Arkansas Department of Health
Environmental Health Protection

Receipt Number 17164019

Individual Onsite System Permit Application

Permit Type ☒ New Installation ☐ Alteration / Repair

Fee Schedule for Structures		√
Structures 1500 sq ft or less	$ 30.00	☐
Structures more than 1500 sq ft and up to 2000 sq ft	$ 45.00	☐
Structures more than 2000 sq ft and up to 3000 sq ft	$ 90.00	☒
Structures more than 3000 sq ft and up to 4000 sq ft	$120.00	☐
Structures more than 4000 sq ft	$150.00	☐
Alteration and Repair	$ 30.00	☐

DR Environmental I.D. #

0	7	6	0	1	0	7	0	2	8	0

PERMIT VALID FOR ONE YEAR FROM DATE OF HEALTH AUTHORITY APPROVAL
Arkansas Department of Health

Part 1 Treatment Type (check one)

☐ STD = Standard Septic Tank
☐ ISF = Intermittent Sand Filter
☐ PMF = Proprietary Media Filter
☐ OTH = Other (Describe)
☒ ATU = Aerobic Treatment Plant
☐ RSF = Re-circulating Sand Filter
☐ RGF = Re-circulating Gravel Filter
☐ HLD = Holding Tank

Disposal Method (check one)

☐ STD = Standard Absorption Field
☒ SUR = Surface Discharge
☐ CPF = Capping Fill
☐ OTH = Other
☐ LPD = Low Pressure Distribution
☐ HLD = Holding Tank
☐ SRL = Serial Distribution
☐ DRP = Drip Irrigation

1. Owner's/Applicant's Name: Nancy Pinson
2. Phone Number: 501-676-6796
Mailing Address: PO Box 471, Lonoke, Ark. 72086
4. County: Lonoke
5. Address of Proposed System (If a 911 address is not available, attach detailed directions or map.): 543 Wattensaw Road, Lonoke, Ark. 72086
6. Subdivision Name: N/A
7. Approval Date: N/A
8. Date Recorded: N/A
9. Lot Number: N/A
10. Lot Dimensions: 668' x 90' x 915' x 723'
11. Total Area (Acres): 6.294
12. # Bedrooms # People: Three
13. Daily Flow (GPD): 370
14. Brief Legal Description of Property (Attach a separate sheet of paper if necessary.): S3, T3N, R8W
15. Water Supply (Specify supplier if Public Water.): Grand Praire
16. GPS Coordinates: At discharge outlet: 34.915494,-91.846914

17. Soil Determination (Primary Area) Indicate the depth to items a-f if observed in the soil (designate inches).

a. Bedrock	b. BSWT	c. MSWT	d. LSWT	e. Adj. MSWT	f. Adj. LSWT	g. H.C./Depth	h. Loading Rate (GPD/ft²)
>48	Surface	23	31	No Load	No Load	Mod/0-23	No Load

18. Soil Determination (Secondary Area) Indicate the depth to items a-f if observed in the soil (designate inches).

a. Bedrock	b. BSWT	c. MSWT	d. LSWT	e. Adj. MSWT	f. Adj. LSWT	g. H.C./Depth	h. Loading Rate (GPD/ft²)

19. Percolation Test (min/in) 20. System Size

Rate for Hole 1	N/A	a. Size of Septic Tank	500 gpd atu	gal	f. Trench Depth	N/A	inches
Rate for Hole 2	N/A	b. Size of Dose Tank	N/A	gal	g. Trench Spacing	N/A	feet
Rate for Hole 3	N/A	c. Absorption Area	N/A	ft²	h. Trench Media	N/A	Trench Width N/A
Alt Area Perc.	N/A	d. Number of Field Lines	N/A				
Average Perc. (1-3)	N/A	e. Length of Field Lines	N/A	ft			

Comments: STUB OUT ON GRADE AT FLAGGED LOCATION. This site is unsuitable for a standard septic system. We are requesting approval to apply for a discharge permit through ADEQ.

NOTE TO INSTALLER: CONTACT SANITARIAN AT 843-7561 - 48HRS PRIOR TO BEGINNING INSTALLATION

21. I certify that I have conducted the above tests and that the above listed information is in accordance with the latest requirements of the Arkansas Department of Health Rules and Regulations Pertaining to Onsite Wastewater Systems, Designated Representatives and Installers. Without Prejudice!

Wayne Long — Signature
D.R. / Owner — Title
Soil Certified ☒ Yes ☐ No
Wayne Long /AMAX Services LLC — Typed Name
04/29/11 — Date
501-681-7971 — Phone Number

22. Approval of Health Authority: The information above has been reviewed and found to meet the requirements of the Arkansas Department of Health for Onsite Wastewater Systems, Designated Representatives and Installers.

A PERMIT FOR CONSTRUCTION is hereby issued.

Environmental Health Specialist _____ Date 5-5-11

EHP-19 (R 2/08)

Owner's/Applicant's Name	Receipt Number

23. Utilization Verification:
I hereby attest that item 12, the number of bedrooms (number of persons for commercial) and square footage of the structure that will utilize the designed individual onsite wastewater system in this permit application, is accurate.

Owner/Applicant X Nancy Pinson Date 2/23/11

Part 2 Installation Inspection

Septic tank manufacturer	Other information
Septic tank material	Trench media and width
Dose tank manufacturer	Depth of interceptor drain
Dose tank material	Depth of settled fill
Pump Information	
Name of Installer	License Number
Environmental Health Specialist	Date

Part 3 Permit for Operation

The information contained in Part 1 and Part 2 of this form has been reviewed and found to meet the requirements of the Arkansas Department of Health. THE PERMIT FOR OPERATION of this system is hereby issued.

Environmental Health Specialist _____ Date _____

Comments

_____

_____

_____

_____

TO THE OWNER

The permit for construction may be deemed invalid by the local Environmental Health Specialist before construction if the site and/or soil conditions have changed after approval of the permit or if the information on the permit is inaccurate.

Approval for operation does not constitute a guarantee that the system will function properly. The approval states that the system was designed and installed according to the Arkansas Department of Health Rules and Regulations Pertaining to Onsite Wastewater Systems, Designated Representatives and Installers, unless there are exceptions or deviations noted in the comments.

A permit is valid for one (1) year from the date of approval. A permit more than one (1) year old must be revalidated by the authorized agent prior to the start of any construction.

Site Revalidation Conducted by ☐ Designated Representative ☐ Environmental Health Specialist

_____ Date _____

Site Revalidation Conducted by ☐ Designated Representative ☐ Environmental Health Specialist

_____ Date _____

System Specification

Designed by D. R. Services Inc.
D.R. #07601070280
Ph.# 501-681-7971

For : Nancy Pinson

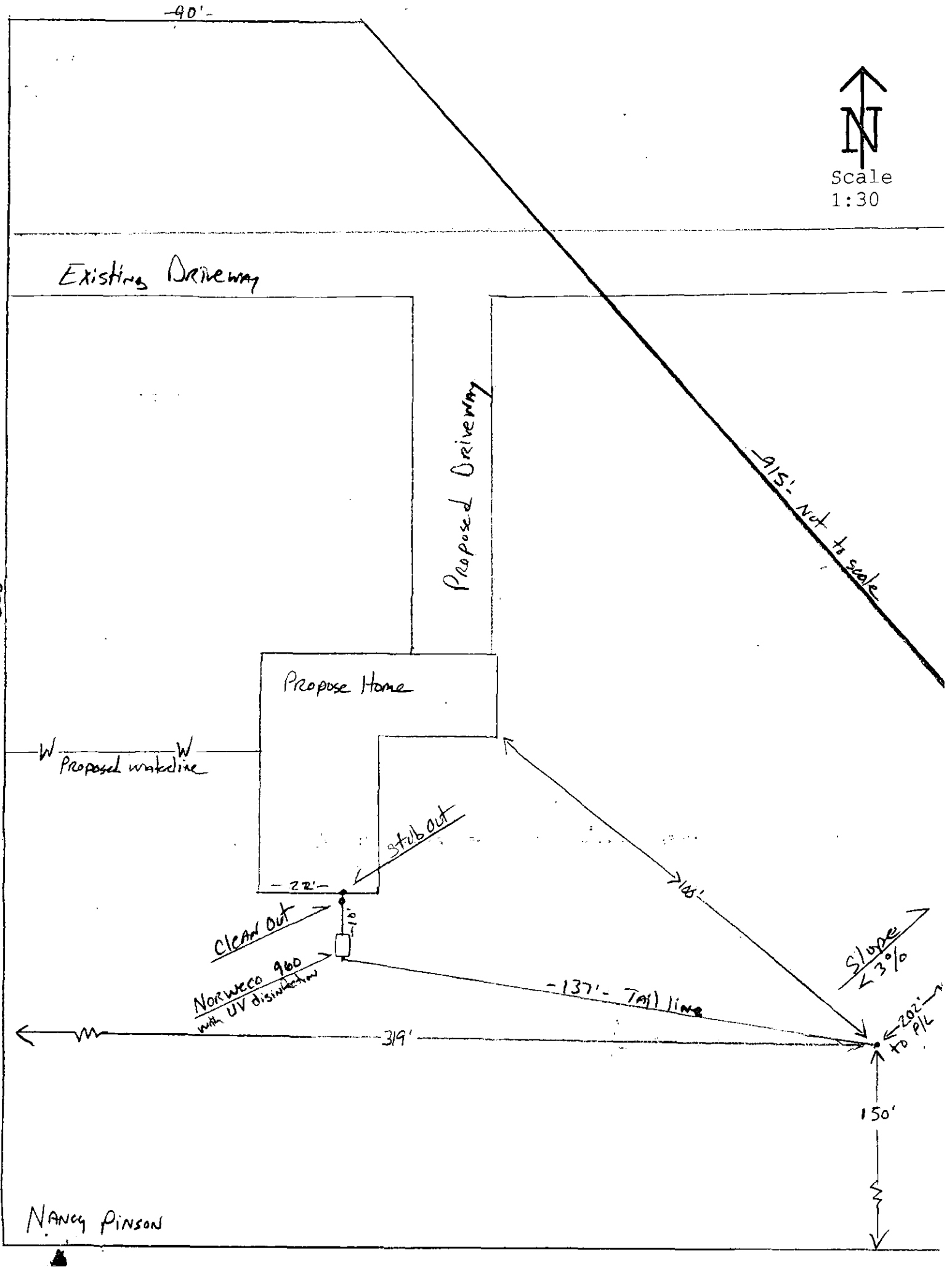
This site is unsuitable for subsurface disposal. This system was designed to be a Norweco Model 960 treatment unit with a U.V. disinfection device. Discharge into a 137' tail line. Stub out at grade.

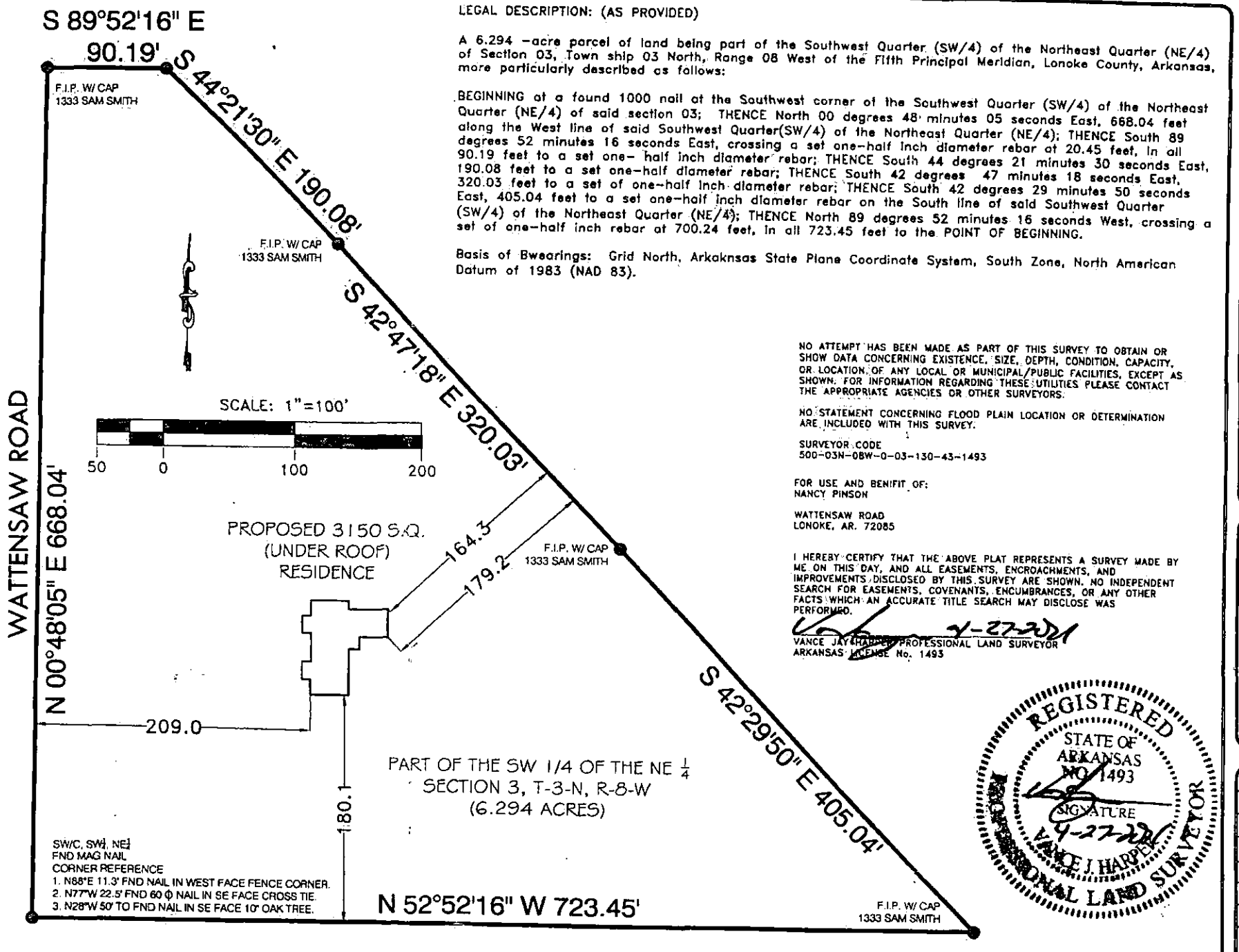
Ground Rod/Flow Line Readings in inches:
Stub Out 51
Model 960 inlet 50/70
Model 960 outlet 50/73
Tail line discharge outlet 77/77
Bench Mark 24.75 on nail in a tree SSW of discharge outlet.

Pipe Specifications:

Schedule 40 PVC from house and between all parts of the system.

Tail line must be at least 1.5" schedule 40.


90'
N
Scale
1:30
Existing Driveway
Proposed Driveway
915' Not to scale
668'
Propose Home
W
Proposed waterline
W
stub out
22'
10'
Clean Out
Norweco 960
with UV disinfection
185'
Slope
< 3%
137' Tail line
319'
202'
to P/L
150'
NANCY PINSON



LEGAL DESCRIPTION: (AS PROVIDED)

A 6.294 –acre parcel of land being part of the Southwest Quarter (SW/4) of the Northeast Quarter (NE/4) of Section 03, Town ship 03 North, Range 08 West of the Fifth Principal Meridian, Lonoke County, Arkansas, more particularly described as follows:

BEGINNING at a found 1000 nail at the Southwest corner of the Southwest Quarter (SW/4) of the Northeast Quarter (NE/4) of said section 03; THENCE North 00 degrees 48 minutes 05 seconds East, 668.04 feet along the West line of said Southwest Quarter(SW/4) of the Northeast Quarter (NE/4); THENCE South 89 degrees 52 minutes 16 seconds East, crossing a set one-half inch diameter rebar at 20.45 feet, In all 90.19 feet to a set one- half inch diameter rebar; THENCE South 44 degrees 21 minutes 30 seconds East, 190.08 feet to a set one-half diameter rebar; THENCE South 42 degrees 47 minutes 18 seconds East, 320.03 feet to a set of one-half inch diameter rebar; THENCE South 42 degrees 29 minutes 50 seconds East, 405.04 feet to a set one-half inch diameter rebar on the South line of said Southwest Quarter (SW/4) of the Northeast Quarter (NE/4); THENCE North 89 degrees 52 minutes 16 seconds West, crossing a set of one-half inch rebar at 700.24 feet, In all 723.45 feet to the POINT OF BEGINNING.

Basis of Bwearings: Grid North, Arkaknsas State Plane Coordinate System, South Zone, North American Datum of 1983 (NAD 83).

NO ATTEMPT HAS BEEN MADE AS PART OF THIS SURVEY TO OBTAIN OR SHOW DATA CONCERNING EXISTENCE, SIZE, DEPTH, CONDITION, CAPACITY, OR LOCATION OF ANY LOCAL OR MUNICIPAL/PUBLIC FACILITIES, EXCEPT AS SHOWN. FOR INFORMATION REGARDING THESE UTILITIES PLEASE CONTACT THE APPROPRIATE AGENCIES OR OTHER SURVEYORS.

NO STATEMENT CONCERNING FLOOD PLAIN LOCATION OR DETERMINATION ARE INCLUDED WITH THIS SURVEY.

SURVEYOR CODE
500-03N-08W-0-03-130-43-1493

FOR USE AND BENIFIT OF:
NANCY PINSON

WATTENSAW ROAD
LONOKE, AR. 72085

I HEREBY CERTIFY THAT THE ABOVE PLAT REPRESENTS A SURVEY MADE BY ME ON THIS DAY, AND ALL EASEMENTS, ENCROACHMENTS, AND IMPROVEMENTS DISCLOSED BY THIS SURVEY ARE SHOWN. NO INDEPENDENT SEARCH FOR EASEMENTS, COVENANTS, ENCUMBRANCES, OR ANY OTHER FACTS WHICH AN ACCURATE TITLE SEARCH MAY DISCLOSE WAS PERFORMED.

4-27-2011

VANCE JAY HARPER, PROFESSIONAL LAND SURVEYOR
ARKANSAS LICENSE No. 1493

REGISTERED
STATE OF
ARKANSAS
NO. 1493
SIGNATURE
4-27-2011
VANCE J. HARPER
PROFESSIONAL LAND SURVEYOR

REVISIONS	DATE

BOUNDARY SURVEY
WATTENSAW ROAD
PART OF THE SW 1/4 OF THE NE 1/4
SECTION 3, TOWNSHIP 3 NORTH, RANGE 8 WEST
LONOKE COUNTY, ARKANSAS

VANCE JAY HARPER
492 BIZZELL ROAD AUSTIN, AR. 72007
(501)-605-8541

DRAWN BY	VH
DATE	04-26-2011
SCALE	1"=100'
SHEET No.	
OF	

MEMORANDUM OF AGREEMENT

SUBJECT: HOME SEWAGE TREATMENT SYSTEM

This is an agreement that the alternative/experimental sewage system installed on this property has been permitted under authority of Act 402 of 1977 and by the Arkansas Department of Health with the understanding that the following provisions are met:

1. The property owner assumes all responsibility for the proper operation of the system and the maintenance of a valid service contract with a Certified Maintenance Personnel approved to service and monitor such home sewage treatment systems. The service contract shall include provisions for the monitoring of free chlorine and PH and reporting to ADH as required.

2. The Arkansas Department of Health has no responsibility in the operation and maintenance of such systems.

3. That the Arkansas Department of Health may monitor the system as to its operation capabilities.

4. That the Arkansas Department of Health is granted permission to make such inspections as deemed necessary.

5. That, on the sale of the property, the perspective buyer will be notified of this agreement, and both the buyer and seller are to sign such memoranda and contracts.

6. Any participation in the design or construction of such experimental systems by the Arkansas Department of Health shall not be considered as a conflict of interest with other parties, and such participation shall not place the Arkansas Department of Health as a responsible party if malfunctions occur.

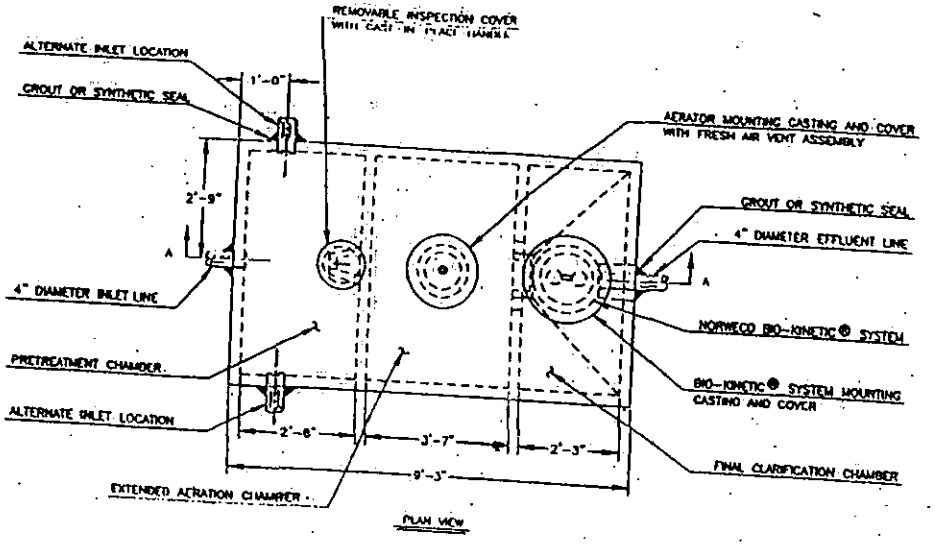
7. The owner may be required to file an application to the Arkansas Department of Environmental Quality (ADEQ) for a National Point Discharge Elimination System (NPDES) permit. The Arkansas Department of Health will notify the ADEQ of all permits issued for systems that discharge sewage, when applicable.

SIGNED: Nancy Pinson
(Property Owner)

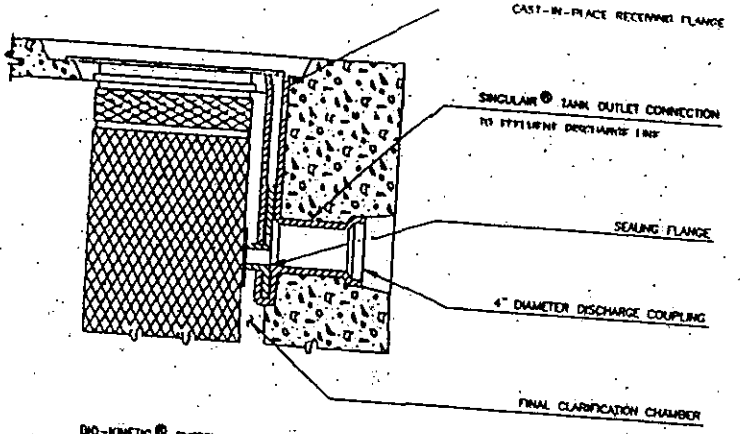
DATE: 2/23/11

SIGNED: _____
(Health Department)

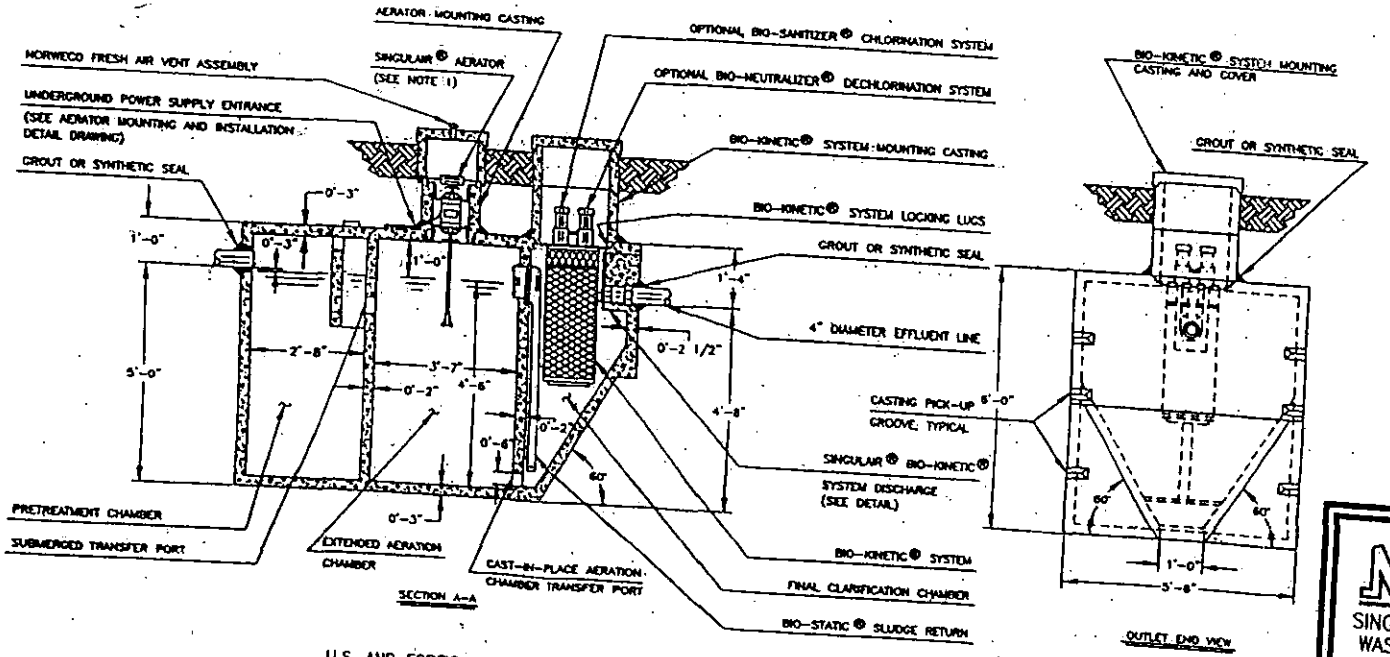
DATE: 5-5-11



PLAN VIEW



BIO-KINETIC® SYSTEM DISCHARGE DETAIL



SECTION A-A

OUTLET END VIEW

GENERAL NOTES

1. SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF.
2. FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
3. ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
4. TANK REINFORCED PER ACI STD. 318-83.
5. REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
6. CONTACT THE LOCAL LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.
7. TOTAL SYSTEM CAPACITY: 1300 GAL.

NORWECO

SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM
MODEL 960-500 GPD

REVISION DATE	REVISION
2-10-97	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-9-96
SCALE	NTS
DRAWING NO.	PC-5-7006

Certified Maintenance Personnel Contract

Onsite Maintenance Program

Property Address: 543 Wattensmi Road
Lonoke, Ark. 72086

Homeowner Name: Nancy Pinson

The following items will be conducted each (6) month interval.

