranty, excluding any warranty or merchantability or fitness, and of any other obligation on the part of AquaKlear, Inc.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

DATA PLATE

AQUAKLEAR, INC.
876 N. Bierdeman Rd. • Pearl, MS 39208
Model No. AK500 (Applicable Suffix)
Capacity: 500 g.p.d.
Serial Number:
Performance Rated: Class I

Certified to NSF/ANSI Standard 40

SERVICE LABEL

DO NOT OIL COMPRESSOR
FOR FACTORY SERVICE CALL:
AQUAKLEAR, INC.
876 N. Bierdeman Rd. • Pearl, MS 39208
601-936-7711
For Local Service Call:

Warranty Registration Certification

Mail Certificate - Complete certificate, detach and mail to the AquaKlear address within thirty (30) days of purchase.

Serial Number:	Model Number:	
Date of Installation:		
Purchaser's Name:		
Address:		
City:	State:	Zip:
Dealer's Name:		
Address:		
City:	State:	Zip:

HOMEOWNER'S COPY - Please retain for your records

Serial Number:	Model Number:	
Date of Installation:		
Purchaser's Name:		
Address:		
City:	State:	Zip:
Dealer's Name:		
Address:		
City:	State:	Zip:

AQUAKLEAR, INC.
876 N. BIERDEMAN ROAD
PEARL, MS 39208
(601) 936-7711