Chlorine residual analysis

PH analysis

Evaluation of system components and their working condition.

File appropriate paperwork with Department of Health to comply with Onsite Maintenance Program.

This Onsite Maintenance Personnel Contract does not include the cost of chorine tablets, or replacement of any non-working components of the septic system.

This Onsite Maintenance Personnel Contract does not replace the maintenance contract provided by the Distributor of the aerobic treatment plant.

This contract is good for (2) years from time of installation, and can be renewed or canceled at the homeowners discretion.

Certified Maintenance Personnel – Mike O'Connor

Date 4/29/11

Date: 5/3/2011

Arkansas
Department of Health
Keeping Your Hometown Healthy

SEPTIC TANK PERMIT

Customer Name: LONIE WAYNE
Customer No: 1501109692

Transaction Date: 5/3/2011
Transaction No: 17164016 Created By: cdgulley

Amount Received: $90.00 Payment Method: Check No. 1421

Comment: Pinson Nancy

Customer Name: Pinson Nancy
Site Location: 543 Walter New Road Lonoke Ar

Subdivision: n/a
Lot Number: n/a

Authorized Rep
Signature: Christenson, Ryan

Thank you for your payment

Lonoke County Health Unit - Cabot
City of Cabot

Cabot AR 72023

CLEAR FLOW *A WASTEWATER MANAGEMENT COMPANY*

Mike O'Connor
P.O. Box 992
Cabot, AR 72023

Michael@ArkansasSeptic.com
Office 501-517-7198
Fax 501-843-2546

May 23, 2011

Adeq
Water Div.

To whom it may concern;

The treatment plant proposed for Nancy Pinson will use the Norweco model 960 as submitted By Strider Consulting Feb 25, 2010.

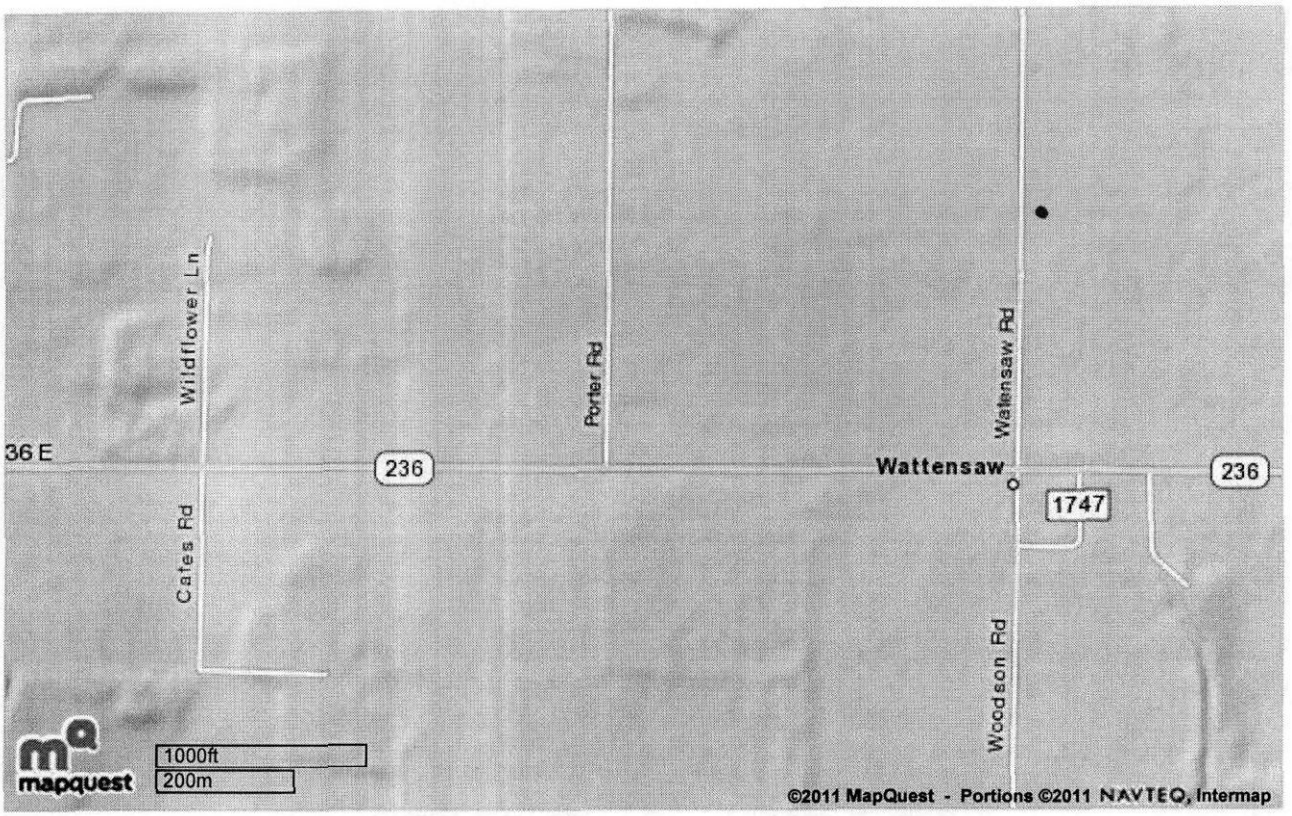
Sincerely,
Clear Flow

Mike O'Connor
DR # 60-37

mapquest

Map of:
Little Rock, AR 72223

Notes



ARG550000 Checklist

ARG55 0382 New ☒ Renewal ☐ Modification ☐

Business ☐ Individual Homeowner ☒

Submitted Permit Fee: Yes ☐ No ☐ Not Required ☒

Discharges to Wattensaw Bayou

Ecologically Sensitive Waterbody: Yes ☐ No ☒

303(d) list? Pathogens ☐ Nutrients ☐ DO ☒

None ☐ Other ☐ _____

Name of Operator: Mike O'Connor License Number 010202

Class of municipal wastewater operator: I ☐ II ☒ III ☐ IV ☐

ADH Approval (EHP-19 Form): Yes ☑ No ☐

Approved System:

	Company Name	System Name
☐	Orenco Systems, Inc.	Advantex AX20
☐	Ecological Tank, Inc.	AquaSafe 500
☒	Norweco, Inc.	Norweco (Singular) 960
☐	Norweco, Inc.	Norweco (Singluar) TNT-500
☐	Clearstream Wastewater Systems, Inc.	Clearstream 500N+1100 Effluent Filter or a post aeration tank
☐	Consolidated Treatment Systems, Inc.	MultiFlo FTB-0.5
☐	EnviroGuard	ENV-0.75
☐	Consolidated Treatment Systems, Inc.	Nyadic M6-A
☐	Bio-Microbics, Inc.	MicroFast ® 0.5/With UV Disinfection and Post Aeration

Additional Treatment: _____

Other Comments: Facility location is 2.2 miles from discharge into Wattensaw Bayou. Will not have negative impact on it for DO.

Design Notes

Prepared for:

Arkansas Department
Of Environmental Quality
General Permit ARG 550000

Project:

Norweco®
Singulair® Bio-Kinetic®
Wasterwater Treatment System
Model 960
Design Flow 500 GPD
Revision 02/09/2010

Prepared by:

STRIDER CONSULTING
Engineering for the Future

1029 Hwy 201 N
Mountain Home, AR 72653

CERTIFICATE OF AUTHORIZATION
STRIDER CONSULTING INC.
No. 1514
ARKANSAS

STATE OF
ARKANSAS
REGISTERED
PROFESSIONAL
ENGINEER
NO. 9120
BENJAMIN H. STRIDER
2/15/10

DESIGN NOTES

Treatment System:
These design notes are prepared specifically for the Norweco® Singular® Model 960 individual treatment system. The purposes of these design notes are to show this system meets the Individual Treatment System General Permit ARG550000 discharge limits. The Singular® Model 960 is for an individual residence only. Specific site applications will need to be evaluated before installation of the Norweco® Singular® Model 9600.

Treatment Process:
The Singular® Model® 9600 is a self-contained treatment system. The system is contained in a precast concrete tank. The tank is baffled in a configuration to separate the process into four treatment components.

Pretreatment Chamber:
The chamber accepts the household waste stream through an inlet. The inlet is precast into the side of the concrete wall. The chamber has a capacity of 60 cubic feet or approximately 448 gallons. This equates to 21.5 hrs of retention time. The outlet of the chamber has a tee which will pull the preconditioned liquid from the vertical center of the section. This will prevent "short circuiting" of the chamber as well as reduce the solids moving into the next phase of treatment.

Extended Aeration Chamber:
The liquid passes through a submerged orifice into the extended aeration chamber. The orifice is precast into a 2" concrete baffling wall. This chamber has a capacity of 80.6 cubic feet which is approximately 600 gallons. With 600 gallons of capacity there is slightly less than 29 hours of retention time in the extended aeration chamber.

Any suspended solids entering the extended aeration chamber will be broken down during this phase of treatment. Bacteria will attach themselves to and consume the organics suspended in the liquid. A Singular Aerator which is tested and accepted by the National Sanitary Federation will be utilized. Only non-corrosive parts will be in contact with the liquid. The aerator will deliver 3 cubic feet per minute of air into the liquid and will run 30 minutes every hour for a total dose of air of 90 cubic feet of air.

Final Clarification Chamber:
Liquid from the extended aeration chamber will pass through a Bio-Static® sludge return into the final clarification chamber. The clarification chamber has a capacity of 213 gallons which is approximately 10.2 hours of retention.

The sides of the clarification chamber are tapered to allow the final setting of solids into the hopper. The hydraulics from the Bio-Static® sludge return will push the sludge back into the aeration chamber.

Bio-Kinetic® System:
The final phase of treatment is the Bio-Kinetic® system. This phase of treatment provides the polishing of the water. The liquid passes through a filter which is made up of non-corrosive material. Chlorination and de-chlorination is performed in the Bio-Kinetic® as required. Additionally, the flow is controlled through orifice plates and can be measured through the discharge weir. Ultimately the treated water is released through a cast-in-place 4" effluent line.

The following are the design calculations for the proposed system. Inflow and infiltration are not considered because pipes are generally glued joints and relatively close to the house.

Design Calculations:

Total Design Flow = 500 gpd

Expected Incoming Effluent Strength:

BOD_5 = 150 mg/l = .0013 lbs/gal
BOD_5 total load = .0013 lbs/gal x 500 gal = .626 lbs per day
TSS = 200 mg/l

Targeted Treatment Quality:

BOD_5 = 10 mg/l
TSS = 15 mg/l
Fecal Coliform = 10,000 N/100 ml
pH: 6 to 9 S.U.

Disinfection Calculations:

Max. flow daily = 500 gpd
Flow rate = 500 gpd / 24 hr day / 60 min = .35 gpm
.35 gpm x 15 min = 5.25 gallons
Bio-Kinetic® Container 15 gal > 5.25 gal OK

BOD_5 Reduction Calculations:

Influent BOD strength = 150 mg/l
Pretreatment reduction:
20% to 30% = 120 mg/l to 105 mg/l
Extended Aeration Reduction:
85% to 95% = 18 mg/l to 5.25 mg/l

Final Clarifier Reduction:

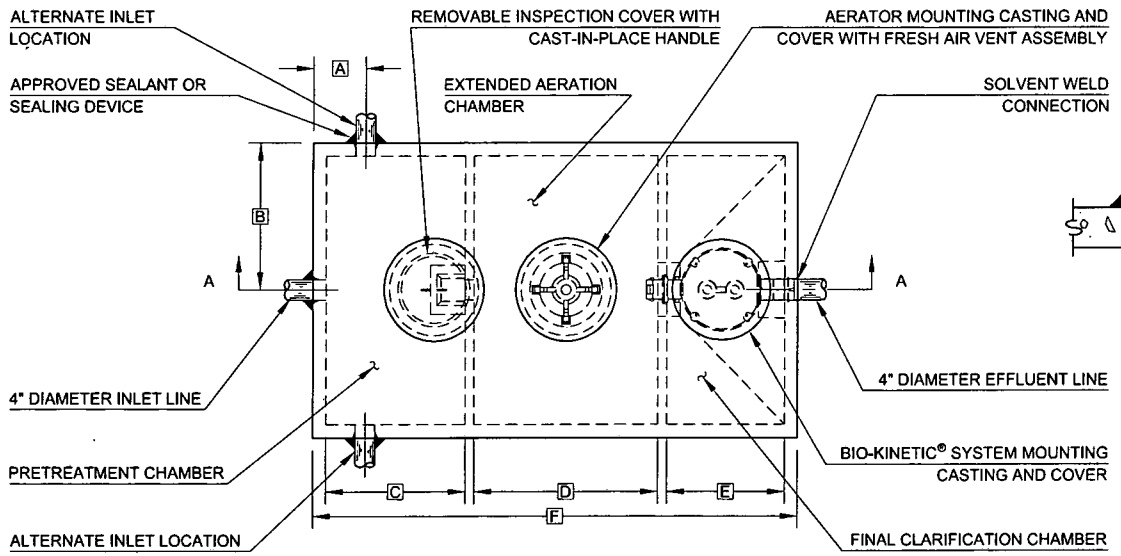
45% to 50% = 9.9 mg/l to 2.6 mg/l

Bio-Kinetic® System:

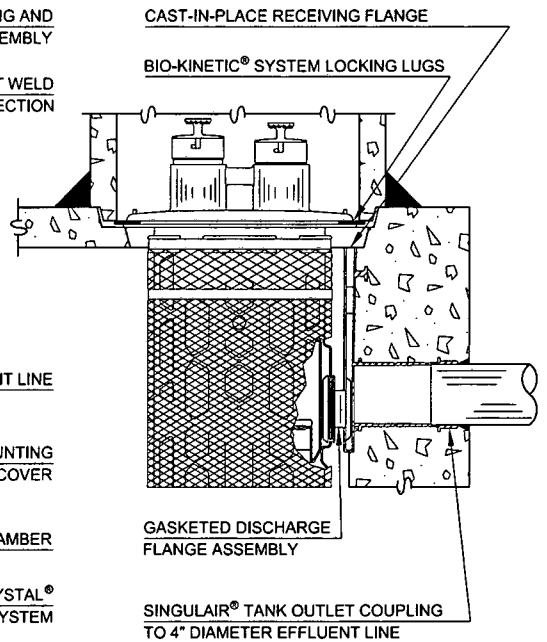
~ 6 mg/l removal = 3.9 mg/l to < 1 mg/l

Following is a list of the supporting documentation.

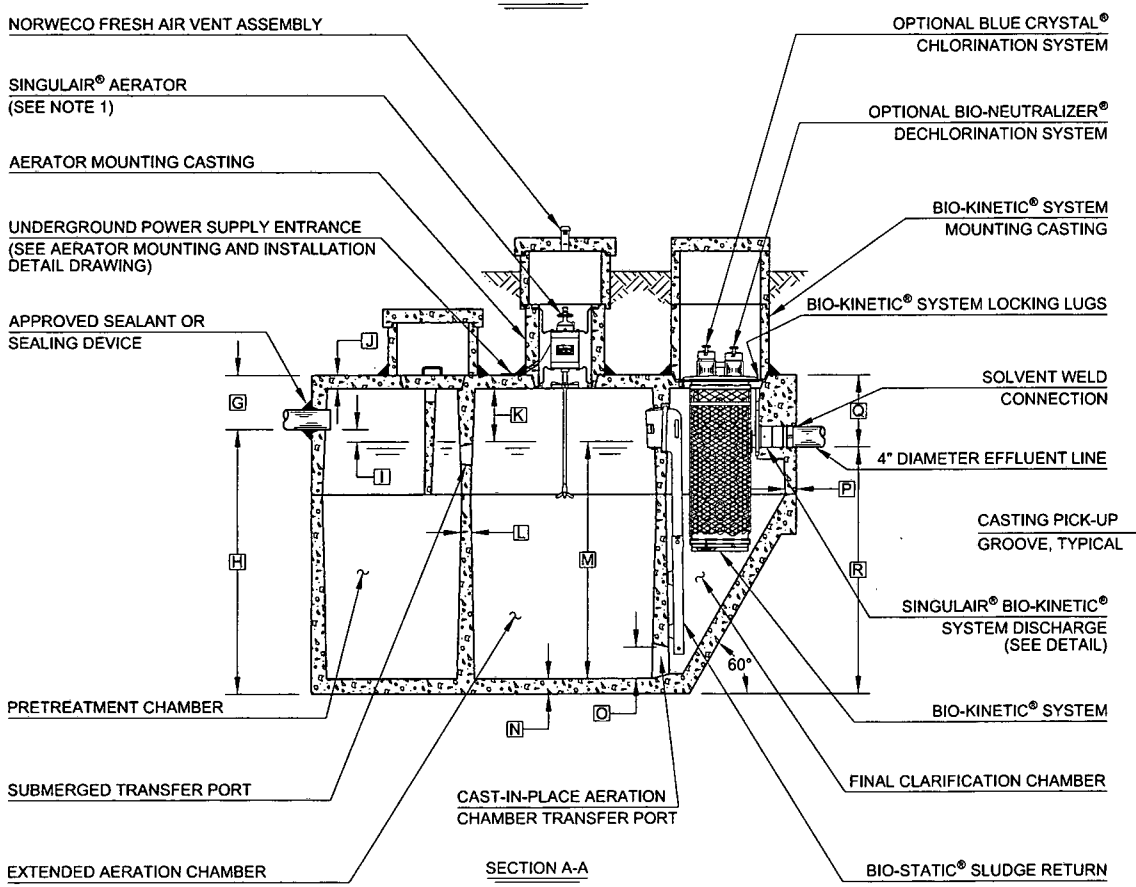
- Singulair Drawing
- Singulair Specifications
- Singular Aerator
- Bio-Kinetic Specifications
- Singulair Brochure



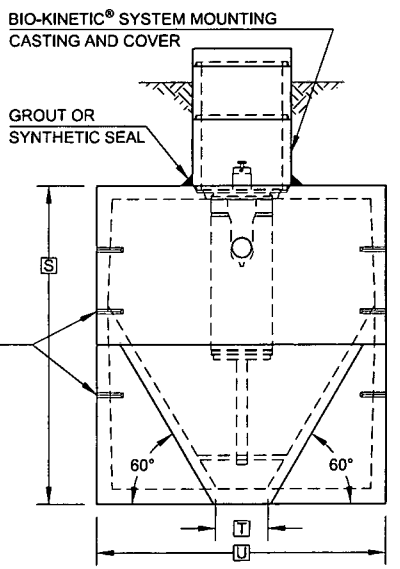
PLAN VIEW



BIO-KINETIC® SYSTEM DISCHARGE DETAIL



SECTION A-A



OUTLET END VIEW

NOTE: TOTAL SYSTEM CAPACITY: 1,300 GALLONS
RATED CAPACITY: 500 GALLONS PER DAY

GENERAL NOTES:

① SINGULAIR® AERATOR, AS TESTED AND ACCEPTED BY NSF.

② FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.

③ ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.

④ TANK REINFORCED PER ACI STD. 318-05.

⑤ REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY-FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.

⑥ CONTACT THE LOCAL, LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.

PROJECT ENGINEER'S APPROVAL:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CONTRACTOR'S CERTIFICATION:
I (WE) HEREBY CERTIFY THAT THIS DRAWING HAS BEEN CHECKED AND IS APPROVED FOR USE IN CONFORMITY WITH THE CONTRACT DOCUMENTS.

DATE: _____

NAME: _____

CRITICAL DIMENSIONS

A	1'- 0"	N	0'- 3"
B	2'- 9"	O	0'- 6"
C	2'- 8"	P	0'- 2 ½"
D	3'- 7"	Q	1'- 4"
E	2'- 3"	R	4'- 8"
F	9'- 3"	S	6'- 0"
G	1'- 0"	T	1'- 0"
H	5'- 0"	U	5'- 6"
I	0'- 3"	V	
J	0'- 3"	W	
K	1'- 0"	X	
L	0'- 2"	Y	
M	4'- 6"	Z	

U.S. AND FOREIGN PATENTS PENDING

© MMVII

norweco

SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM MODEL 960 - 500 GPD

REVISION DATE	1-29-07
REVISION #	J
DRAWN BY	BDS
APPROVED BY	JMM
DATE	1-9-96
SCALE	NTS
DRAWING NO.	PC-5-7006

norweco®

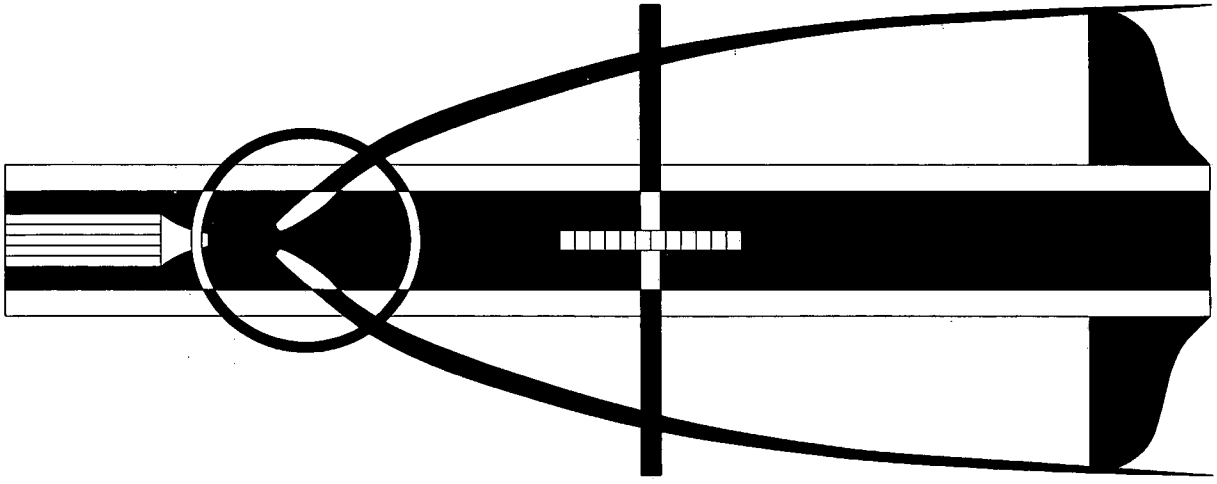
SINGULAIR® BIO-KINETIC®

WASTEWATER TREATMENT SYSTEM MODEL 960

SPECIFICATIONS

GENERAL SPECIFICATIONS

The contractor shall furnish and install one complete Singulair Bio-Kinetic wastewater treatment system with all necessary parts and equipment as described in the following specifications. Treatment of the domestic wastewater shall be accomplished by the extended aeration process with non-mechanical flow equalization, pretreatment of the influent, and filtration of the final effluent. The treatment system shall provide primary, secondary, and tertiary treatment of the wastewater flow, and if required, chlorination and dechlorination of the effluent prior to discharge. All treatment processes shall be contained within reinforced precast concrete tankage meeting the requirements of ACI Standard 318. The wastewater treatment system shall be a Singulair Model 960 as manufactured by Norweco, Inc., Norwalk, Ohio, USA. Systems utilizing fiberglass, steel, or plastic tankage are subject to floatation when dewatered and shall not be considered for this application.



The wastewater treatment system shall include precast concrete tankage providing separate pretreatment, aeration and final clarification chambers. The tankage shall be furnished with cast-in-place inlets, submerged transfer ports, aerator mounting casting with removable cover, cast-in-place molded plastic vent assembly, cast-in-place outlet coupling and Bio-Kinetic system mounting casting with removable cover. Principal items of electro-mechanical equipment supplied with the Singulair system shall be a 1725 RPM mechanical aerator, UL Listed Service Pro electrical control center with MCD technology, Bio-Static sludge return and Bio-Kinetic tertiary treatment device for flow equalization and final filtration of system effluent.

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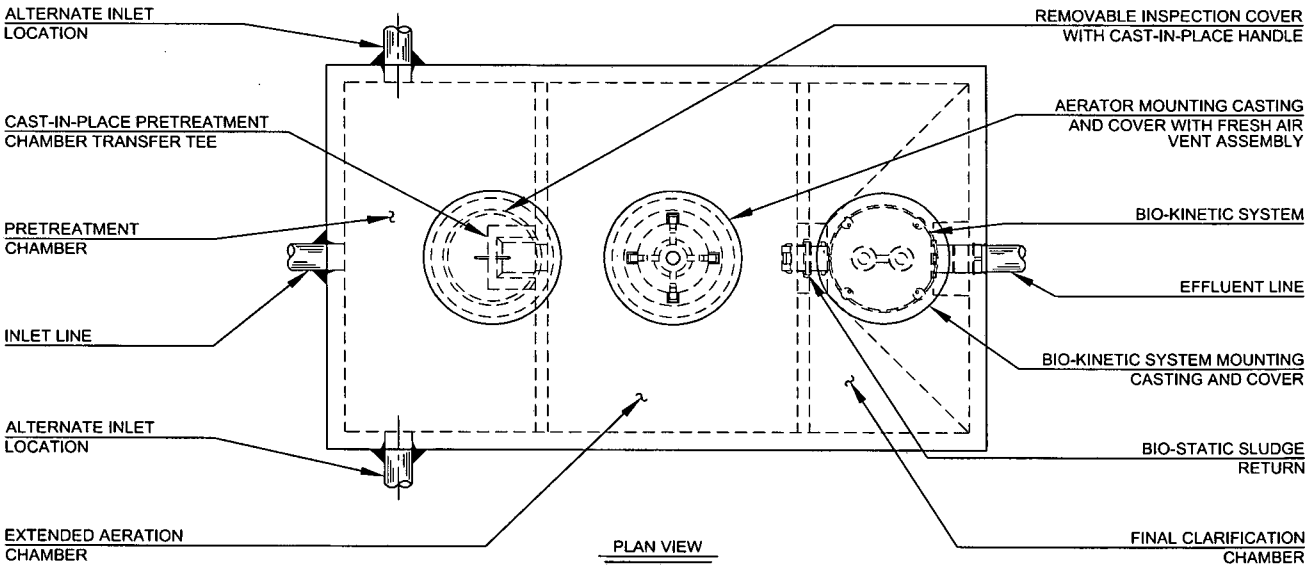
OPERATING CONDITIONS

Total holding capacity of the system shall provide a minimum of 48 hour retention of the daily flow. The pretreatment chamber shall provide at least 18 hour retention, the extended aeration chamber shall provide at least 24 hour retention, and the clarification chamber shall provide at least 6 hour retention. The non-mechanical flow equalization device shall increase each individual chamber and total system retention time in direct proportion to loading. Design of the system shall include a compartmented tank and non-mechanical flow equalization device to insure successful treatment performance without upset even when the significant runoff period is six hours. Hydraulic design considerations of the system and flow equalization device shall be such that intermittent peak flow factors as high as four shall not upset hydraulic reliability within the system. Capability of the system to perform as outlined, when built by an approved manufacturer, shall be certified by an independent testing laboratory and approved for use by the local governing regulatory agency.

PRETREATMENT CHAMBER

The pretreatment chamber shall be an integral part of the wastewater treatment system. All domestic wastewater shall be preconditioned and flow equalized while passing through the pretreatment chamber prior to being introduced to the extended aeration chamber. The outlet of the pretreatment chamber shall be equipped with a discharge tee that extends vertically into the liquid so that only the preconditioned equalized flow from the center area of the chamber is displaced to the extended aeration chamber. The discharge tee and transfer port shall be of adequate size to handle a peak flow factor of four without restricting the outlet and disturbing hydraulic displacement to the extended aeration chamber. A removable inspection cover shall be cast into the top of the pretreatment chamber to allow tank and transfer tee inspection. As a safety measure, the uncovered opening shall be small enough to insure that the tank cannot be entered for inspection or service.



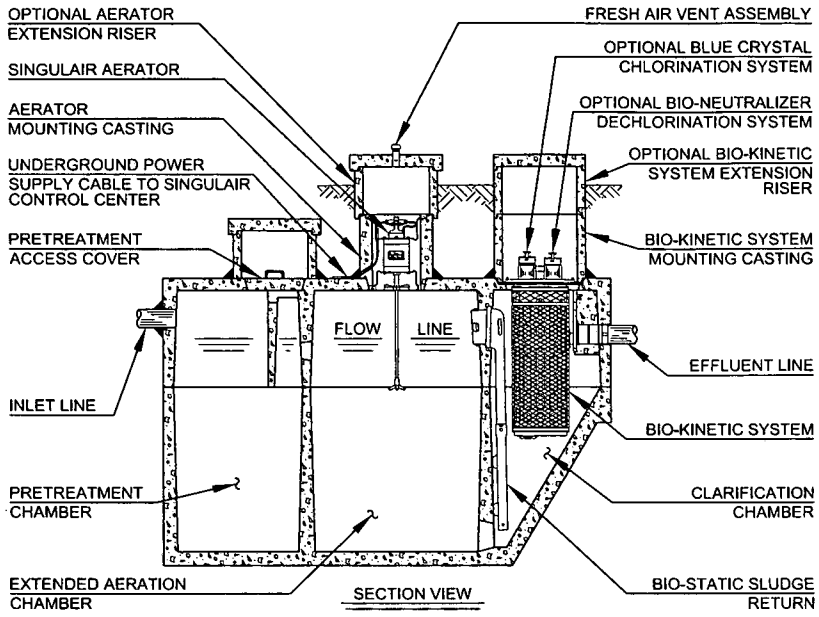
PLAN VIEW

AERATION CHAMBER

The extended aeration chamber shall provide in excess of 24 hour retention of the equalized daily flow. The chamber shall be of sufficient size to provide a minimum of 80 cubic feet of tank capacity per pound of applied BOD. The aeration chamber length-width-depth ratio shall be designed to insure uniform tank mixing and provide optimum treatment. The aeration chamber(s) shall be an integral part of the system flow path and constructed of properly reinforced 5,000 PSI, 28 day compression strength precast concrete. All castings used to construct the precast concrete tankage shall be monolithic units with external and internal walls incorporated into each section.

FINAL CLARIFICATION CHAMBER

The final clarification chamber shall consist of 5 functionally independent zones operating together to provide satisfactory settling and clarification of the equalized flow. An inlet zone shall be provided and shall dissipate transfer turbulence at the flow inlet of the clarification chamber. Its performance shall also eliminate turbulence in other zones of the clarifier. Liquid shall be hydraulically displaced from the inlet zone to the sludge return zone. Hydraulic currents shall sweep settled sludge from the hoppered walls and return these solids via the inlet zone to the aeration chamber. As solids are removed, liquid is displaced to the hopper zone of the clarifier. In this zone, settling by gravity takes place. Three of the four sidewalls are slanted to form a hopper which directs all settled material back to the sludge return zone. Clarified liquid from the hopper zone shall be displaced into the final settling zone to provide additional clarification of the liquid. The liquid is finally displaced to the outlet zone for final filtration and discharge from the system. Non-mechanical equalization of the flow, through all 5 independent zones, shall provide optimal settling and clarification.

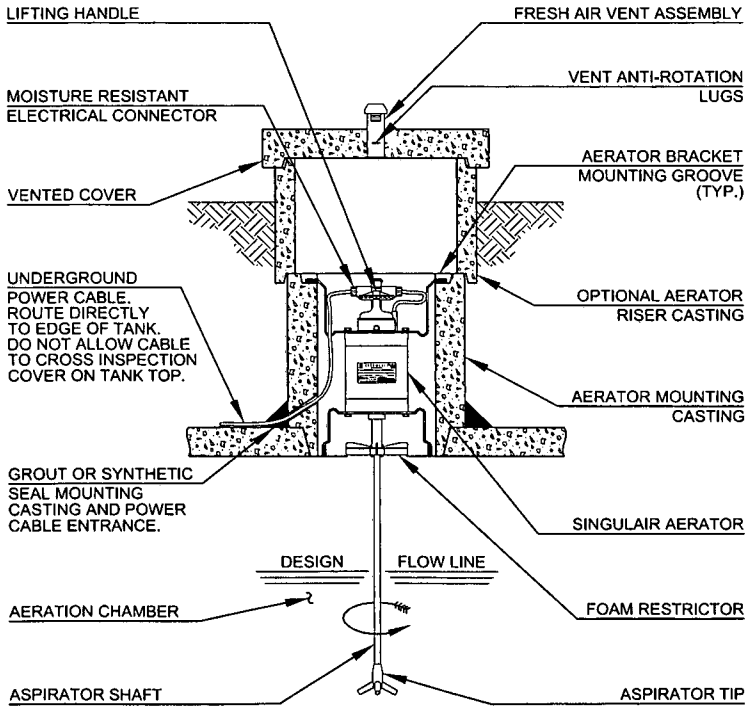


BIO-STATIC® SLUDGE RETURN

A Bio-Static sludge return shall be installed into the cast-in-place opening(s) in the aeration/clarification chamber wall to provide positive return of settled solids. Aeration chamber hydraulic currents shall enter the sludge return(s) and be directed into the sludge return zone of the clarification chamber. The Bio-Static sludge return shall accomplish resuspension and return of settled solids without disturbing the clarified liquid in the final settling zone and outlet zone.

MECHANICAL AERATOR

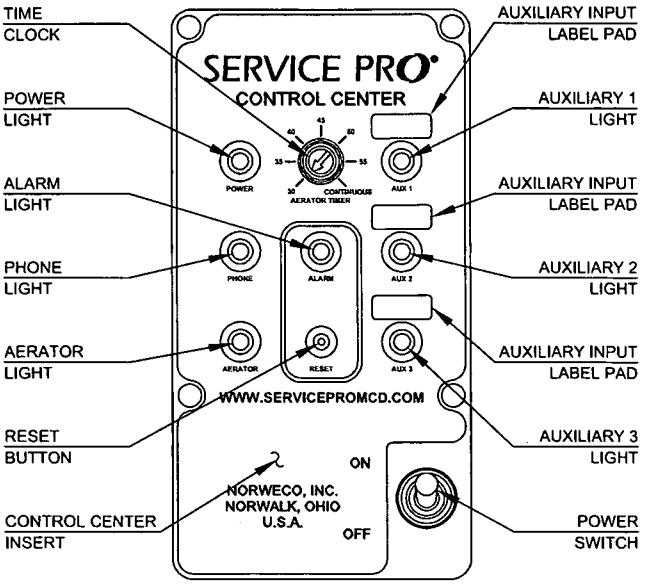
Each Singulair aerator shall be installed in a concrete aerator mounting casting above the aeration chamber. Fresh air shall be supplied through a molded plastic vent assembly cast into the concrete access cover above the aerator. The Singulair aerator shall include plated mounting brackets, NEMA 6 rated electrical connector, UL recognized fractional horsepower motor, molded plastic lifting handle, molded plastic air intake screens, molded plastic foam restrictor, stainless steel aspirator shaft and molded glass-filled nylon aspirator tip. The motor shall contain precision manufactured o-ring type seals installed between the motor shell and the machined aluminum endbells to insure watertight integrity is maintained. Molded Viton elastomer shaft seals shall be utilized to protect the bearings from contamination. Only the stainless steel aspirator shaft and glass-filled nylon aspirator tip shall be installed in contact with the liquid. There shall be no submerged electrical motors, bearings, or fixed air piping in the aeration system. Singulair aerator motors shall be designed not to exceed the motor nameplate rating when installed and operated as recommended for the system. The fractional horsepower aerator motor shall be equipped with a foam restrictor to protect the motor against high water and foam. The motor shall be 4 pole, 1725 RPM, 115 volt, 60 Hertz, single phase, ball bearing constructed with a 1.0 service factor. It shall draw less than 4.0 amps when operating at the rated nameplate voltage. Aerator motors without UL recognition have not demonstrated compliance with international electrical standards for safety and reliability and shall not be considered for this application.



BIO-KINETIC®

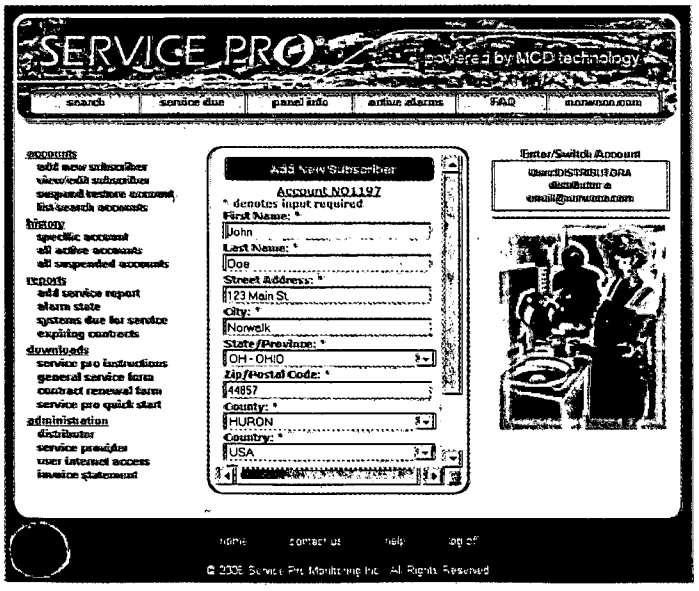
SERVICE PRO® ELECTRICAL CONTROL CENTER

The Service Pro electrical control center with MCD technology shall provide Monitoring, Compliance and Diagnostic functions for the Singulair treatment plant using a microprocessor based platform. The Service Pro control center shall contain nonvolatile memory to prevent loss of programming in the event of a power failure. The pre-wired controls shall be mounted in a lockable NEMA rated enclosure designed specifically for outdoor use. Each Service Pro control center shall be a UL Listed assembly and shall include a time clock, alarm light, reset button, power switch, power light, phone light, aerator alarm light and three auxiliary alarm lights. The control center shall monitor all treatment system operating conditions including aerator over current, aerator under current and open motor circuit. In the event the control center detects one of these conditions, power to the aerator shall be interrupted, a diagnostic sequence shall begin and the visual alarm shall activate. After a programmed recovery interval, an automatic restart attempt shall be initiated. If normal aerator operation does not resume during 24 programmed recovery and restart cycles, the audible alarm shall activate and the telemetry system shall report the specific condition to the Service Pro monitoring center. In the event that any of the auxiliary inputs detect abnormal operation of the treatment system auxiliary equipment, the audible and visual alarms shall immediately activate and the telemetry system shall report the alarm condition to the monitoring center. The service provider shall automatically be notified by the Service Pro monitoring center of the specific alarm condition using phone, fax or email.



TIME CLOCK

The aerator run cycle shall be controlled by an adjustable, pre-wired time clock. The minimum setting shall not permit the aerator to be "off" for more than 30 minutes per hour. It shall be adjustable in 5 minute increments and designed such that any adjustment results in additional run time up to "continuous" operation (60 minutes per hour). Use of a time clock can seriously affect system performance and operating cost. Systems that have not been performance certified at the minimum time clock setting by an independent testing laboratory shall not be considered for this application.



www.servicepromcd.com

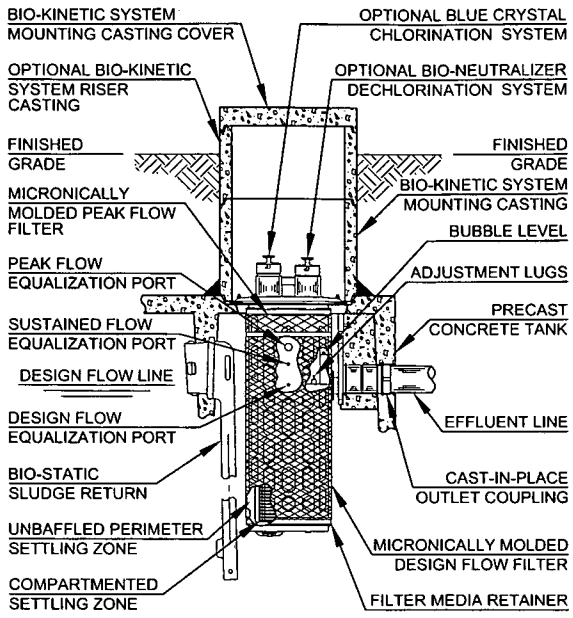
SERVICE PRO® MONITORING CENTER

The Service Pro monitoring center shall include a 128 bit encrypted password protected website for interface with the monitoring center database. Access to the secure website shall be obtained through a unique user name and password that provides tiered access to data from monitored treatment systems. Access level tiers shall include distributors, service providers, regulatory agencies and individual system owners. Distributors and service providers shall be able to create accounts, maintain service records and grant regulatory agencies access to the information. Individual system owners shall be able to view information regarding their own systems, as well as download instructional information. Integrity of stored data shall be maintained through the use of multiple servers operating in geographically isolated locations.

SPECIFICATIONS

BIO-KINETIC® SYSTEM

A Bio-Kinetic system shall be installed in the mounting casting(s) above the clarification chamber. Each Bio-Kinetic system shall provide non-mechanical flow equalization through all plant processes including pretreatment, aeration, clarification, tertiary filtration, chlorination and dechlorination. The assembly shall be supplied with locking lugs and removable moisture/vapor shield and shall consist of a design flow and peak flow micronically molded filter, baffled perimeter settling zone, flow distribution deck, lifting handles, level indicator, adjustment lugs, optional chlorination feed tube, unbaffled perimeter settling zone, solids contact zone, vertical inlet zone, compartmented settling zone consisting of 42 baffled chamber plates, effluent stilling well, final discharge zone, adjustable outlet weir, optional dechlorination feed tube, outlet zone and gasketed discharge flange. All components shall be manufactured from inert synthetic materials or rubber, assembled in circular fashion and connected to a plastic outlet coupling. The outlet coupling shall accept a 4" diameter, Schedule 40, PVC pipe. Each Bio-Kinetic system shall be installed with the inverts of the design flow equalization ports located at the normal liquid level of the clarifier. If intermittent flow rates exceed the capacity of the design flow ports, flow shall be held upstream until the intermittent flow dissipates. If the intermittent flow continues to increase, the liquid level may reach a pair of sustained flow equalization ports. With four ports in use, flow through the system increases while continuing to provide flow equalization to all upstream and downstream processes. Peak flow equalization ports are supplied but should not be required in a properly sized system. Optional Blue Crystal and Bio-Neutralizer tablet feed tubes shall be positioned such that the flow-activated chemical cannot make contact with the liquid upstream of the feed tubes.



FLOW EQUALIZATION

The wastewater treatment system shall include a non-mechanical, demand use, flow equalization device. The device shall control normal residential flow rates and reduce typical residential flow surges. The flow equalization rate shall be dependent upon the specific loading pattern and the duration of flow surges. At the 600 gallon per day NSF Standard 40 design loading schedule, minimum performance of the device shall equalize daily flow an average of 50%.

BLUE CRYSTAL® CHLORINATION SYSTEM (Optional)

The Singulair system shall be furnished complete with a tablet feeder and a six month supply of Blue Crystal disinfecting tablets. Blue Crystal tablets shall be specifically formulated for consistent chlorine dosage and effluent disinfection to the sustained, variable and intermittent flows that are typical of domestic wastewater treatment systems. The tablets shall be manufactured from pure calcium hypochlorite and contain a minimum of 70% available chlorine. Each tablet shall be $2\frac{5}{8}$" diameter, compressed to a 1" thickness, weigh approximately 5 ounces and be white in color with blue crystals for easy identification. The tablets shall dissolve in direct proportion to the flow rate, releasing controlled amounts of chlorine.

BIO-NEUTRALIZER® DECHLORINATION SYSTEM (Optional)

The Singulair system shall be furnished complete with a tablet feeder and a six month supply of Bio-Neutralizer dechlorination tablets. The dechlorination tablets shall contain active ingredients specially formulated to chemically neutralize both free and combined chlorine. Each tablet shall be $2\frac{5}{8}$" diameter, compressed to a $\frac{13}{16}$" thickness, weigh approximately 5 ounces and be green in color for easy identification. The tablets shall dissolve slowly, releasing controlled amounts of chemical for the instantaneous removal of residual chlorine from the system effluent.

WARRANTY AND EXCHANGE PROGRAM

The manufacturer shall provide a two year limited warranty for each Singulair aerator, Service Pro control center, Bio-Kinetic system and any other Singulair components purchased from the manufacturer. A comprehensive exchange program offers Singulair owners an additional forty-eight years of equipment protection. The distributor shall provide warranty and exchange program details to the regulatory agency, contractor and customer as required.

EQUIPMENT MANUFACTURER

The equipment specified herein shall be the product of a manufacturer having a minimum of seven years experience in the construction of prefabricated wastewater treatment equipment and systems. Bids shall be prepared on the basis of the equipment and material specified herein for purposes of determining the low bid. This is not done, however, to eliminate other products or equipment of equal quality and efficiency. If equipment is to be substituted, approval of such substitution must be made prior to execution of any order. It is assumed that substitution will result in a reduction of cost to the contractor and that if accepted, these savings will be passed along by a reduction in the base bid.

SINGULAIR® MODEL 960 DATA CHART

Designation: Model 960-	500 GPD	750 GPD	1000 GPD	1250 GPD	1500 GPD
Daily Treatment Capacity (Gallons Per Day)	500/600	750/800	1000	1250	1500
Total System Capacity (Gallons)	1300	1600	2300	2850	3400
Number of Singulair Aerators	1	1	2	2	2
Number of Bio-Kinetic Systems	1	2	2	3	3
Number of Bio-Static Sludge Returns	1	1	1	2	2
Drawing Number (PC-5-)	7006	7007	7008	7009	7010

PROGRESS THROUGH SERVICE SINCE 1906

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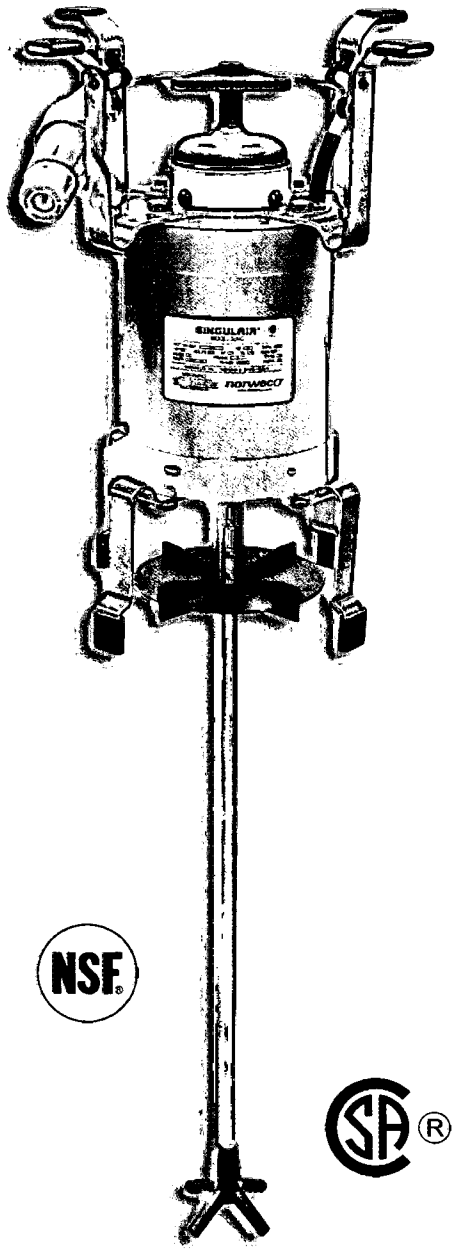
WE HAVE REVOLUTIONIZED AIR DELIVERY

THE SINGULAIR MODEL 206C AERATOR
FLOODPROOF CONSTRUCTION
DEPENDABLE PERFORMANCE
EASILY MAINTAINED

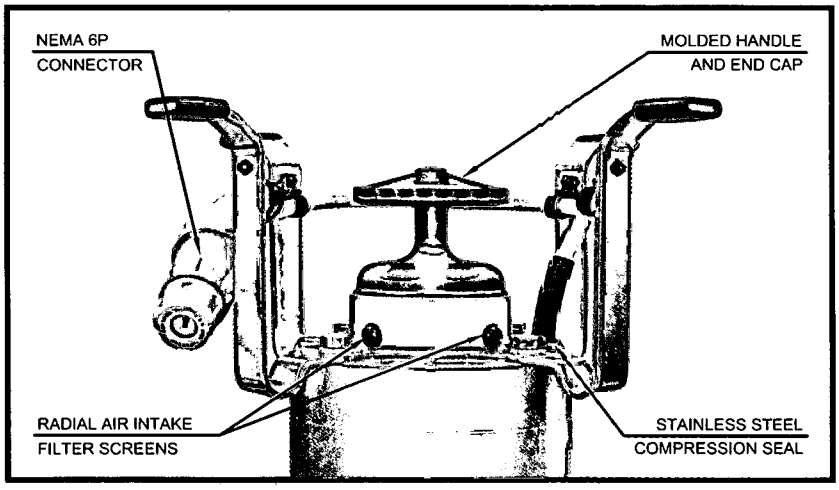
The Model 206C Singulair aerator delivers performance worth talking about. Built with improved watertight integrity, state-of-the-art ball bearings, radial air intake openings and waterproof electrical connections, this Singulair air delivery system outperforms and outlasts all others.



TECHNOLOGY YOU CAN COUNT ON
ENGINEERED FOR EXTENDED LIFE

Combining advanced electro-mechanical components with energy efficiency, the Model 206C aerator masters the competition. Designed specifically for use in the rigorous environment of an aeration chamber, this aerator runs cooler, cleaner, quieter and longer than any other air delivery system on the market today.

THE PERFORMANCE YOU NEED
THE QUALITY YOU CAN TRUST



NSF

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SINGULAIR MODEL 206C AERATOR FEATURES

- Lowest electrical usage in the industry
- Technologically advanced ball bearings
- NEMA 6P electrical connector
- Floodproof design
- Proprietary bearing protection system
- Radial air intake openings
- Quieter, cleaner operation
- Certified to UL standard
- Made in the U.S.A.

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BIO-KINETIC®

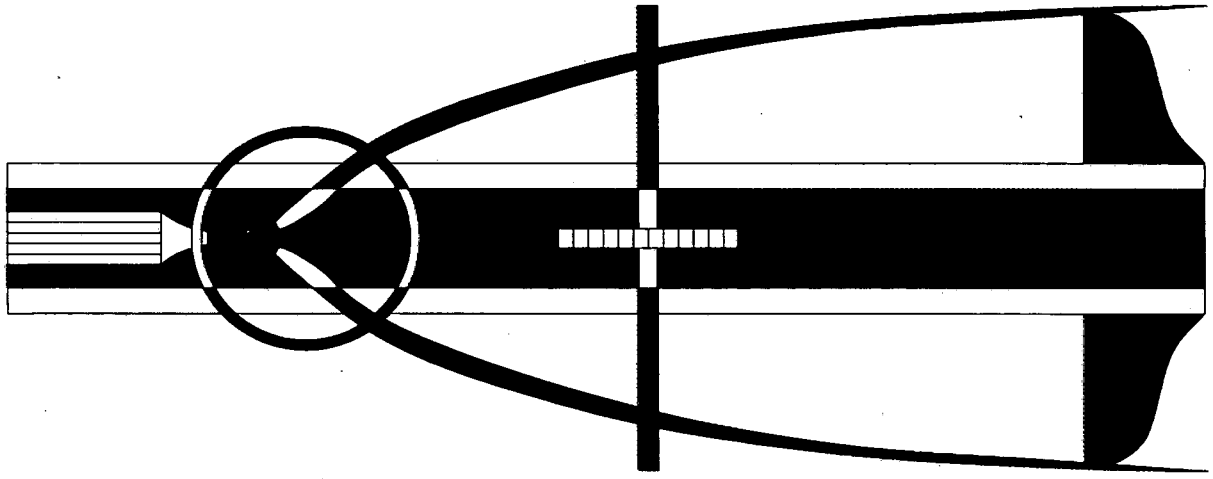
WASTEWATER MANAGEMENT SYSTEM

MODEL BK 2000

SPECIFICATIONS

GENERAL SPECIFICATIONS

The contractor shall furnish and install one complete Bio-Kinetic wastewater management system with Bio-Kinetic tertiary device, including all applicable equipment, as described in the following specifications. All domestic wastewater shall pass through the Bio-Kinetic wastewater management system for advanced treatment prior to being returned to the environment. Settling and storage of suspended solids, flow equalization, filtration and chemical addition shall be accomplished for the wastewater treatment facility by the Bio-Kinetic wastewater management system. The advanced treatment system shall be a Bio-Kinetic Model BK 2000 wastewater management system, as manufactured by Norweco, Inc., Norwalk, Ohio, USA. The wastewater management system shall be serviceable from grade and shall include a solids settling and retention basin, Bio-Kinetic tertiary device, anti-shear inlet and outlet couplings, safety/service guard, lockable access cover, compression clamp, system mounting casting and extension risers as required.



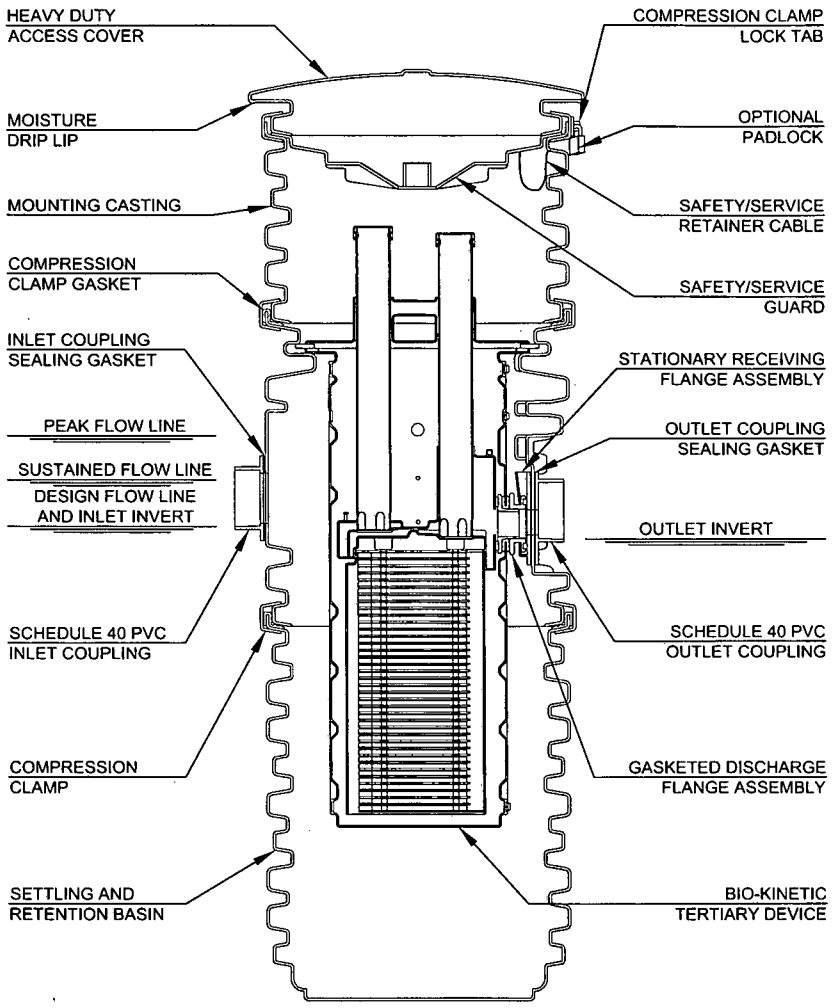
OPERATING CONDITIONS

The Bio-Kinetic wastewater management system shall be an integral part of the overall wastewater treatment and disposal facility. The system shall be rated to accommodate domestic wastewater flows up to 2,000 gallons per day when used downstream of a properly sized treatment facility. Total holding capacity of the wastewater treatment facility shall provide a minimum of 24 hour retention of the average design daily flow. Design of the wastewater treatment facility, including primary/secondary treatment and wastewater management system, shall insure reliable, long term performance without upset even when the significant runoff period is six hours. Hydraulic design considerations of the treatment facility and wastewater management system shall be such that intermittent peak flow factors as high as four shall not upset hydraulic reliability within the facility. Use of the Bio-Kinetic wastewater management system, when installed by an authorized agent, shall be approved by the local governing regulatory agency.

BIO-KINETIC®

SETTLING AND RETENTION BASIN

The settling and retention basin shall be designed to remove biosolids from domestic wastewater. Total holding capacity of the retention basin below the outlet invert shall be 52 gallons. For special applications, additional ring sections are available to increase the liquid and solids retention capacity. The retention basin shall be manufactured to be watertight at burial depths of up to 12 feet. The inlet and outlet couplings of the basin shall contain 4" diameter Schedule 40 PVC pipe couplings to permit a solvent weld connection of inlet and discharge piping. Fall through the retention basin and internal components from inlet invert to outlet invert shall be a total of one inch. A system mounting casting to allow access to the retention basin, Bio-Kinetic tertiary device and all internal components shall be provided. The mounting casting shall be equipped with a molded, one-piece, heavy duty, ribbed, removable access cover with moisture drip lip. The access cover shall be securely installed such that the moisture drip lip is 3" above finished grade. The cover shall be secured to the retention basin by an injection molded compression clamp with lock tab to prevent unauthorized access. The retention basin shall be equipped with a safety/service guard. The safety/service guard shall be installed below the retention basin cover and securely connected to the mounting casting by a retainer cable. The internal safety/service guard shall be designed to prevent accidental entry and be supported by the uppermost internal rib of the mounting casting. To prevent loss or theft, the safety/service guard shall be permanently connected to the retention basin by stainless steel cable. The retention basin, optional ring sections, safety/service guard, access cover and system mounting casting shall be constructed of corrosion resistant, UV stabilized polyethylene. All joints within the retention basin shall be sealed with a polyisoprene gasket and injection molded compression clamp secured with bolted lock tab. The retention basin shall be an integrally molded, heavy duty, one-piece unit, with only one clamp required to attach the access cover. For deeper installations, additional clamps shall be used to connect ring sections and extension risers to the retention basin. Where special shipping considerations apply, the retention basin may be shipped in individual sections for field assembly with compression clamp.



BK 2000 SYSTEM

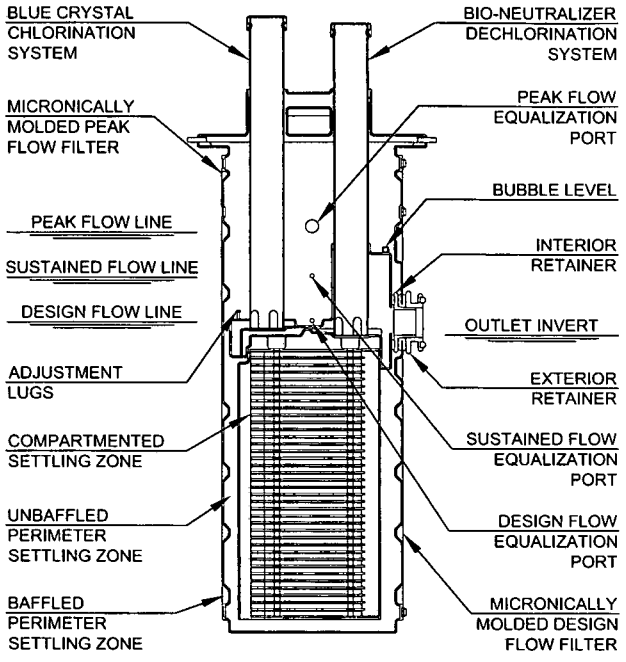
EXTENSION RISERS

For installations where the inlet invert of the retention basin is more than 28" below finished grade, optional extension risers shall be installed. Extension risers shall be constructed of the same material as the retention basin, optional ring sections and mounting casting. To permit maximum installation flexibility and to accommodate various treatment system elevations, individual extension risers shall be available in 6" increments from 6" up to 72" in height. When an extension riser is used, the internal safety/service guard shall be mounted in the uppermost rib of the riser, directly below the access cover. Extension risers shall be connected to the mounting casting and sealed with a polyisoprene gasket and injection molded compression clamp.

MODEL BK 2000

BIO-KINETIC® TERTIARY DEVICE

A Bio-Kinetic tertiary device shall be connected to the outlet coupling within each retention basin. Suspended and settleable solids and BOD shall be removed from the wastewater flow and retained within the basin and/or the three separate filtration zones and eight independent settling zones of the Bio-Kinetic tertiary device. Each Bio-Kinetic tertiary device shall provide non-mechanical flow equalization through all gravity flow treatment processes of the upstream and downstream wastewater facility, including (as applicable) pretreatment, anaerobic treatment, aerobic treatment, clarification, filtration, chlorination, dechlorination and surface or subsurface effluent disposal systems. The Bio-Kinetic device shall be supplied with locking lugs and removable moisture/vapor shield and shall consist of a design flow and peak flow micronically molded filter, baffled perimeter settling zone, non-mechanical flow equalization, flow distribution deck, lifting handles, level indicator, adjustment lugs, chlorination feed tube, unbaffled perimeter settling zone, solids contact zone, vertical inlet zone, compartmented settling zone consisting of thirty-seven baffled chamber plates, effluent stilling well, final discharge zone, adjustable outlet weir, dechlorination feed tube, outlet zone and gasketed discharge flange. All components shall be manufactured from inert synthetic materials or rubber, assembled in circular fashion and connected to a PVC outlet coupling. The outlet coupling shall permit a solvent weld connection to the discharge piping. Each Bio-Kinetic device shall be installed such that the inverts of the design flow equalization ports are located at the normal liquid level of the gravity flow treatment facility. If intermittent flow rates exceed the capacity of the design flow ports, flow shall be held upstream until the intermittent flow dissipates or continues to increase. If the intermittent flow continues to increase, it will reach the pair of sustained flow equalization ports. With four ports in use, flow through the system increases while the Bio-Kinetic device continues to provide non-mechanical flow equalization to all upstream and downstream processes. Two peak flow equalization ports shall be supplied to equalize intermittent periods of peak hydraulic loading. Blue Crystal tablet chlorination system and Bio-Neutralizer tablet dechlorination system feed tubes shall be positioned such that the flow-activated chemical cannot make contact with the liquid upstream of the feed tubes. Treatment systems utilizing only slotted or screen filtration do not provide non-mechanical flow equalization throughout all gravity flow processes or chemical addition and shall not be considered for this application.



BIO-KINETIC TERTIARY DEVICE

NON-MECHANICAL FLOW EQUALIZATION

The Bio-Kinetic device shall provide non-mechanical, demand use, flow equalization to the entire gravity flow wastewater treatment facility. Flow equalization shall control normal residential flow rates and reduce typical residential flow surges (e.g. shower @ 10 minutes duration, bathtub discharge @ 5 minutes duration, clothes washer discharge @ 2 minutes duration, and dishwasher discharge @ 2 minutes duration). The flow equalization rate shall be dependent upon the hydraulic loading pattern, the duration of flow surges and the size of the treatment facility tankage. In order to fully utilize the upstream flow equalization capacity, the transfer pipe connecting the upstream facility to the Bio-Kinetic wastewater management system shall be not longer than 10 feet and shall fall no more than 1/4" over the entire length. The transfer pipe may be installed at greater length and/or with more fall, but shall result in decreased flow equalization rates that are dependent upon overall pipe length and total fall. At a 2,000 gallon per day residential loading pattern, minimum performance of the device shall equalize daily flow more than 60% when used with a treatment facility having at least 80 square feet of upstream liquid surface area. Flow equalization shall increase detention time of the wastewater in all treatment processes and shall prevent hydraulic upset and solids washout. Flow equalization shall result in additional solids being retained in the upstream portion of the treatment facility, insuring fewer and more stabilized solids in the effluent. Remaining solids shall be further reduced by the Bio-Kinetic wastewater management system. Reduced hydraulic and organic loading shall result in increased treatment and disposal system life.

BLUE CRYSTAL® CHLORINATION SYSTEM

The BK 2000 shall be equipped with a supply of Blue Crystal residential disinfecting tablets installed in the chlorine feed tube of the wastewater management system. Blue Crystal tablets shall be specifically formulated for consistent chlorine dosage to the sustained, variable and intermittent flows that are typical of domestic wastewater treatment systems. The tablets shall be manufactured from pure calcium hypochlorite and shall contain a minimum of 70% available chlorine. The tablets shall incorporate beveled edges to enhance the chemical dissolution pattern. Each tablet within the feed tube shall be 2 5/8" diameter, compressed to a 1" thickness, weigh approximately 5 ounces and be white in color with blue crystals for easy identification. The tablets shall dissolve in direct proportion to the flow rate, releasing controlled amounts of chlorine.

BIO-NEUTRALIZER® DECHLORINATION SYSTEM

The BK 2000 shall be equipped with a supply of Bio-Neutralizer dechlorination tablets installed in the dechlorination feed tube of the wastewater management system. The active ingredients of the dechlorination tablets shall be specifically formulated to chemically neutralize both free and combined chlorine. The tablets shall incorporate beveled edges to enhance the chemical dissolution pattern. Each tablet within the feed tube shall be 2 5/8" diameter, compressed to a 13/16" thickness, weigh approximately 5 ounces and be green in color for easy identification. The tablets shall dissolve in direct proportion to the flow rate, releasing controlled amounts of chemical for the instantaneous removal of residual chlorine.

TEN YEAR LIMITED WARRANTY

The manufacturer shall provide a limited warranty against defects in material and workmanship under normal use and service for a period of ten years. The limited warranty shall cover all components of the Bio-Kinetic wastewater management system purchased from the manufacturer, including retention basin, ring sections, safety/service guard, access cover, system mounting casting, extension risers and Bio-Kinetic tertiary device. A detailed copy of the warranty shall be provided to the regulatory agency, contractor and customer as required.

EQUIPMENT MANUFACTURER

The equipment specified herein shall be the product of a manufacturer having a minimum of seven years experience in the construction of prefabricated wastewater treatment equipment and systems. Bids shall be prepared on the basis of the equipment and material specified herein for purposes of determining the low bid. This is not done, however, to eliminate other products of equal quality and efficiency. If equipment is to be substituted, approval of such substitution must be made prior to the execution of any order. It is assumed that substitution will result in a reduction of cost to the contractor and that if accepted, these savings will be passed along by a reduction in the base bid.

PROGRESS THROUGH SERVICE SINCE 1906

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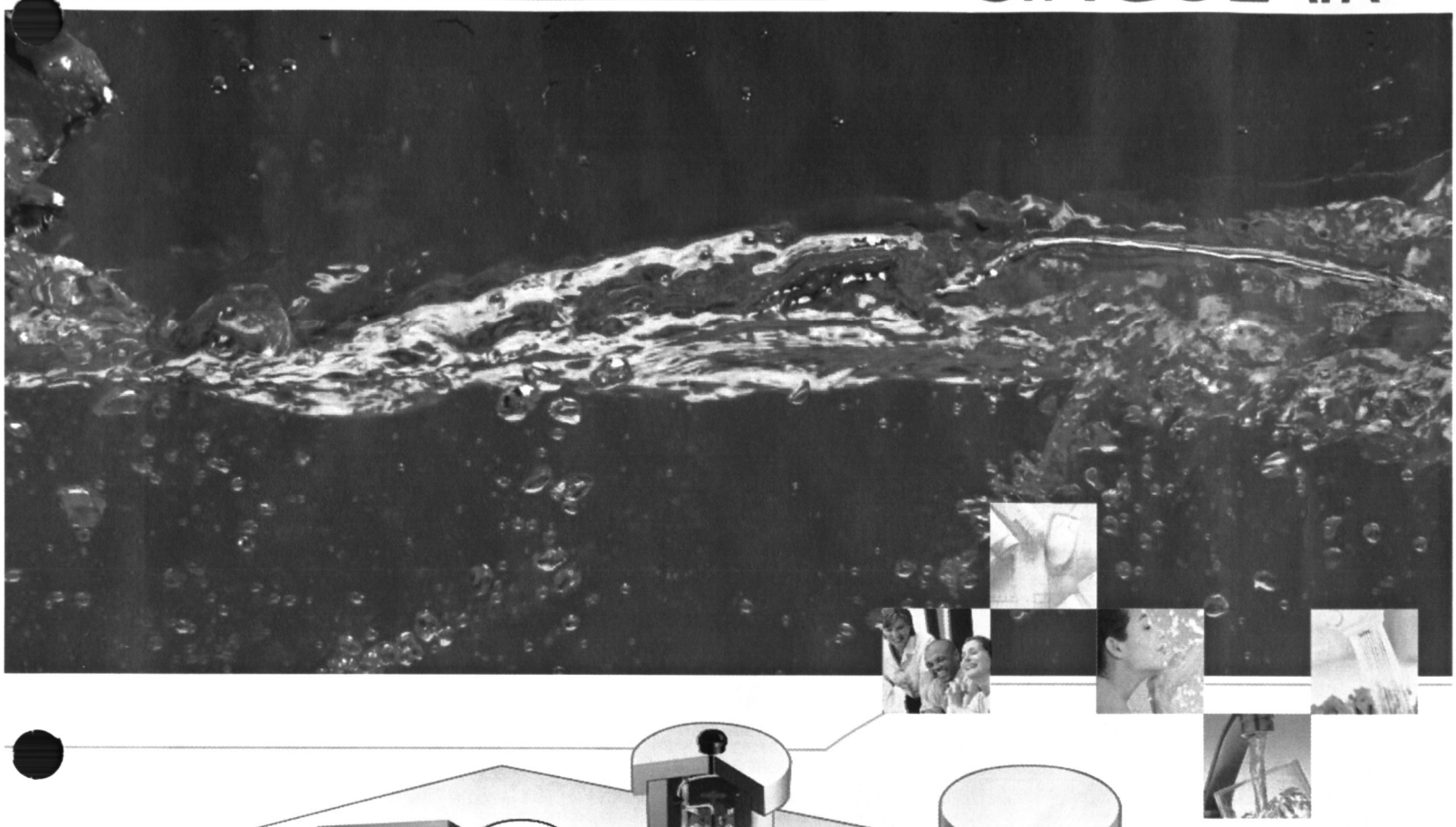

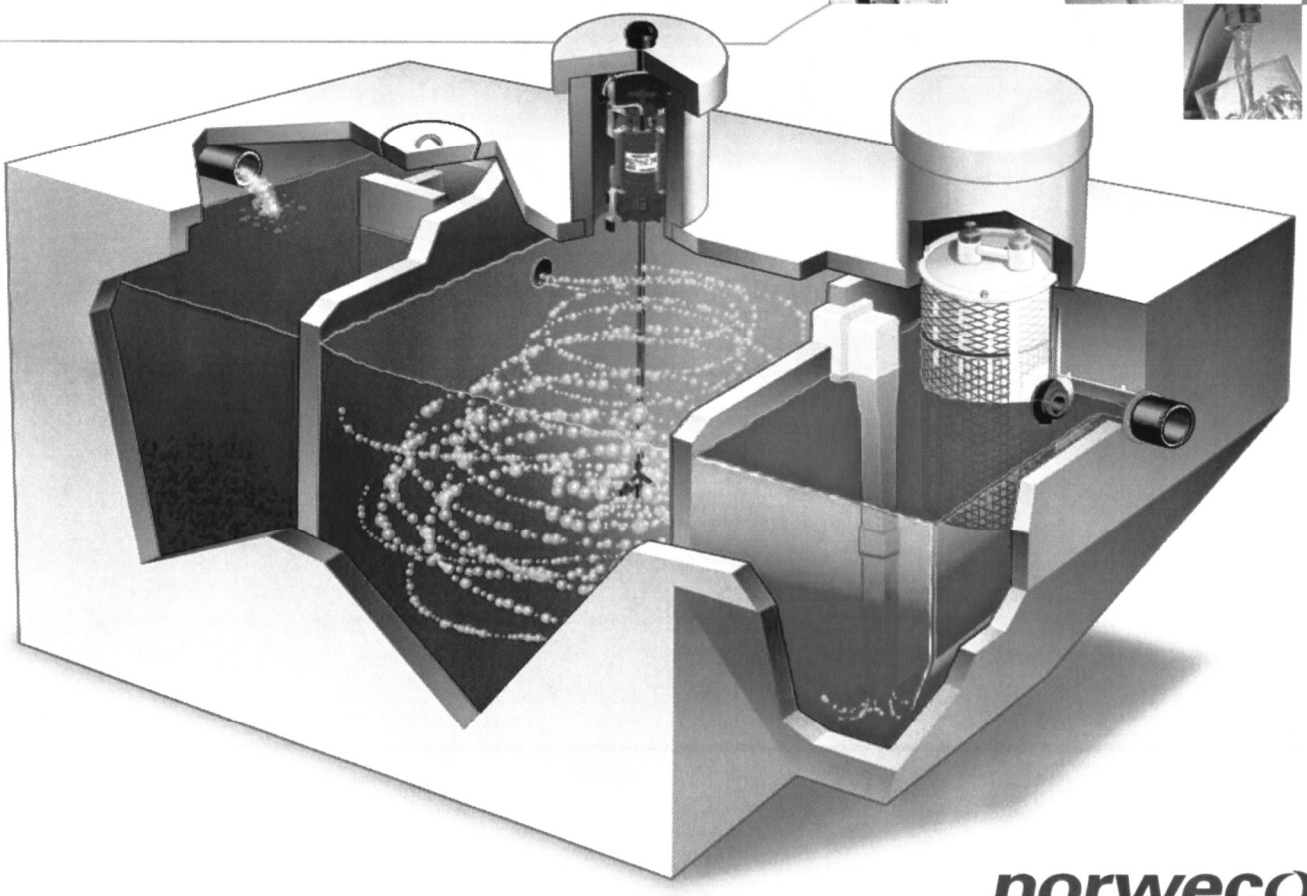

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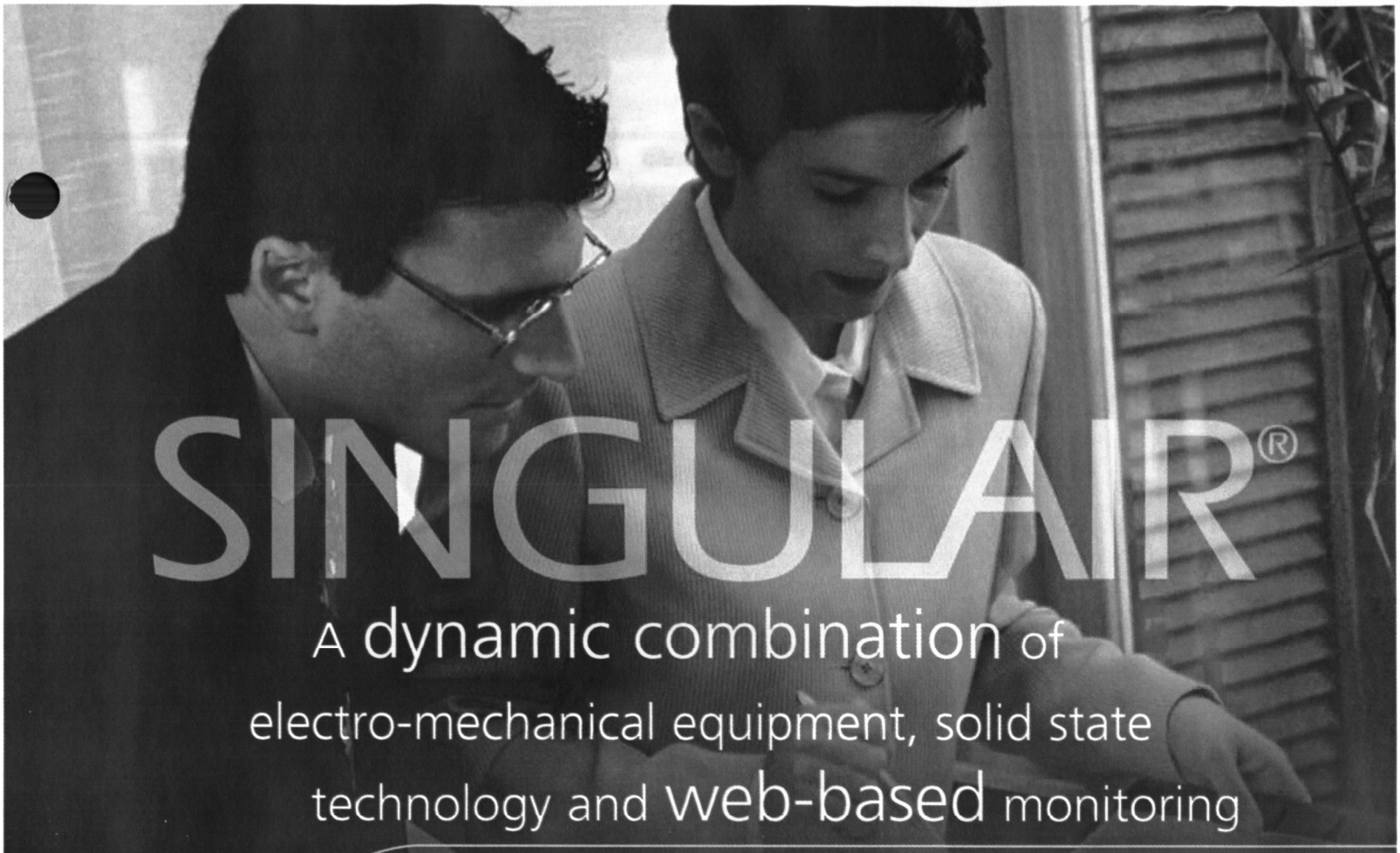

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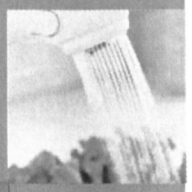
A dynamic combination of electro-mechanical equipment, solid state technology and web-based monitoring that translates to increased property value, performance certified for you

The new state-of-the-art Singulair treatment system is the trouble-free, energy-efficient alternative to that out-dated, unmanageable septic tank. It sets a new standard for properties that are not connected to centralized sewers. It quietly, efficiently and automatically treats all incoming wastewater, returning harmless effluent to the environment in just 24-hours. Because it operates only 30-minutes every hour, the new Singulair uses half the energy required by continuous-run systems.

We've been providing progress through service since 1906. When you consider the facts presented in this brochure, you will see why Norweco is recognized everywhere as providing today's answer for the protection of tomorrow's environment.

solutions in wastewater treatment



Norweco distributors are located throughout the United States and much of the rest of the world. Research, product development, manufacturing, marketing and sales support are conducted inside our offices and factory in Norwalk, Ohio. Everyone at Norweco is committed to shaping the future of our industry.

engineering the future

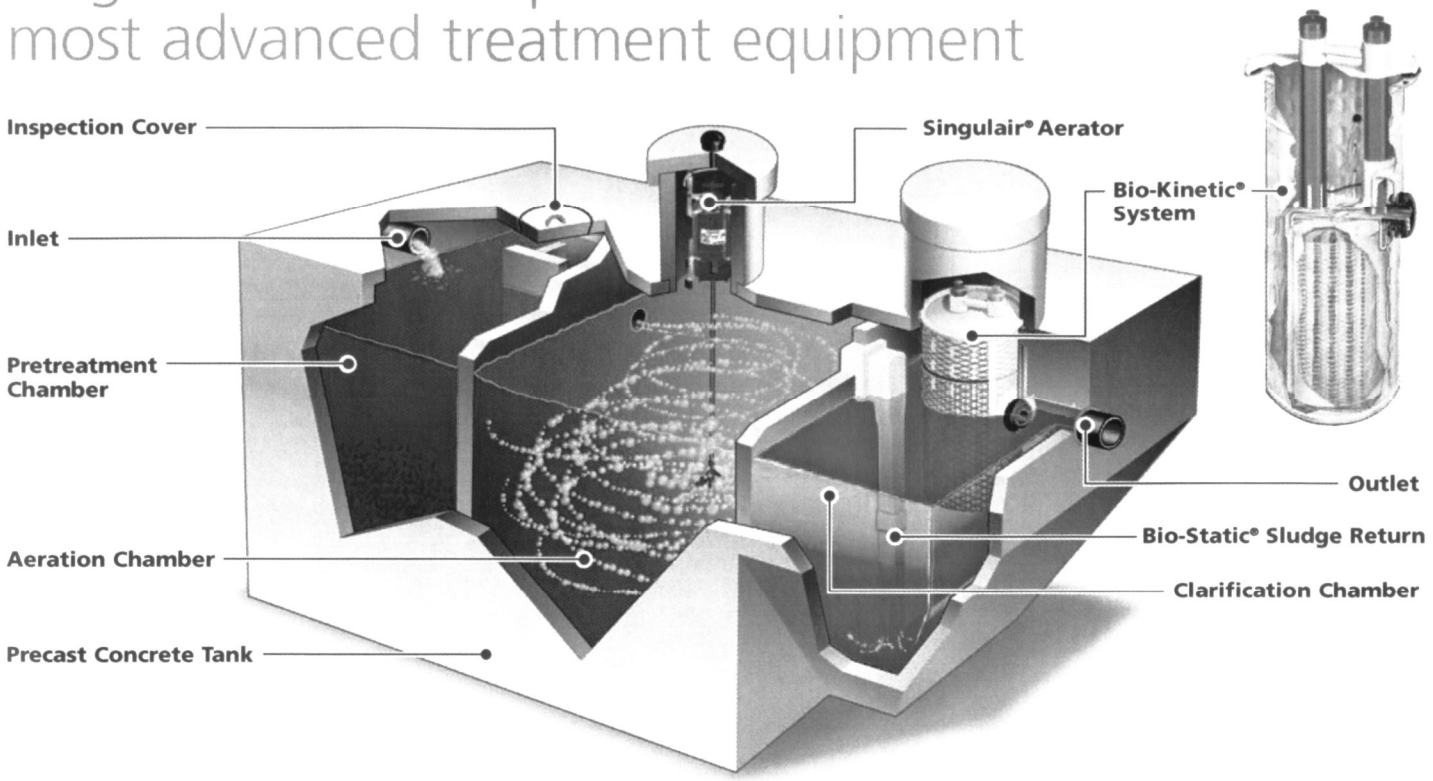
of water and wastewater treatment

Specify Singulair®

Your local Norweco distributor is fully trained to install your Singulair System and any other Norweco product you choose to protect your environment. Each of our distributors has completed a nationally accredited Singulair factory-training program.

The Singulair System comes to you complete, including delivery, tank setting, equipment installation, plant start-up and service. A series of service and adjustment inspections are scheduled for the first two years of operation at the time your system is installed. These inspections are included in the sale so that your system continues to perform at the highest level to protect you and your investment. Extended service contracts are also available from your Norweco distributor.

Singulair® rivals the performance of the world's most advanced treatment equipment



Inlet
Untreated wastewater enters the system here.

Pretreatment Chamber
Wastewater enters at the Singulair inlet and is equalized here as anaerobic bacteria and gravity precondition it.

Aeration Chamber
Here, safe, living aerobic bacteria convert the wastewater into stable substances. Flow equalization maximizes this biological oxidation and assures 24-hour retention and treatment.

Aerator provides complete treatment
Our exclusive aerator infuses the fresh air that safe, living micro-organisms require to fully digest and treat wastewater inside the Aeration Chamber. Powered by our 1725 RPM, 115 volt, fractional horsepower motor, our quiet, reliable aerator is inexpensive to operate, reduces heat build up and dramatically increases bearing life. Each aerator is precision engineered, tested and certified to operate only 30-minutes per hour. Only the stainless steel aspirator shaft and reinforced nylon aspirator come in contact with liquid in the Aeration Chamber.

Clarification Chamber
Flow equalization enhances the settling of biologically active substances inside the Clarification Chamber. Wastewater has now been converted into clarified liquids in this chamber.

Flow Equalization Ports
They control the flow through all upstream and downstream processes and they regulate the amount of treated effluent that can enter the Bio-Kinetic System.

Bio-Kinetic® System
Constructed entirely of plastic and rubber components that are impervious to this environment, our Bio-Kinetic System combines filtration, settling, non-mechanical flow equalization, optional disinfection, adjustable outlet weir and optional dechlorination features into a single, revolutionary package.

Precast Concrete Tank
Every Singulair System is constructed of high quality, non-corrosive materials under our rigid quality control standards. The tank, access risers and cover are reinforced precast concrete manufactured locally by your factory-trained, licensed Norweco distributor.

Inspection Cover
Access is safe and easy.

Outlet
Only a clear, safe and odorless liquid exits the system here for return to your environment.

SERVICE PRO® Control Center

EVERY SINGULAIR AERATOR IS INSTALLED WITH A SOLID STATE ELECTRICAL CONTROL CENTER. EACH IS EQUIPPED WITH RESETTABLE CURRENT SENSOR, ON/OFF SELECTOR SWITCH, RED WARNING LIGHT, TIME CLOCK, AUDIBLE ALARM, AUXILIARY INPUTS AND FCC LICENSED AUTODIALER FOR REMOTE MONITORING OF INDIVIDUAL COMPONENTS.

Progress Through Service Since 1906. Ultimately, our success over all these years boils down to perceived, appreciated and consistently delivered quality service to our customers.

customer focus

Consider the facts:

- The Singulair Bio-Kinetic System meets or exceeds government standards. The Singulair System is performance certified and listed by NSF International. The Singulair is certified to NSF Standard 40 and our Bio-Kinetic System is certified to NSF Standard 46. Underwriters Laboratories and the Canadian Standards Association have recognized, certified and/or listed all electromechanical components. The auto dialer telemetry system is licensed by the Federal Communications Commission.
- The Bio-Kinetic System includes 3 positive filtration zones with 8 independent settling zones.
- 48-hour retention in the Singulair System reduces pumping frequency as compared to smaller capacity systems.
- Operating costs are low. The only electrical component is our low RPM aerator.
- Excessive hydraulic flows can cause major problems for septic tanks, sand filters and any treatment method that does not provide flow equalization. The exclusive non-mechanical flow equalization feature of our Bio-Kinetic System guarantees that all incoming wastewater is fully treated, regardless of heavy use periods.
- You can install an efficient Singulair plant for about the same cost as an old-fashioned septic tank.
- Eliminates odors and all unsightly, unsanitary conditions so common with septic tanks.
- Durable, reliable components are safely installed out-of-sight below grade. No exposed power cords, compressors, filters or air lines accessible to children or pets.
- No need to purchase a separate tank – our precast concrete pretreatment chamber is part of the Singulair System.
- The Singulair System automatically equalizes influent and effluent flow through all treatment and disposal stages. Flow variations from guests, parties or vacations do not effect treatment performance.
- All flow is equalized an average of 50% at the NSF Standard 40 600 GPD (gallons per day) design loading pattern.
- Your local, factory-trained, certified and licensed Norweco distributor sells, installs and services your Bio-Kinetic System with pride. You'll find your distributor's name and contact info conveniently posted on the system's control center.

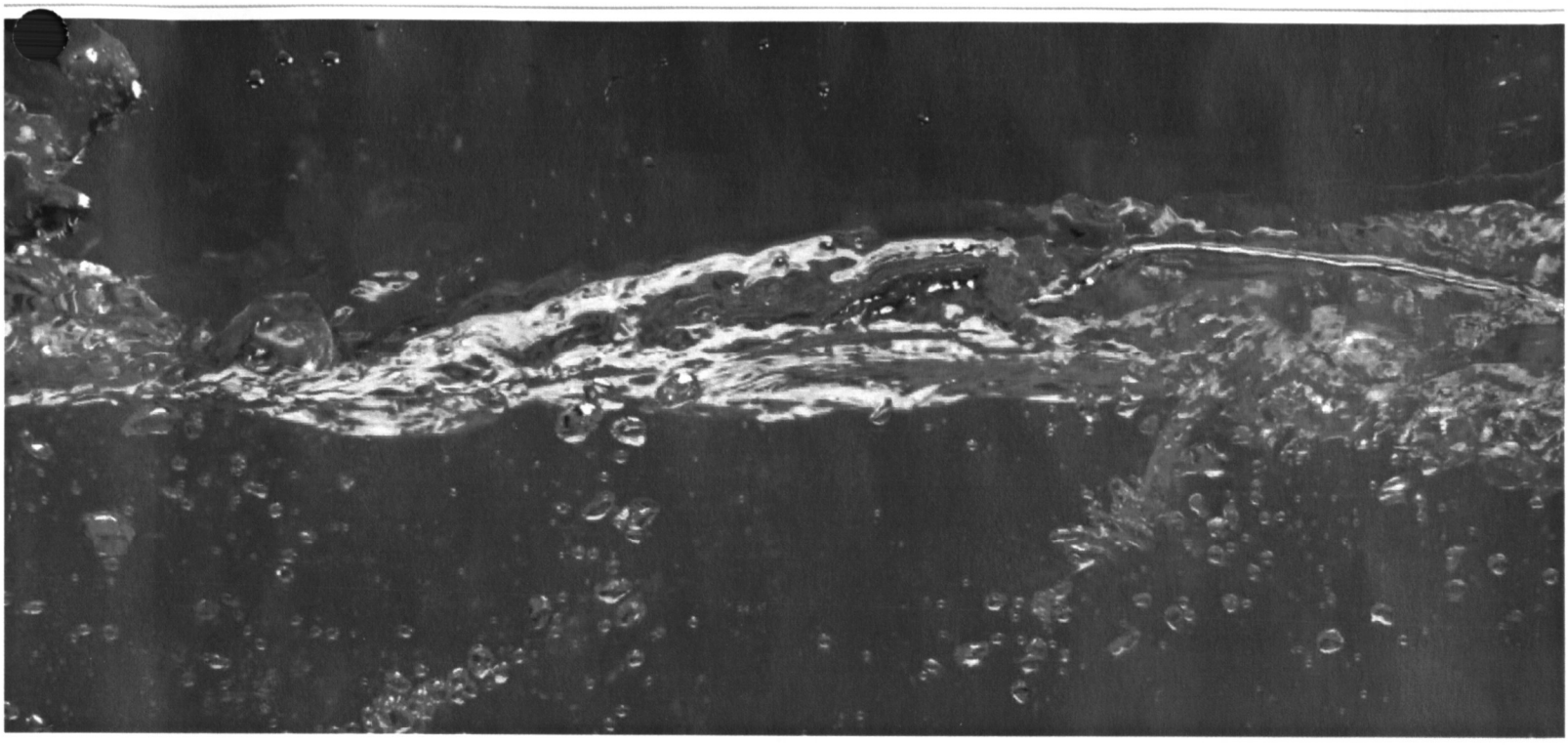
Optional Blue Crystal® Residential Disinfecting Tablets

OUR PURE CALCIUM HYPOCHLORITE TABLETS ARE SPECIALLY FORMULATED FOR USE IN THE SINGULAIR SYSTEM FOR EFFICIENT, RELIABLE DISINFECTION. EACH BLUE CRYSTAL TABLET CONTAINS AT LEAST 70% AVAILABLE CHLORINE. PACKAGED IN RE-SEALABLE CONTAINERS, OUR TABLETS ARE AVAILABLE FROM YOUR LOCAL NORWECO DISTRIBUTOR IN 10 AND 100 POUND POLYETHYLENE PAILS.

Optional Bio-Neutralizer® Dechlorination Tablets

RELIABLY, SAFELY AND ECONOMICALLY REDUCE RESIDUAL CHLORINE AND PROTECT ENVIRONMENTALLY SENSITIVE SURFACE WATER WITH OUR SPECIALLY FORMULATED TABLETS. PACKAGED IN EASY TO HANDLE, RE-SEALABLE CONTAINERS, OUR BIO-NEUTRALIZER DECHLORINATION TABLETS ARE AVAILABLE IN 25 AND 45 POUND POLYETHYLENE PAILS FROM YOUR LOCAL NORWECO DISTRIBUTOR.

Today's Answer for the Protection of Tomorrow's Environment



comprehensive protection, guaranteed

Singulair is warranted against defects in material and workmanship under normal use and service by a comprehensive 50 year Warranty and Exchange Program. This 2 year Limited Warranty and 48 year Exchange provides single source protection and covers all system components. Complete Warranty and Exchange information, a Warranty Registration Card and Owner's Manual are included with purchase.

The Singulair Bio-Kinetic System components have been listed, licensed and/or certified by each of the following agencies/organizations.

norweco®

Engineering the future of water and wastewater treatment

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WASTEWATER TECHNOLOGY

Report on Evaluation of
Norweco Inc.
Singulair® Model 960
Wastewater Treatment System

under the provisions of
NSF Standard 40
on Individual Aerobic
Wastewater Treatment Plants

NSF *International*
3475 Plymouth Road
PO Box 130140
Ann Arbor, Michigan 48113-0140 USA

Report on the Performance Evaluation of the Norweco Singulair® Model 960 Wastewater Treatment System

Under the provisions of ANSI/NSF Standard 40 Relating to Individual Aerobic Wastewater Treatment Plants

April 1996

EXECUTIVE SUMMARY

Testing of the Singulair® Model 960 Wastewater Treatment System was conducted under the provisions of ANSI/NSF Standard 40 for Individual Aerobic Wastewater Treatment Plants (July 1990 revision). ANSI/NSF Standard 40 was developed by the NSF Joint Committee on Wastewater Technology.

The performance evaluation was conducted at the NSF Wastewater Technology Test Facility in Chelsea, Michigan, using wastewater diverted from the Chelsea municipal wastewater collection system. The evaluation consisted of seven months of testing, during which a seven and a half week stress test was conducted. The evaluation consisted of three weeks of dosing without sampling to allow for plant start-up, sixteen weeks of dosing at design flow, seven weeks of stress test and three weeks of dosing at design flow. Sampling started in the early summer and continued through the fall and into winter, covering a full range of operating temperatures.

Standard 40, in Section H. (3) of Appendix A, provides for exclusion of up to ten percent of the effluent sample days, not to exceed one during stress testing, in completing the pass/fail determination. No sample days were excluded in the pass/fail determination for this evaluation.

Over the course of the evaluation, the average effluent BOD_5 was 6 mg/L, ranging between <5 and 18 mg/L, and the average effluent suspended solids was 10 mg/L, ranging between <5 and 37 mg/L. The effluent pH ranged from 7.7 to 8.2.

The Singulair® Model 960 produced an effluent that successfully met the performance requirements established by ANSI/NSF Standard 40 for Class I effluent:

> The maximum arithmetic mean of seven consecutive sample days was 10 mg/L for BOD_5 and 19 mg/L for suspended solids, both well below the allowed maximum of 45 mg/L. The maximum arithmetic mean of 30 consecutive sample days was 8 mg/L for BOD_5 and 13 mg/L for suspended solids, both well below the allowed maximum of 30 mg/L. Average removal rates for 30 consecutive sample days ranged from 95 to 97 percent for BOD_5 and from 94 to 98 percent for suspended solids, consistently above the requirement of 85 percent.

The effluent pH during the entire evaluation ranged between 7.7 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 individual aerobic wastewater treatment plants is achieved within the provisions of ANSI/NSF Standard 40: Individual Aerobic Wastewater Treatment Plants (revised July 1990), 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 satisfy the requirements of meeting EPA Secondary Treatment Guidelines[1] for five day biochemical oxygen demand, 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 an individual aerobic wastewater treatment plant 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 ANSI/NSF Standard 40 (revised July 1990) that the Singulair® Model 960 Wastewater Treatment System manufactured by Norweco, Inc., has fulfilled the requirements of ANSI/NSF Standard 40. The Norweco Singulair® Model 960 has therefore been authorized to bear the NSF Mark so long as Norweco 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 of NSF *International*, located in Chelsea, Michigan. The raw waste utilized in the test was diverted comminuted municipal waste. The characteristics of the waste 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 plants 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 Certification

Thomas Stevens
Manager
Engineering and Research Services

TABLE OF CONTENTS

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1.0 PROCESS DESCRIPTION

The Norweco Singulair® Model 960 wastewater treatment system utilizes patented, extended aeration, activated sludge and filtration 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.[2]

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 facultative bacteria in the aerobic state. 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. The Norweco Singulair® Model 960 wastewater treatment system incorporates a timed aeration cycle, and provides the proper environment for the development of facultative bacteria.

2.0 PERFORMANCE EVALUATION

2.1 Description of Plant Evaluated

The Singulair® Model 960 System tested in this evaluation has a rated capacity of 500 gallons per day (gpd). Specifications and drawings are included in Appendix A. The system achieves treatment by a flow equalized, flow through process, starting with a pretreatment chamber, followed by an aeration chamber provided with an infused air system operating on a timed run cycle. Settling is accomplished in a clarification chamber following the aeration chamber. A Bio-Kinetic® System located in the clarification chamber provides flow equalization, optional chlorination, final filtration, settling and optional dechlorination prior to effluent discharge.

The Singulair® Model 960 System is made up of four treatment stages. Incoming wastewater flows into the pretreatment chamber for removal of easily separated solids. Anaerobic bacteria break down the solids and begin to solubilize organic particles. A baffle at the outlet of the chamber provides for retention of floating solids in the chamber. Wastewater is transferred from the pretreatment chamber by hydraulic displacement into the aeration chamber through a cast-in-place transfer tee.

The aeration chamber provides a retention time of at least 24 hours. Aeration is achieved by release of air through a rapidly spinning aspirator submerged in the aeration chamber. The spinning of the aspirator in the wastewater draws air down the aspirator shaft, releasing small bubbles that cause the wastewater to rise in the chamber, establishing a circulation pattern. The infused air provides oxygen for the aerobic bacteria, as well as mixing of the wastewater with the bacteria.

The aerator run cycle is controlled by the use of a time clock. Its design does not permit the aerator to be "off" more than thirty minutes per hour. While the time clock is adjustable, any adjustment automatically results in additional run time. The seven month test was performed at full design load (500 gpd), with the aerator running only thirty minutes per hour.

From the aeration chamber, the wastewater passes by hydraulic displacement into the clarification chamber through a cast-in-place transfer port located at the bottom of the wall between the aeration chamber and the clarification chamber. Initial separation of solids takes place in the clarification chamber. The quiescent design of the clarification chamber allows gravity settling of the solids and sludge. Three of the four side walls in the clarifier are sloped to form a hopper. These 60° sloped walls direct material down to the transfer opening. A stationary sludge return device, located in the clarifier, utilizes hydraulic currents to return settled activated sludge from the bottom of the clarifier back to the aeration chamber.

A Bio-Kinetic® System, connected to an outlet coupling cast into the concrete tank, provides the final treatment stage. The Bio-Kinetic® System is located in the center of the clarification chamber and extends down into the chamber. The outlet coupling allows for installation and service of the System from ground level. The System is made up of three filtration zones, seven settling zones and three pairs of flow equalization ports. Wastewater from the aeration chamber flows up through the clarification chamber to the Bio-Kinetic® System where it passes through the design flow filter mesh that extends around the baffled perimeter settling zone. The design flow filter mesh provides for initial filtration and entrapment of solids. Peak flow filter mesh is located above the design flow mesh. Flow control through the System is provided by two design flow equalization ports and two sustained flow equalization ports. The ports become submerged orifices as the water level in the chamber rises, equalizing the flow rate through the entire plant. Extreme hydraulic flows are handled through a pair of peak flow equalization ports, which act to return the plant to normal operating levels. All flow passing through the flow equalization ports drops to a deck that directs flow through an optional chlorine tablet feeder and vertically downward to the unbaffled perimeter settling zone. From this area, flow is displaced to the contact basin and then onto the baffled chamber plates. A continuous baffle on each of 37 plates acts as a kinetic filtration weir with a 1/16 inch opening provided between plates. A larger open area immediately downstream of the baffle provides for settling and storage of solids. The clarified water then passes to an effluent stilling well, final settling zone, adjustable outlet weir, optional dechlorination tablet feeder and discharge zone.

2.2 Test Protocol

The ANSI/NSF Standard 40 Performance Evaluation method and requirements are included in Appendix B. Start up of the plant is accomplished by filling one-third of the 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) for three weeks. Doses were made 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 three week start up period, the plant is subjected to the following loading sequence:

Design loading	-	16 weeks
Stress loading	-	7 weeks
Design loading	-	3 weeks

During the design loading periods, 24-hour composite samples are collected of the influent and effluent five times per week. The samples are analyzed for BOD_5, suspended solids and volatile suspended solids. On-site determinations of the effluent temperature, pH and dissolved oxygen are also made five times per week. In plant measurements of aeration chamber temperature, pH, dissolved oxygen and suspended 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 system failure. The test sequence includes (1) Wash Day stress, (2) Working Parent stress, (3) Power Failure stress, and (4) Vacation stress. Detailed descriptions of the stress sequences are shown in Appendix B.

During the stress test sequences, 24 hour composite samples are collected before and for seven days 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. Additional samples are collected during the Wash Day and Working Parent stresses for informational purposes only and are not included in the pass/fail calculations. These samples include two samples collected during the Wash Day stress, two during the Working Parent Stress, one sample collected immediately after the power is renewed to the plant during the Power Failure stress and one collected with the start of dosing in the Vacation 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[1]:

> BOD_5 and Suspended Solids: (a) the arithmetic mean of all effluent samples collected in a period of 30 consecutive sample days must be $\leq$ 30 mg/L, with $\geq$ 85 percent removal; and (b) the arithmetic mean of all effluent samples collected in a 7 consecutive sample day period must be $\leq$ 45 mg/L.
>
> pH: 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. In determining if the plant meets the effluent requirements, ten percent of the samples during the testing, not to exceed one sample during stress testing, may be excluded from the pass/fail determination. A minimum of 118 sample days, 23 during the stress test sequence, must be collected and analyzed for the test to be valid.

2.3 Test Chronology

The system was installed under the direction of the manufacturer on May 17, 1995. Dosing, at the rate of 500 gpd, was started on May 22, 1995. After three weeks of start up, sampling was started on June 12, 1995. The stress test sequence was started on October 2, 1995, and ended on November 22, 1995. The testing was completed on December 18, 1995, although sampling continued through January 9, 1996. No maintenance or mechanical adjustment was performed during the test.

3.0 ANALYTICAL RESULTS

3.1 Summary

Chemical analysis of samples collected during the evaluation were completed using the procedures in *Standard Methods for the Examination of Water and Wastewater*[3], or U.S. Environmental Protection Agency procedures[4]. 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.

Guidelines for evaluating the analytical results from the testing are described in Section 5.1 and Section H of Appendix A in ANSI/NSF Standard 40. In completing the pass/fail determination on the data generated from the testing, ten percent (a total of twelve) of the samples collected during testing (not to exceed one sample during stress testing) can be excluded from the pass/fail calculations. Samples collected for informational purposes during the stress test sequence are not included in the pass/fail determinations. During testing of the Norweco Model 960 System, no sample days were excluded from the pass/fail determination.

Section 2.9 and Section E of Appendix A of the Standard define influent wastewater characteristics as they apply to testing under the Standard. Typical domestic wastewater is defined as having a BOD_5 concentration between 100 and 300 mg/L and a suspended solids concentration between 100 and 350 mg/L. By the Program Specific Policies for *Wastewater Treatment Devices and Related Products and Components* (dated January 1, 1991):

> When the influent Biochemical Oxygen Demand and/or Suspended Solids fall outside the ranges specified in Section 2.9 of Standard 40, the effluent samples for the two calendar days immediately following the occurrence may be excluded in the 7 and 30 sample averages.

The Policy does not require exclusion of data following a day with influent concentrations outside the defined ranges, but allows for discard should the influent strength have an apparent impact on plant performance. There were eight sample days when the influent strength fell outside the specified range, but none were determined to have an impact on plant performance.

3.2 Biochemical oxygen demand

The carbonaceous five day biochemical oxygen demand (BOD_5) analyses were completed using the EPA Method 405.1. The results of the analyses completed on the samples collected during the testing, except those collected for informational purposes, are shown in Figure 1.

Influent BOD_5:

The influent BOD_5 ranged from 120 to 360 mg/L during the evaluation, with an average concentration of 184 mg/L and a median concentration of 180 mg/L.

TABLE I. SUMMARY OF ANALYTICAL RESULTS

	Average	Std. Dev.	Minimum	Maximum	Median	Interquartile Range
BOD_5 (mg/L)						
Influent	184	35	120	360	180	160-200
Effluent	6	2	<5	18	5	<5-7
Suspended Solids (mg/L)						
Influent	238	57	150	450	225	200-270
Aeration Chamber	659	269	250	1,300	605	440-890
Effluent	10	6	<5	37	8	6-14
Volatile Suspended Solids (mg/L)						
Influent	204	47	120	370	200	170-220
Aeration Chamber	532	204	200	990	490	360-700
Effluent	9	4	<5	30	7	5-12
pH						
Influent	-	-	7.4	7.9	7.7	7.5-7.8
Aeration Chamber	-	-	7.4	7.8	7.7	7.6-7.7
Effluent	-	-	7.7	8.2	7.9	7.9-8.0
Temperature (°C)						
Influent	18	2	13	21	19	17-20
Aeration Chamber	19	4	10	23	20	17-22
Effluent	19	4	10	23	20	17-22
Dissolved Oxygen (mg/L)						
Aeration Chamber	5.6	1.5	2.8	9.0	5.4	4.4-6.6
Effluent	2.1	0.8	1.0	4.7	1.9	1.4-2.4

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.

Effluent BOD_5:

The effluent BOD_5 concentrations ranged from <5 to 18 mg/L over the course of the evaluation, with an average concentration of 6 mg/L. The median effluent BOD_5 concentration was 5 mg/L.

Standard 40 requires that over the course of the evaluation, the effluent BOD_5 not exceed 45 mg/L on a 7-day average and 30 mg/L on a 30-day average, and represent a reduction of not less than 85 percent of the 30-day average influent. The averages refer to seven and thirty consecutive sample averages, and not consecutive days. A plot of the 7 and 30-day average concentrations and 30-day average percent removal, is shown in Figure 2.

Figure 1. Biochemical Oxygen Demand

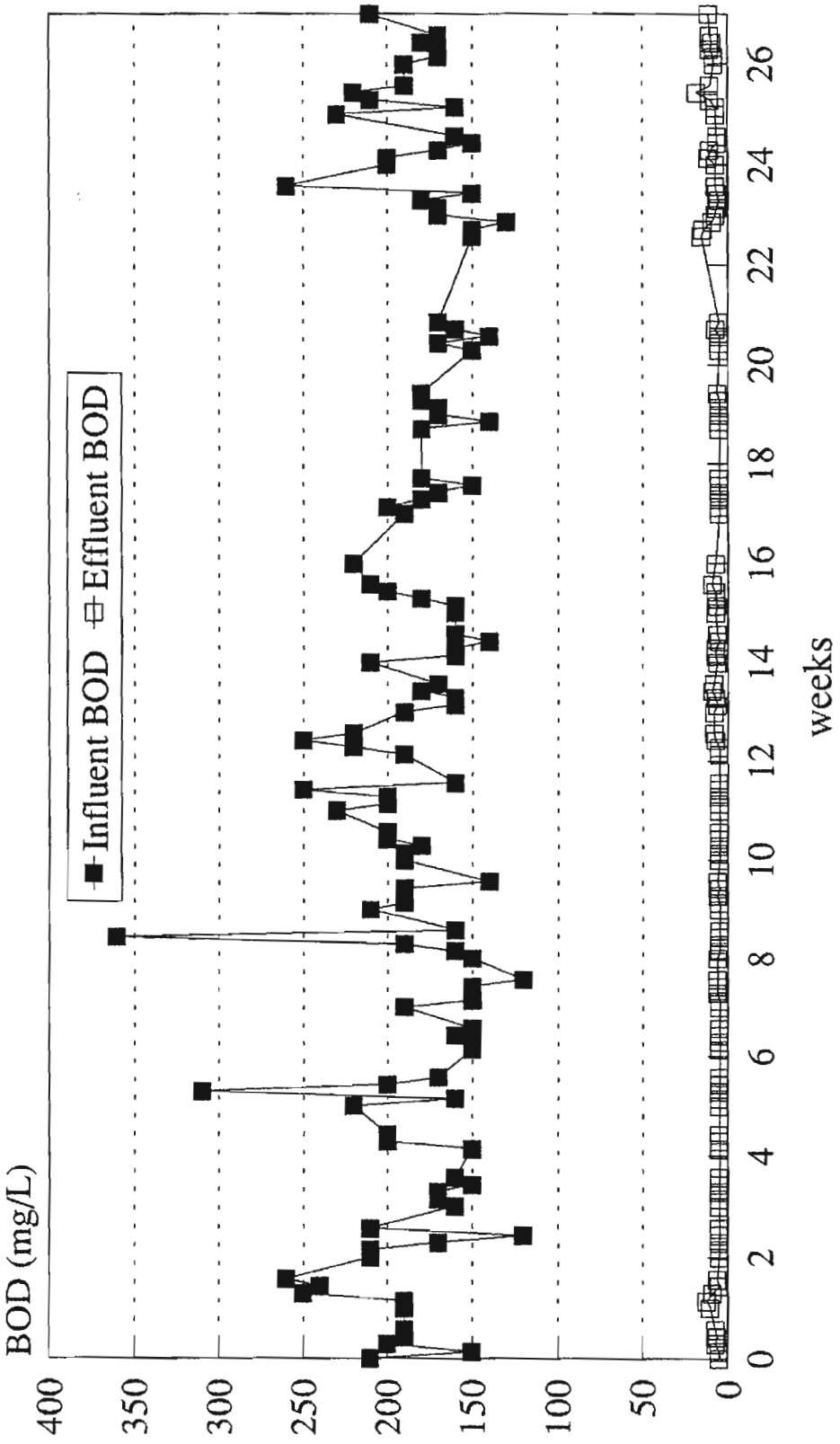
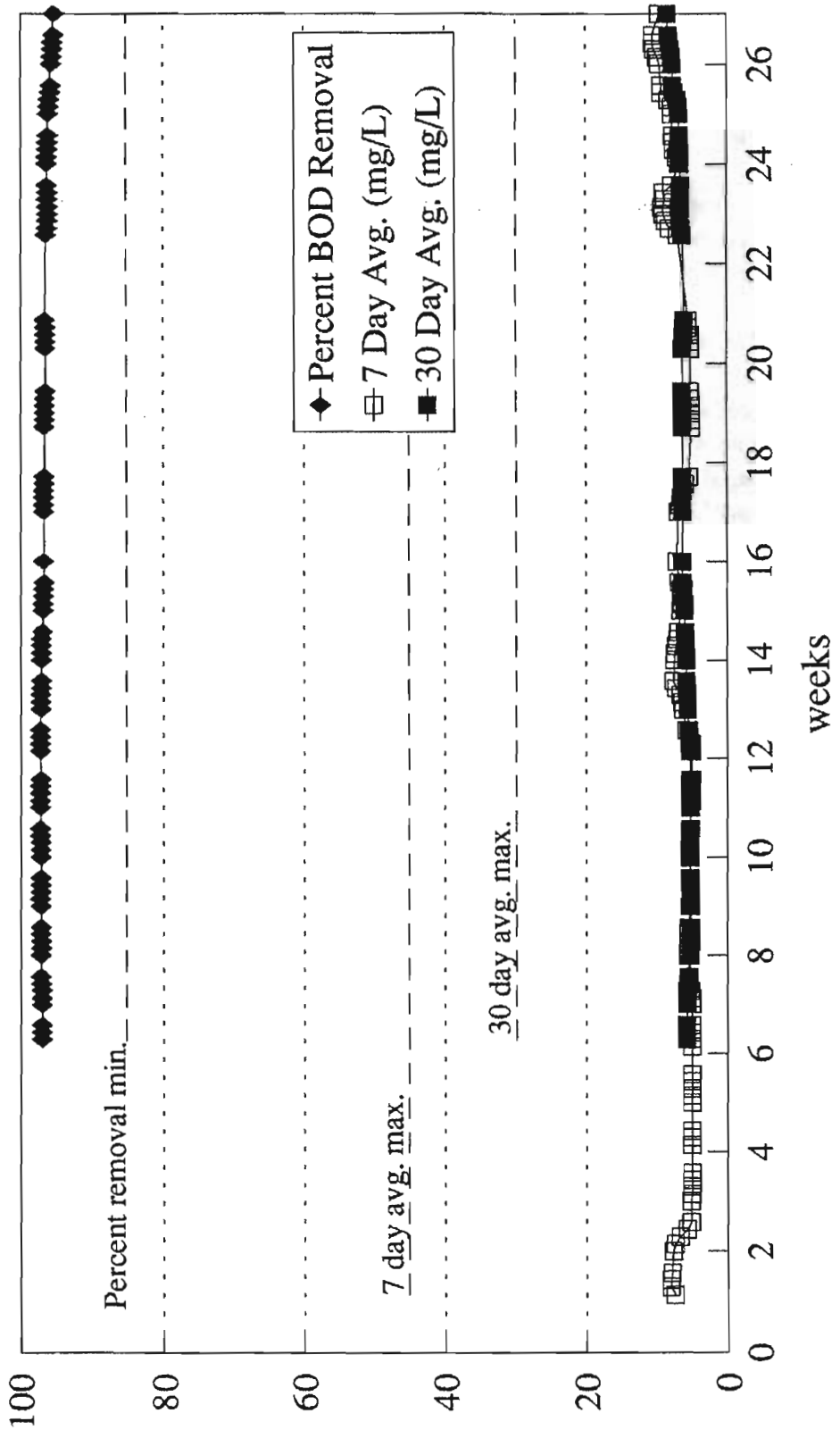


Figure 2. Effluent BOD Averages and Percent BOD Removal



The 7-day average for effluent BOD_5 ranged from 5 to 10 mg/L, the 30-day averages ranged from 5 to 8 mg/L and the percent removal ranged from 95 to 97 percent. As shown in Figure 2, the Norweco Model 960 System met the requirements of Standard 40 for effluent BOD_5.

3.3 Suspended solids

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 3. The data from both analyses are summarized in Table I.

Influent suspended solids:

The influent suspended solids ranged from 150 to 450 mg/L during the evaluation, with an average concentration of 238 mg/L. The median influent suspended solids concentration during the evaluation was 225 mg/L. The influent volatile suspended solids ranged from 120 to 370 mg/L during the evaluation, with an average concentration of 204 mg/L and a median concentration of 200 mg/L.

Aeration chamber suspended solids:

The aeration chamber suspended solids ranged from 250 to 1,300 mg/L during the evaluation, with an average concentration of 659 mg/L. The aeration chamber volatile suspended solids ranged from 200 to 990 mg/L, with an average concentration of 532 mg/L. The median values for the aeration chamber were 605 mg/L suspended solids and 490 mg/L volatile suspended solids.

Effluent suspended solids:

The effluent suspended solids concentration ranged from <5 to 37 mg/L during the evaluation, with an average concentration of 10 mg/L and a median concentration of 8 mg/L.

Over the course of the evaluation, ANSI/NSF Standard 40 requires that the effluent suspended solids not exceed 45 mg/L on a 7-day average, 30 mg/L on a 30-day average and that the plant achieve not less than 85 percent reduction of the 30-day average influent suspended solids concentration. A plot of the 7-day and 30-day averages, as well as the percent removal, is shown in Figure 4.

The 7-day average suspended solids ranged from 5 to 19 mg/L, the 30-day averages ranged from 6 to 13 mg/L and the percent reduction ranged from 94 to 98 percent. As shown in Figure 4, the Norweco Model 960 System met the requirements of ANSI/NSF Standard 40 for effluent suspended solids.

3.4 pH

Over the entire evaluation period, the influent pH ranged from 7.4 to 7.9 (median of 7.7), while the aeration chamber pH ranged from 7.4 to 7.8 (median of 7.7). The effluent pH ranged from 7.7 to 8.2 during the evaluation (median of 7.9), within the 6 to 9 range required by ANSI/NSF Standard 40. The pH data for the evaluation are shown in Appendix C.

Figure 3. Suspended Solids

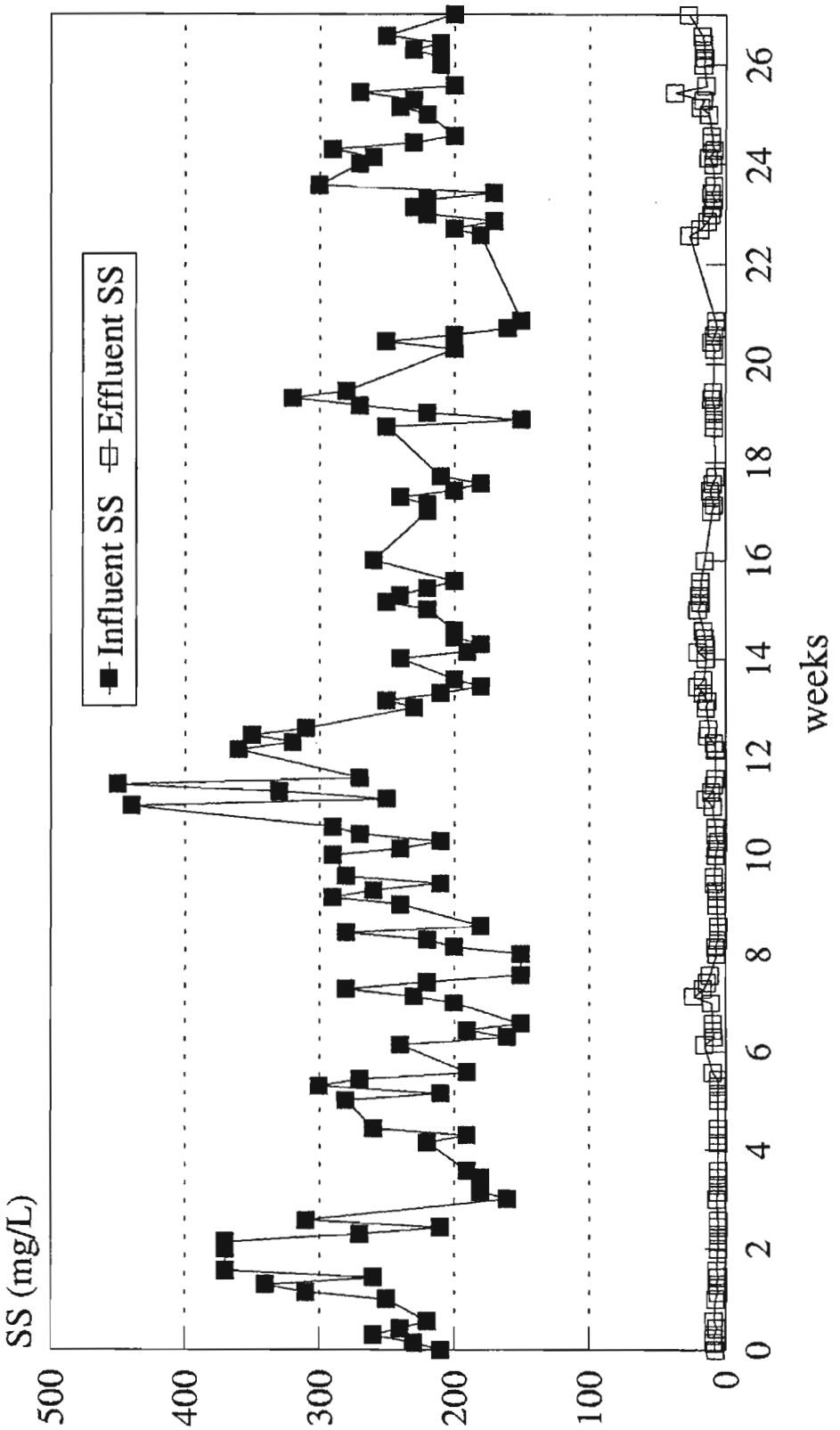
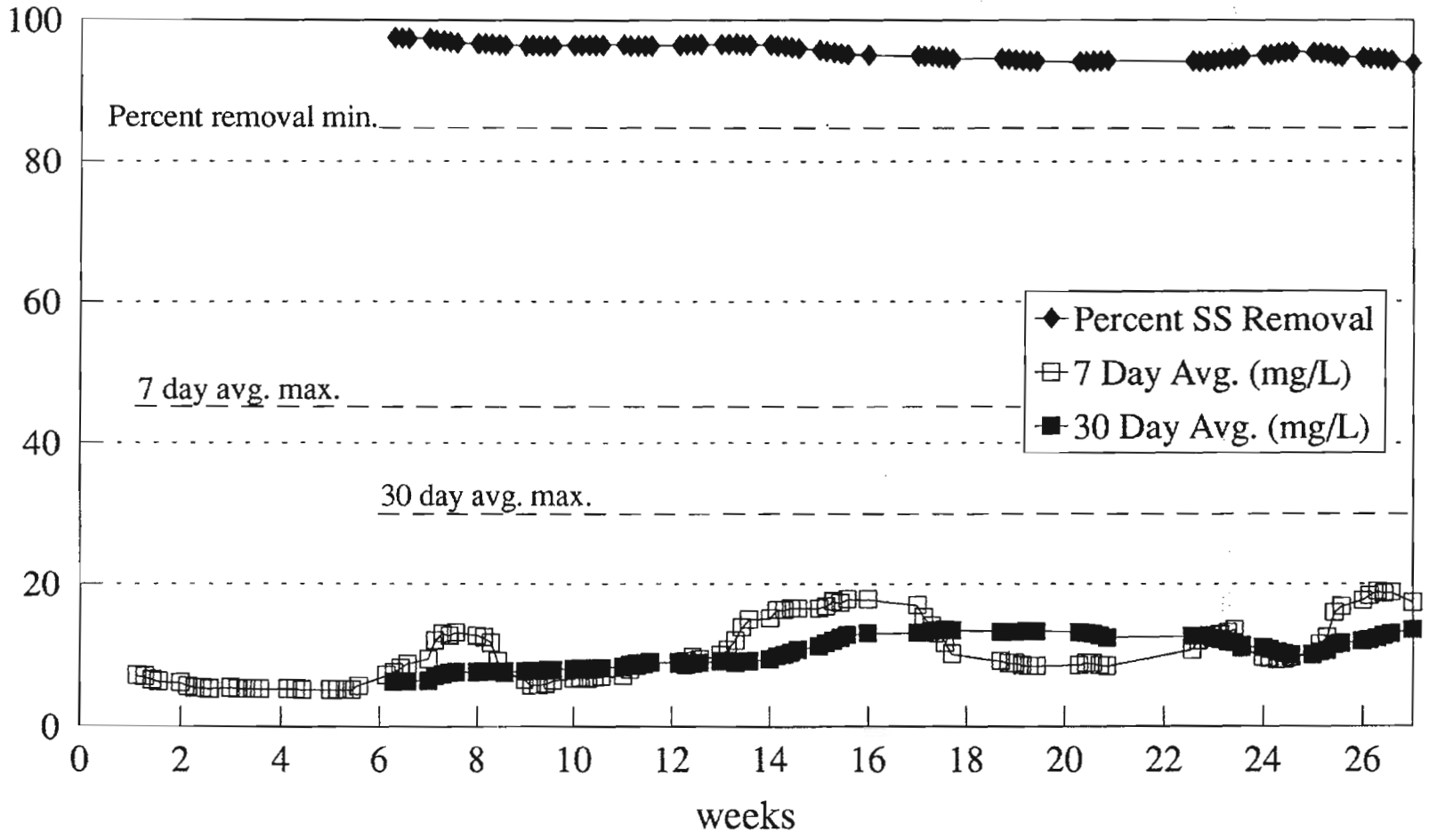


Figure 4. Effluent SS Averages and Percent SS Removal



3.5 Temperature

Influent temperatures over the evaluation period ranged from 13 to 21 °C (median of 19 °C). Effluent temperatures ranged between 10 and 23 °C (median of 20 °C). 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 2.8 and 9.0 mg/L (median of 5.4 mg/L), while the effluent DO ranged between 1.0 and 4.7 mg/L (median of 1.9 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 ANSI/NSF Standard 40.

4.0 REFERENCES

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

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

3. APHA, AWWA, WPCF, Standard Methods for the Examination of Water and Wastewater, 17th 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.

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APPENDIX A

PLANT SPECIFICATIONS

PLANT SPECIFICATIONS

Norweco Singulair® Model 960

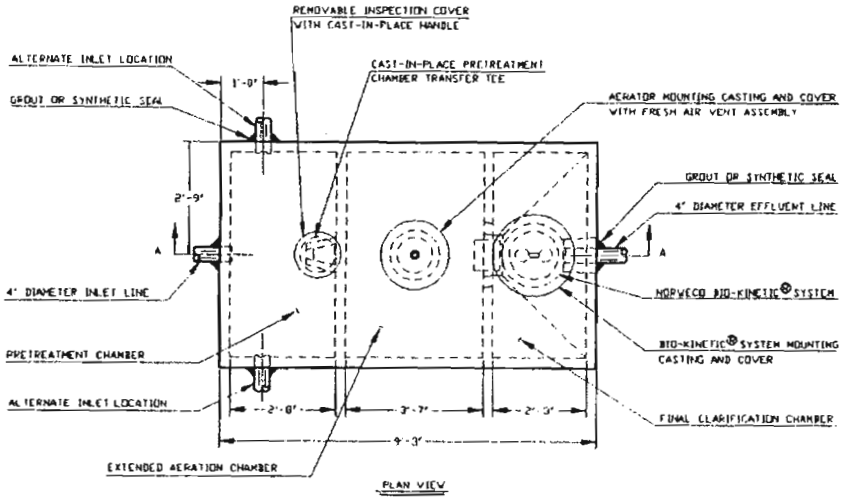
Plant Capacity

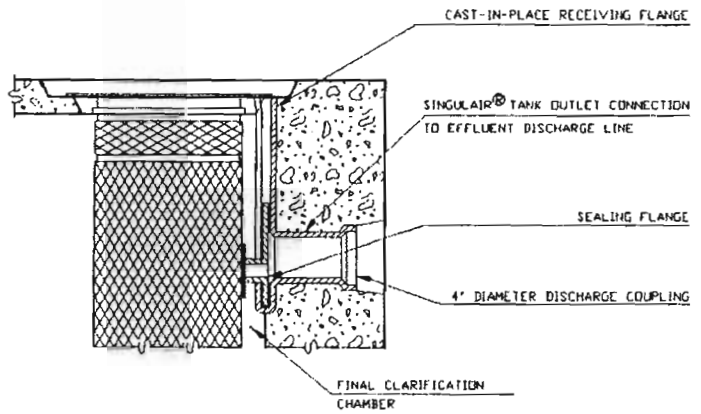
Design Flow	500 gpd
Plant Hydraulic Capacity	
Pretreatment Chamber	450 gallons
Aeration Chamber	600 gallons
Settling Chamber	250 gallons
Hydraulic Retention Time (at Design Flow)	
Pretreatment Chamber	21.6 hours*
Aeration Chamber	28.8 hours*
Settling Chamber	12.0 hours*
Total Hydraulic Retention Time	62.4 hours*

* Note: The flow equalization provided by the Bio-Kinetic® System results in an increased detention time for each chamber. The amount of flow control and exact increase in the detention time is dependent upon the specific daily flow pattern.

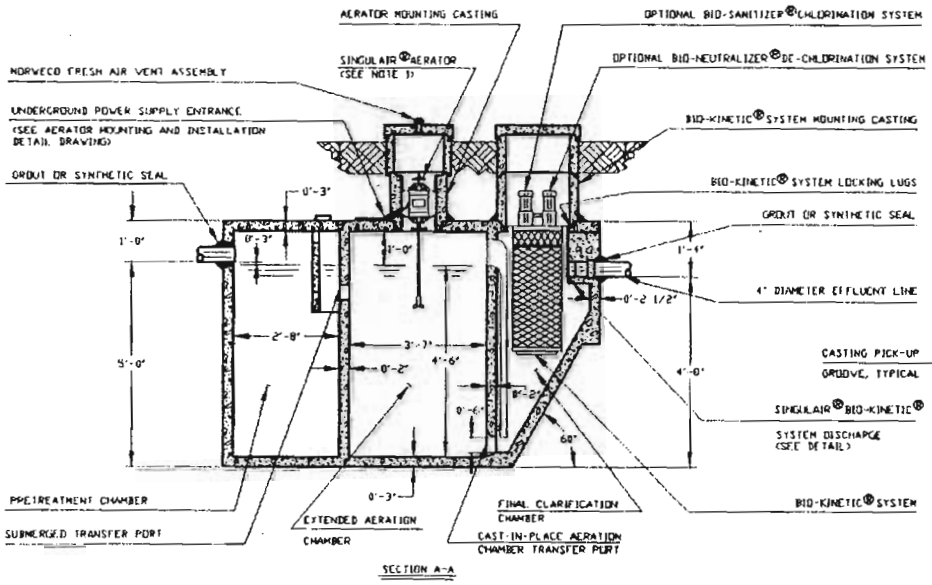
Aerators and Control Centers

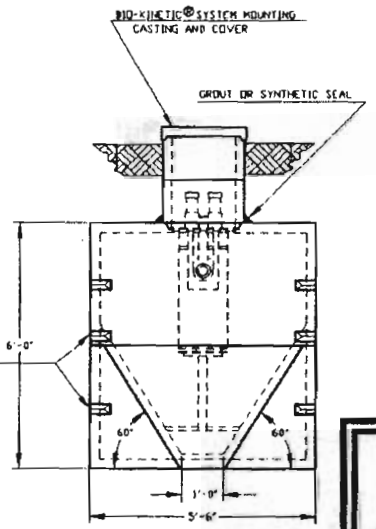
Model 95 Aerator	CSA Listed
Type	Floodproof
Motor	1/6 HP, 1725 RPM, 115V, 60Hz, 1 pH, 3.6 Full Load Amps,
Output	3 CFM
Model 95 Control Center	CSA Listed
Type	115v, 60 Hz, 1 phase with visual alarm and time clock. Run setting adjustable from 30 minutes per hour minimum, to continuous run.
Audible Alarm	Optional
Model 93 Aerator	CSA Listed
Type	Floodproof
Motor	1/6 HP, 3450 RPM, 115V, 60Hz, 1 Ph, 4.2 Full Load Amps,
Output	3 CFM
Model 93 Control Center	CSA Listed
Type	115v, 60 Hz, 1 phase with visual alarm and (optional) time clock. Run setting adjustable from 30 minutes per hour minimum, to continuous run.
Audible Alarm	Optional





BIO-KINETIC® SYSTEM DISCHARGE DETAIL





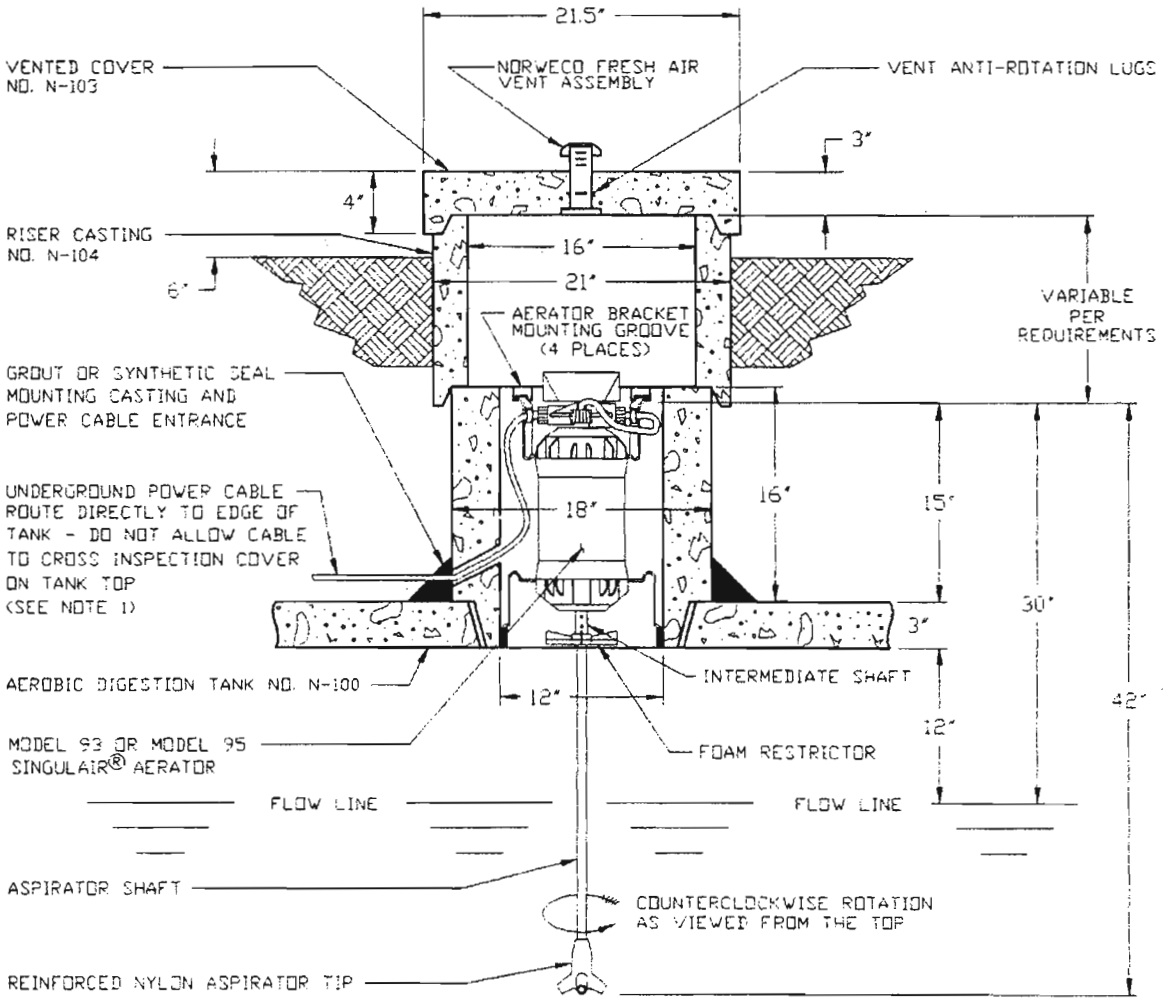
GENERAL NOTES

1. SINGULAIR® AERATOR MODEL 95, OR MODEL 93, AS TESTED AND ACCEPTED BY NSF.
2. FALL THROUGH SINGULAIR® PLANT FROM INLET INVERT TO OUTLET INVERT IS FOUR INCHES. INLET INVERT IS TWELVE INCHES BELOW TANK TOP.
3. ON DEEPER INSTALLATIONS, PRECAST RISERS MUST BE USED TO EXTEND AERATOR MOUNTING CASTING AND BIO-KINETIC® SYSTEM MOUNTING CASTING TO GRADE. INSPECTION COVER ON PRETREATMENT CHAMBER MUST BE DEVELOPED TO WITHIN TWELVE INCHES OF GRADE.
4. TANK REINFORCED PER ACI STD. 318-83.
5. REMOVABLE COVERS ON RISERS WEIGH IN EXCESS OF SEVENTY FIVE POUNDS EACH TO PREVENT UNAUTHORIZED ACCESS.
6. CONTACT THE LOCAL LICENSED SINGULAIR® DISTRIBUTOR FOR ELECTRICAL REQUIREMENTS.
7. TOTAL SYSTEM CAPACITY: 1300 GAL.

NORWECO
NORWALK WASTEWATER EQUIPMENT COMPANY
NORWALK, OHIO

SINGULAIR® BIO-KINETIC® WASTEWATER TREATMENT SYSTEM
MODEL 960-500 GPD

REVISION DATE	REVISION
1-25-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-9-96
SCALE	NTS
DRAWING NO.	PC-5-7006



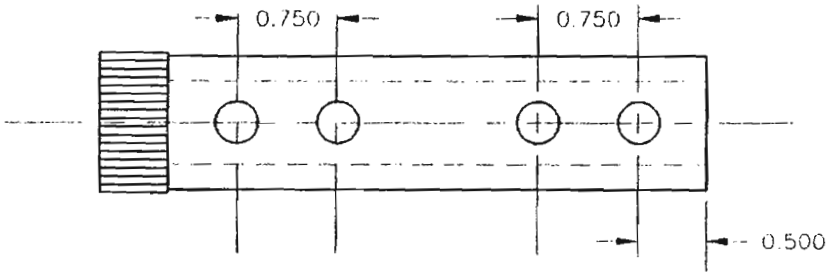
NOTES:

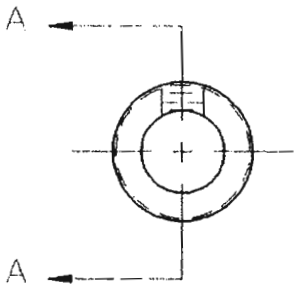
1. UNDERGROUND POWER SUPPLY MUST BE WIRED INTO APPROVED SINGULAIR® CONTROL CENTER.
2. SINGULAIR® CONTROL CENTER MUST BE WIRED INTO A SEPARATE 10 AMP CIRCUIT BREAKER AT MAIN ELECTRICAL SERVICE PANEL IN THE FACILITY.
3. AERATOR AND AERATOR CONTROL CENTER MUST BE PROPERLY GROUNDED.
4. THE LOCAL, LICENSED NORWECO DISTRIBUTOR WILL PLACE THE AERATOR INTO SERVICE WHEN THE FACILITY IS READY TO BE OCCUPIED.

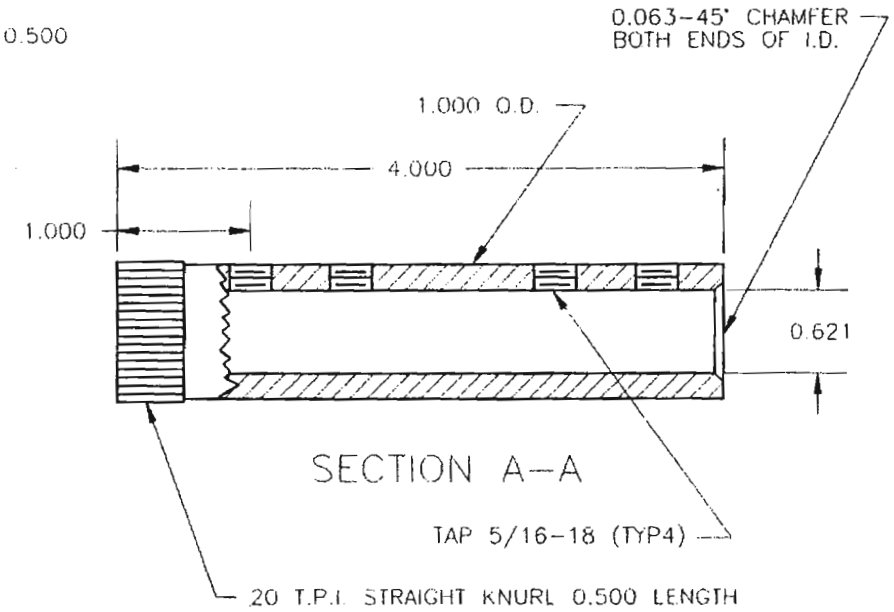
NORWECO
NORWALK WASTEWATER EQUIPMENT COMPANY
NORWALK, OHIO

MODEL 93 AND MODEL 95 SINGULAIR® AERATOR MOUNTING AND INSTALLATION DETAIL

REVISION DATE	REVISION
1-25-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-8-95
SCALE	NTS
DRAWING NO.	PC-5-7600





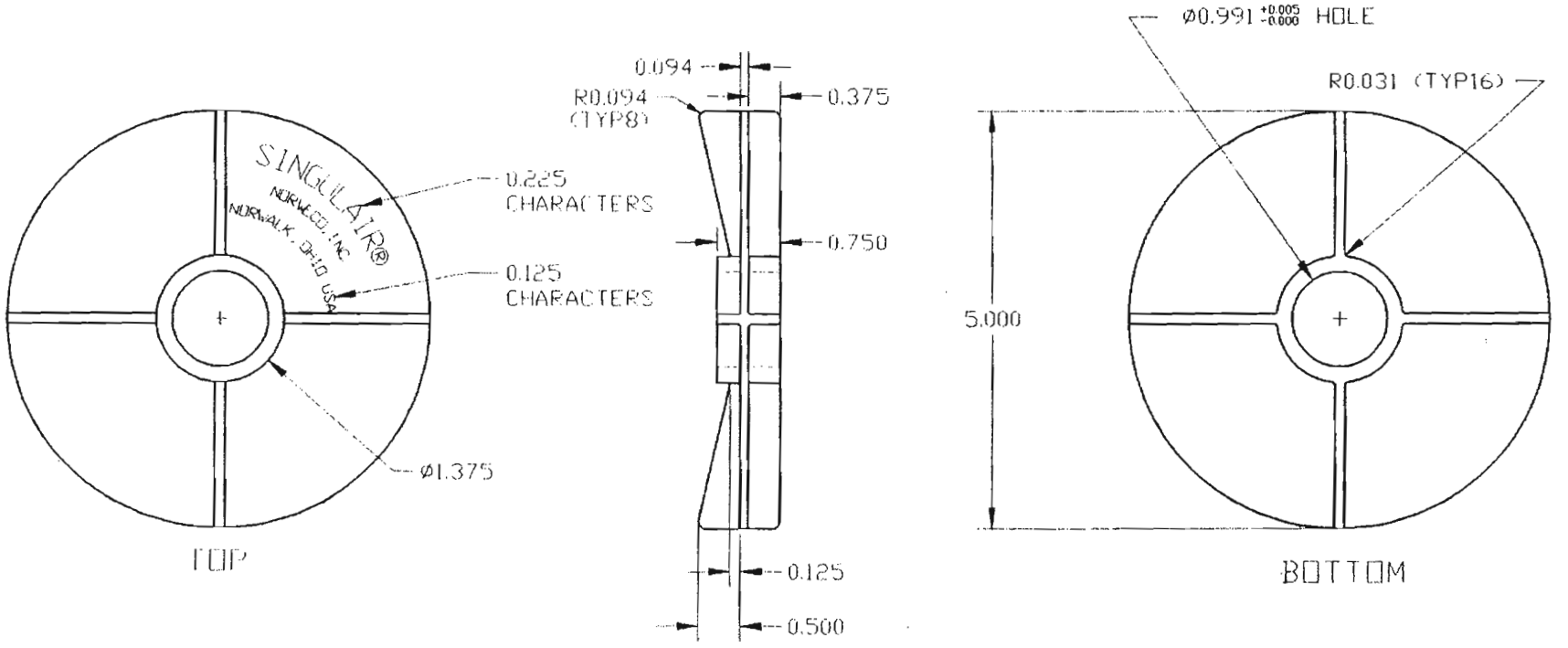


NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. MATERIAL: STAINLESS STEEL.
3. REMOVE BURRS; ENSURE NO SHARP EDGES.
4. TOLERANCES ARE SPECIFIED IN MANUFACTURING PROCEDURE.

NORWECO.
NORWALK WASTEWATER EQUIPMENT COMPANY

SINGULAIR®
MODEL 93 AND MODEL 95
INTERMEDIATE SHAFT

REVISION DATE	REVISION
1-25-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-8-95
SCALE	NTS
DRAWING NO.	PC-5-7506



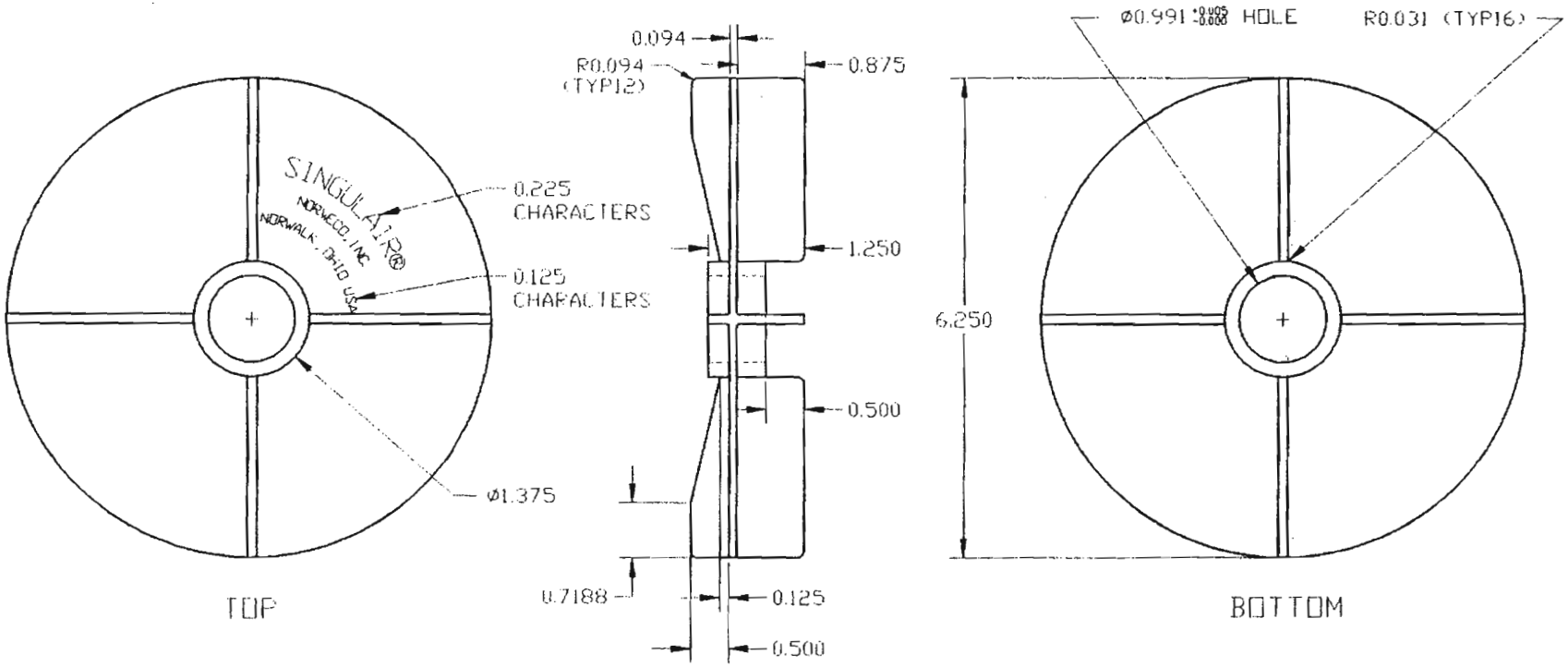
NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. BALANCE 0.010 IN-OZ MAXIMUM.
3. TOLERANCE: ±0.005.
4. COLOR MUST MATCH APPROVED SAMPLE
5. FACES MUST BE FLAT WITHIN 0.010 T.I.R.
6. BORE AND CIRCUMFERENCE MUST BE CONCENTRIC AND TRACK WITHIN 0.010 T.I.R.
7. MATERIAL: ABS 911.

NORWECO
NORWALK WASTEWATER EQUIPMENT COMPANY
NORWALK, OHIO

SINGULAIR®
MODEL 93
FOAM RESTRICTOR

REVISION DATE	REVISION
1-25-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-8-95
SCALE	NTS
DRAWING NO.	PC-5-7508



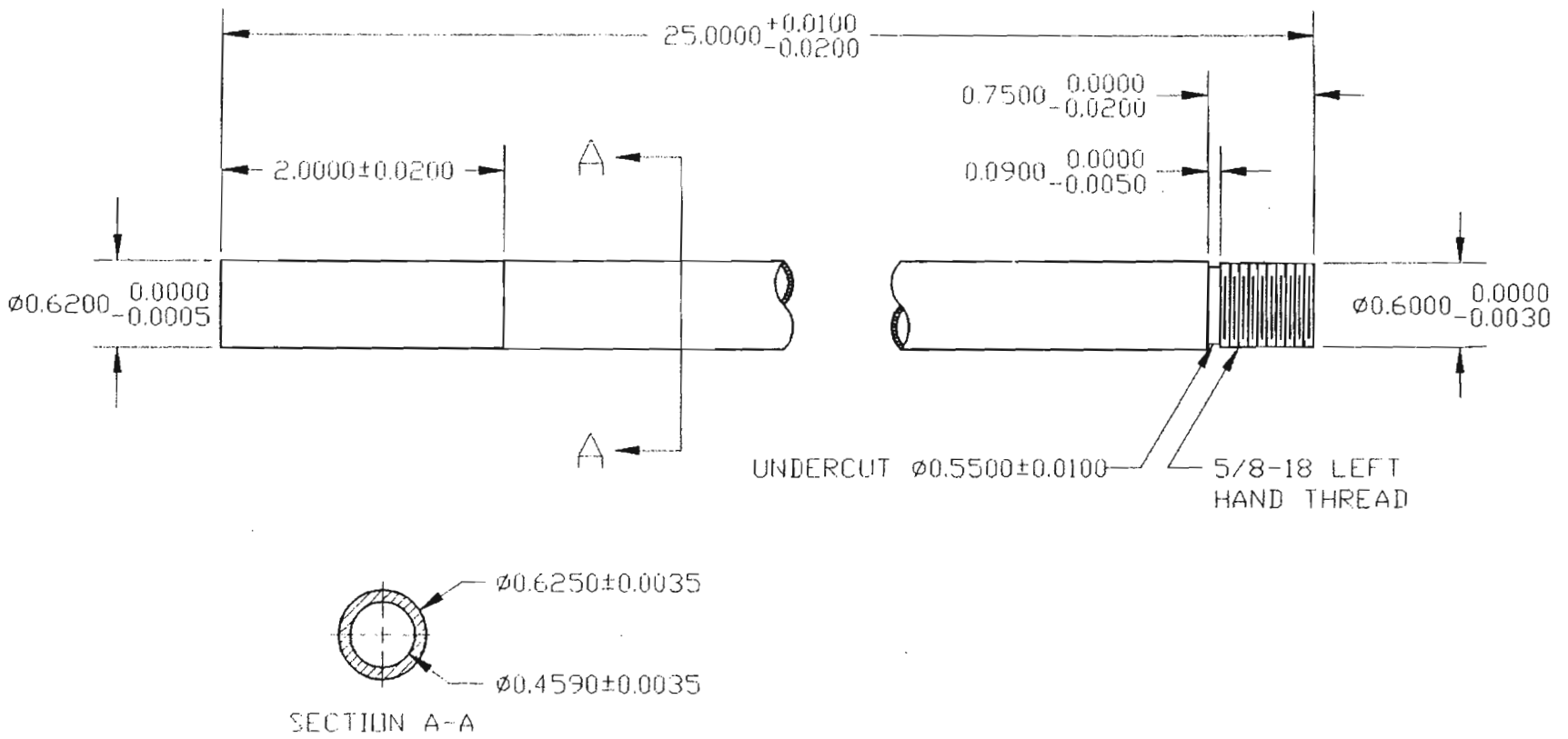
NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. BALANCE 0.010 IN-OZ MAXIMUM.
3. TOLERANCE: ±0.005.
4. COLOR MUST MATCH APPROVED SAMPLE.
5. FACES MUST BE FLAT WITHIN 0.010 T.I.R.
6. BORE AND CIRCUMFERENCE MUST BE CONCENTRIC AND TRACK WITHIN 0.010 T.I.R.
7. MATERIAL: ABS 911.

NORWECO.
NORWALK WASTEWATER EQUIPMENT COMPANY
NORWALK, OHIO

SINGULAIR®
MODEL 95
FOAM RESTRICTOR

REVISION DATE	REVISION
1-25-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-12-96
SCALE	NTS
DRAWING NO.	P[illegible] 5-7595



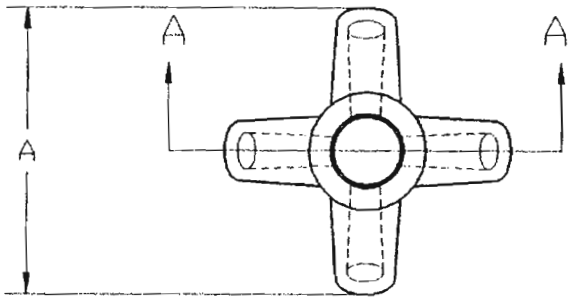
NOTES:

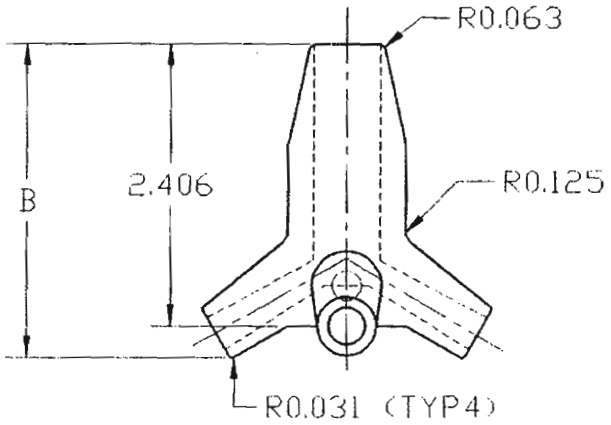
1. ALL DIMENSIONS ARE IN INCHES.
2. BREAK CORNERS, REMOVE BURRS; ENSURE NO SHARP EDGES.
3. MATERIAL: 304 STAINLESS STEEL, STRESS RELIEVED AND ROLL STRAIGHTENED.
4. SHAFT TO BE STRAIGHT FULL LENGTH WITHIN 0.0040.
5. ALL DIAMETERS ARE CONCENTRIC WITHIN 0.0005.
6. PLUNGE GRIND UNTHREADED END.
7. WALL THICKNESS: 0.0830.

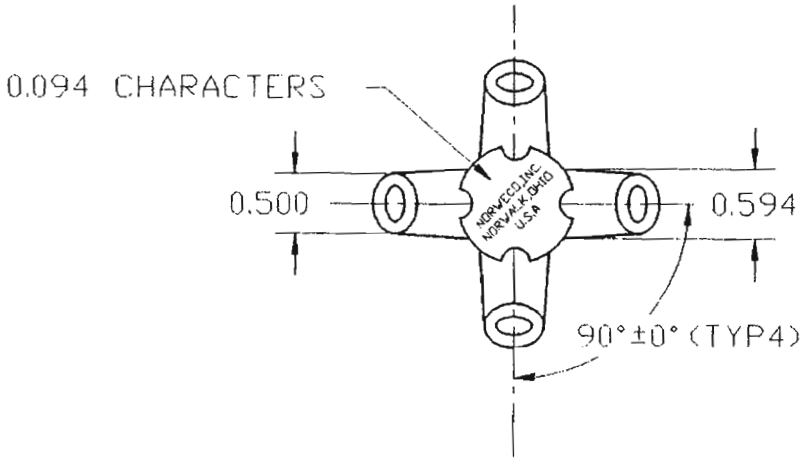
NORWECO.
NORWALK, OHIO

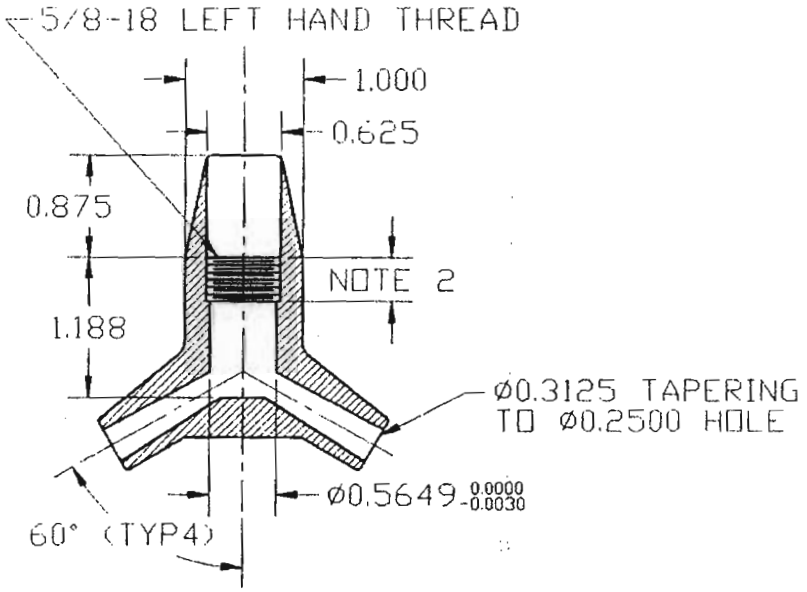
SINGULAIR®
MODEL 93 AND MODEL 95
ASPIRATOR SHAFT

REVISION DATE	REVISION
1-25-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-8-95
SCALE	NTS
DRAWING NO.	PC-5-7507









SECTION A-A

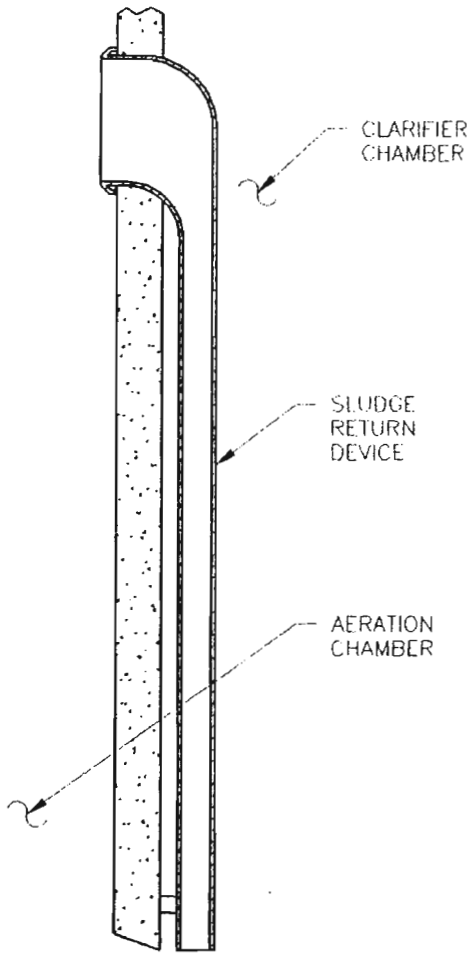
	A	B
MODEL 93	2.500	2.687
MODEL 95	4.139	3.193

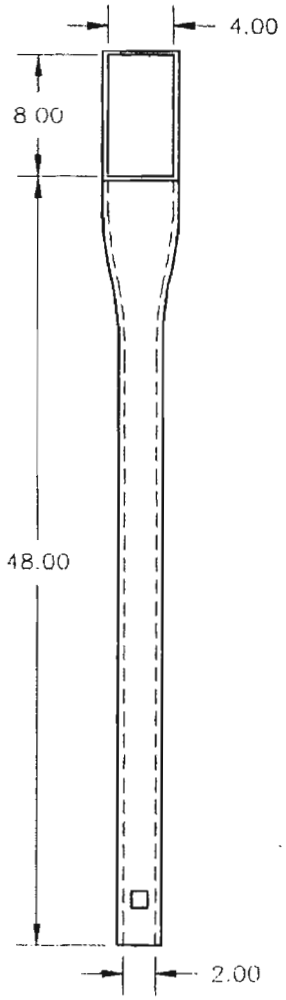
NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. DIMENSION DETERMINED BY LENGTH OF 4-6 FULL THREADS.
3. BALANCE 0.010 IN-OZ MAXIMUM.
4. TOLERANCE: ±0.005.
5. COLOR MUST MATCH APPROVED SAMPLE.
6. TIPS MUST BE EQUALLY AND ACCURATELY SPACED AND TRACK IN THE SAME PLANE WITHIN 0.010 T.I.R.
7. MATERIAL: GLASS-FILLED POLYPROPYLENE.

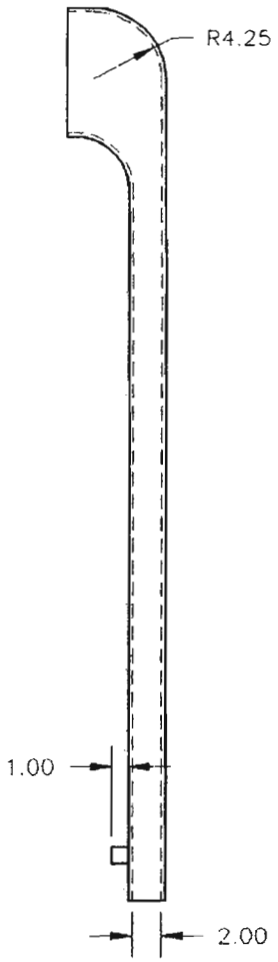
NORWECO.
NORWALK WASTEWATER EQUIPMENT COMPANY
NORWALK, OHIO

SINGULAIR®
MODEL 93 AND MODEL 95
ASPIRATOR TIP

REVISION DATE	REVISION
1-23-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-8-95
SCALE	NTS
DRAWING NO.	PC-5-7509







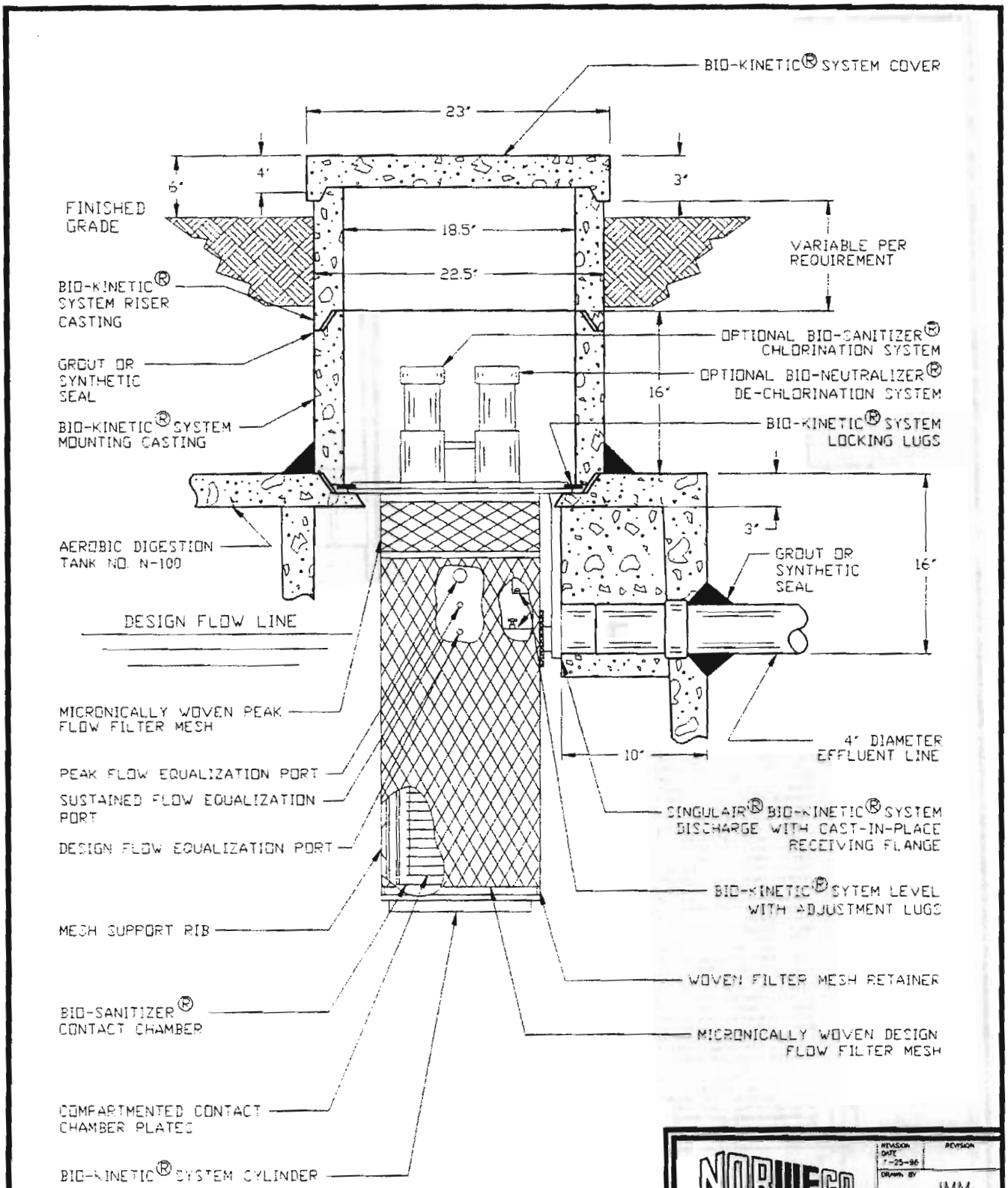
INSTALLATION DETAIL

NOTES:
1. ALL DIMENSIONS ARE IN INCHES.
2. EXTERNAL DIMENSIONS ARE DEPENDENT ON MANUFACTURING PROCESS.
3. ALL DIMENSIONS ARE INTERIOR.

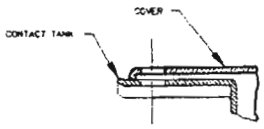
NORWECO.
NORWALK WASTEWATER EQUIPMENT COMPANY
NORWALK, OHIO

SINGULAIR®
MODEL 960-500 GPD
SLUDGE RETURN DEVICE

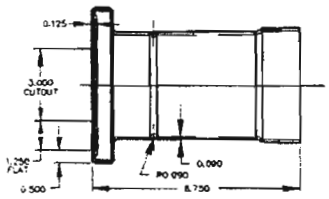
REVISION DATE	1-25-96
REVISION	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-9-96
SCALE	NTS
DRAWING NO.	PC-5-8602



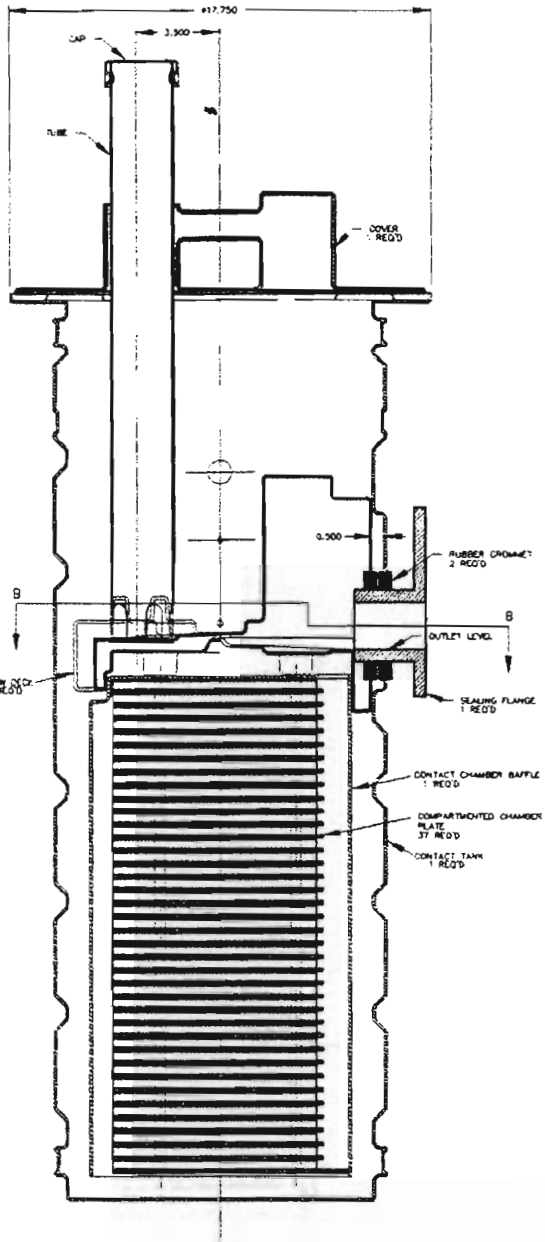
U.S. AND FOREIGN PATENTS GRANTED AND PENDING



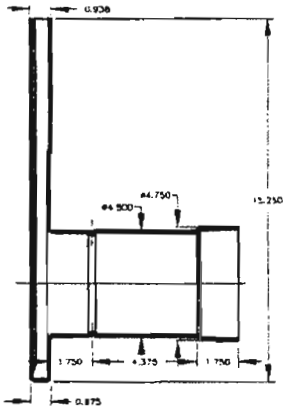
CROSS-SECTION THRU HOLES
SHOWN AT 45° FROM SECTION A – A
SCALE 2X



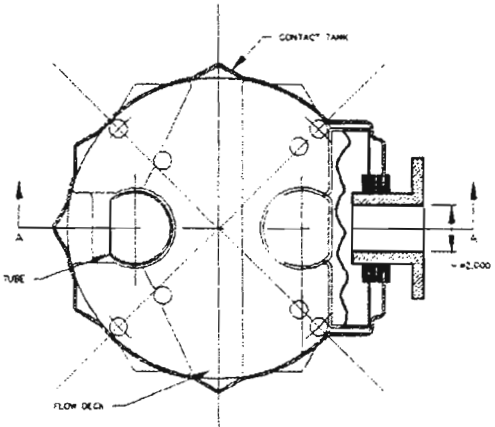
TOP VIEW



PARTIAL SECTION A–A



SIDE SECTION
RECEIVING FLANGE CAST IN TANK



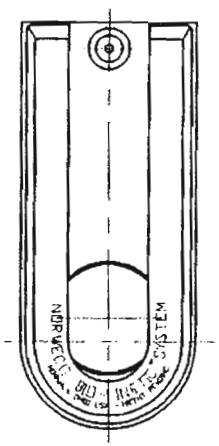
SECTION B – B
FLOW DECK PARTIALLY
SECTIONED

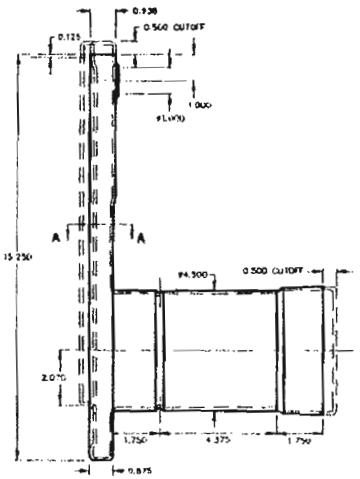
U.S. AND FOREIGN PATENTS GRANTED AND PENDING

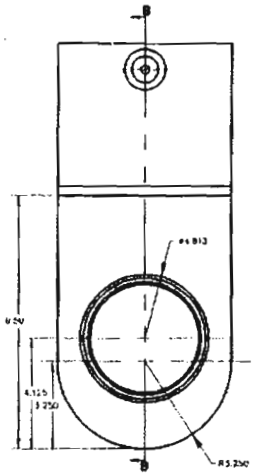
NORWECO.
NORWALK WASTEWATER EQUIPMENT COMPANY

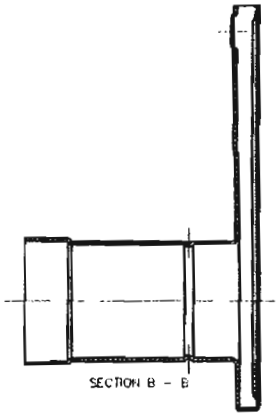
BIO-KINETIC®
ASSEMBLY
DRAWING

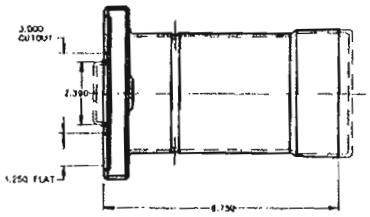
REVISION DATE	REVISION
1-25-96	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-8-95
SCALE	NTS
DRAWING NO.	PC-5-8600

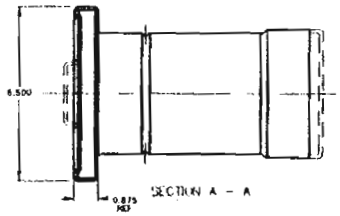


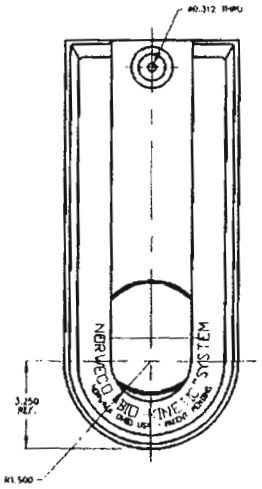


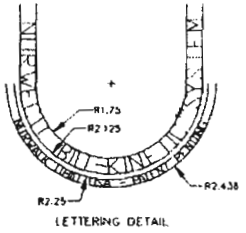




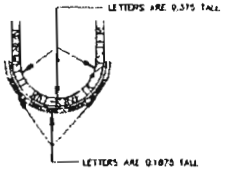








LETTERING DETAIL



LETTERING DETAIL

NOTES:

1. ALL DIMENSIONS ARE IN INCHES.
2. TOLERANCES ARE SPECIFIED IN MANUFACTURING PROCEDURE.
3. COMPANY AND PRODUCT NAME TO BE MOLDED ON PART.

NORWECO
NORWALK WASTEWATER EQUIPMENT COMPANY

SINGULAIR® BIO-KINETIC®
SIMPLEX
RECEIVING FLANGE

REVISION DATE	REVISION
1-25-95	
DRAWN BY	JMM
APPROVED BY	GJS
DATE	1-8-95
SCALE	NTS
DRAWING NO.	PC-5-8014

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APPENDIX B

NSF STANDARD 40 PERFORMANCE EVALUATION METHOD AND REQUIREMENTS

TEST METHOD

A. PURPOSE

The purpose of this test method is to verify that a plant complies with the applicable class effluent requirements during a six-month period.

Performance evaluation of the plant shall be independent of design and construction. However, structural weaknesses or defects and failures of process support equipment, shall be reported in the test results.

B. PREQUALIFICATIONS

1. APPLICATION: The application for performance evaluation of a particular model or model series shall include a basic description, design data, drawings, and parts and materials specifications for the plant and all equipment and appurtenances. A complete installation, operation, and maintenance manual, including a thorough discussion of process fundamentals, shall accompany the application.

2. MODEL SERIES: For a series of plants of the same model, varying in rated treatment capacities between 1514 and 5678 L (400 and 1500 gallons) per day, results achieved by the smallest plant in the series shall be indicative of the capabilities of all other plants in the series. The design and configurations of larger capacity plants shall be proportionally identical to the plant tested.[1]

C. TESTING SEASON

The test can be carried out at any time of the year. If the test is conducted during cold weather, the plant and equipment shall be protected from freezing. If the test is conducted during warm weather, the temperature of the aeration compartment contents shall not exceed 30°C (86°F).

D. ANALYTICAL METHODS

All sample collection and analytical methods shall be those in the seventeenth edition of Standard Methods for the Examination of Water and Wastewater, published by the American Public Health Association[2], except as otherwise specified.

E. INFLUENT WASTEWATER CHARACTERISTICS

The influent wastewater characteristics shall be equivalent to wastewater generated from a normal household complying with the following typical domestic wastewater parameters:

BOD_5	100-300 mg/L
SS	100-350 mg/L

[1]When defining "proportionally identical," some of the parameters that should be considered are hydraulics, dimensions, mixing, and filtration.

[2]American Public Health Association, 1015 Fifteenth St., N.W., Washington, DC 20005.

F. LOADING REQUIREMENTS

1. DESIGN LOADING: The plant shall be hydraulically loaded at its rated daily capacity[3] according to the following pattern of flow:

6 a.m. - 9 a.m.	35% of total daily flow
11 a.m. - 2 p.m.	25% of total daily flow
5 p.m. - 8 p.m.	40% of total daily flow

2. STRESS TESTING[4]: The plant shall be hydraulically loaded as indicated in the applicable figure in the following sequence:

- Wash Day (Figure A1),
- Working Parents (Figure A2),
- Equipment or Power Failure (electrical equipment off) (Figure A3),
- One week vacation followed by shock loading. Typical of a family's return from vacation (Figure A4).

G. TEST METHOD

1. GENERAL:

a. Should mechanical malfunctions at the test facility occur during testing (dosing interruption, comminutor failure, sampler malfunction, etc.) the testing agency shall determine the potential adverse affect on the performance of the system and determine what analytical values shall be included in the thirty- and seven-sample averages.

b. The plant shall be installed, operated, and maintained according to the manufacturer's instructions during the test period. If these instructions conflict with provisions in this Appendix, the provisions in this Appendix shall be used.

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[3]Rated daily capacity is the designed treatment of the plant. Note the example below:

Effect of Testing at Design Loading
Assume average family = 5 persons
and average water use = 189 L/person/day (50 gals/person/day); then daily household waste = 946 Lpd (250 gpd).
Therefore, testing at rated daily capacity provides greater loading to plant than average family might be expected to contribute.

If minimum plant size = 1892 Lpd (500 gpd), then design loading simulates: Use by 10 persons @ 189 L/person/day (50 gals/person/day); or use by 5 persons @ 378 L/person/day (100 gals/person/day), or equal.

[4]Basis for 60% loading used to simulate working parents, equipment/power failure, and return from vacation:

Assume 5-person occupance and 1892 Lpd (500 gpd) design capacity for aerobic system; Then
2 flushes/person @ 95 L/flush (25 gals) = 189 L (50 gals)
1 shower/person @ 76 L/shower (20 gals) = 379 L (100 gals)
3 loads washing @132 L/load (35 gals) = 379 L (105 gals)
food preparation and dishes (est.) = 114 L (30 gals)
1079 L (285 gals)
= 60% Design Flow (approximately)

c. If the plant under test is installed at a higher grade than a typical field installation, the manufacturer may insulate the plant if normal treatment temperatures could be affected.

2. START-UP PROCEDURES:

a. The plant shall be assembled according to the manufacturer's instructions. Equipment shall be checked by the manufacturer to determine that it is structurally sound. All defects shall be reported. If no defects are detected, that fact shall be indicated by the testing agency.

b. If no defects are detected and the plant is judged to be structurally sound, it shall be filled to capacity with one-third wastewater and two-thirds water[5].

c. The wastewater loading pattern provided in Section F.1 (normal loading) shall begin. Sampling and testing shall begin within three weeks after the plant is filled and placed into operation, and continue without interruption until the end of the test, with the following exception:

The testing agency shall make repairs for unexpected mechanical malfunctions that are explained in the manufacturer's operation manual. Routine service and maintenance of the plant will not be allowed during the test period.

d. LOADING SEQUENCE: The plant shall be subjected to the following loading sequence:

Design loading (Section F.1) - 16 weeks
Stress sequence (Section F.2) - 7 weeks
Design loading (Section F.1) - 3 weeks

The plant shall be returned to design loading for seven days between each stressing sequence.

3. SAMPLING:

a. GENERAL:

- The daily composite sample shall consist of flow-proportional samples collected at least once per hour during periods of influent flow.

b. DESIGN LOADING:

- The evaluation analyses as specified in Appendix A, Table 1 shall be followed.
- All samples shall be collected and analyzed on a five-days-per-week basis.

c. STRESS TESTING:

- Samples collected immediately following each stressing shall include 24-hour composites of influent and effluent and analyzed in accordance with Appendix A, Table 1.
- Samples shall be collected immediately before the beginning of each sequence and each 24 hours for 7 days following each stress sequence.

NOTE: Two samples shall be collected during the working parent and wash day stresses and analyzed for BOD_5, SS, and pH. The data shall not be used in determining acceptance.

[5]Start-up of plant with two-thirds water and one-third wastewater is not intended to dictate actual field start-up procedures.

TABLE 1
GENERAL TEST SAMPLING

Sample Location	Sample Type	Test Frequency	DO mg/L	BOD_5 mg/L	Suspended Solids (SS), mg/L	Volatile Suspended Solids (VSS), Percent	Settleable Solids in mL/L 45 min.	Temp. °C	pH
Raw Influent	24 hr. Composite*	Monday thru Friday		X	X	X		X[1]	X[1]
Final Effluent	24 hr. Composite*	Monday thru Friday	X[1]	X	X	X		X[1]	X[1]
Aeration Chamber	Grab	Monday thru Friday	X[1]		X	X	X	X[1]	X[1]

*See Item 3.a.
[1]In situ measurement.

H. ACCEPTANCE

1. The plant shall meet the applicable performance requirements of Section 5 of this standard.

2. To evaluate the pass/fail criteria set forth in Section 5 of this Standard a minimum of 118 sample days (23 during stressing) shall be collected and analyzed.

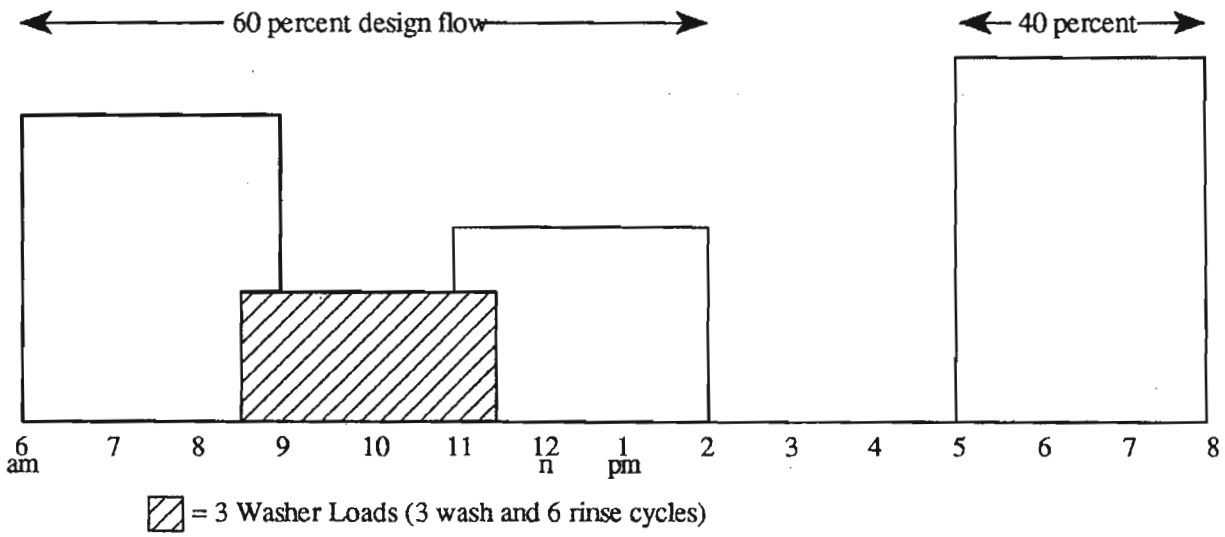
3. Due to the biological process, it is understood that aerobic systems may have days of upset. Therefore, for both Class I and Class II plants, 10% of the samples during testing (not to exceed one sample during stress testing) will not be included in the pass/fail determination.

I. REPORTS

- The testing agency shall provide a report to the manufacturer that includes significant data showing test results for the plant tested in accordance with this standard. Appropriate comments shall be provided. All data shall be included in the report, along with rationale for exclusion of any data due to adverse conditions during testing.

Figure A.1

Wash Day Loading
Added to plants 3 times in one 5-day week with one 24-hour period between each loading



Wash cycle contains low sudsing commercially available household detergent and household bleach at manufacturer's recommended use level

Figure A.2

Working Parents
No loading 9 am to 5 pm for 5 consecutive days

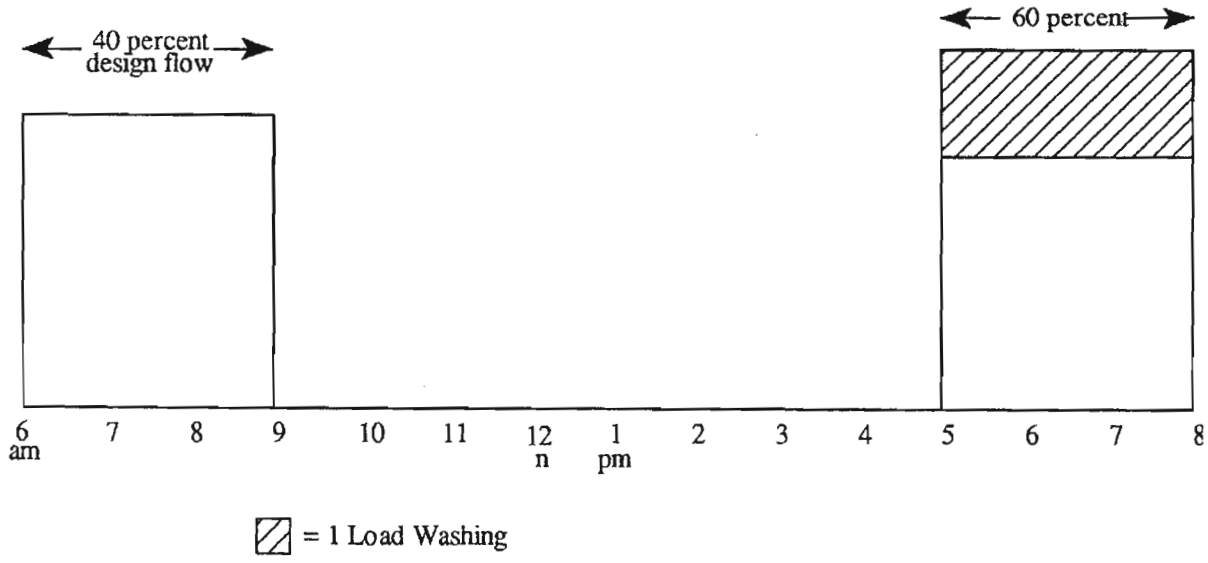


Figure A.3

Equipment or Power Failure
All power to plant off for 48 hours, 1 time only

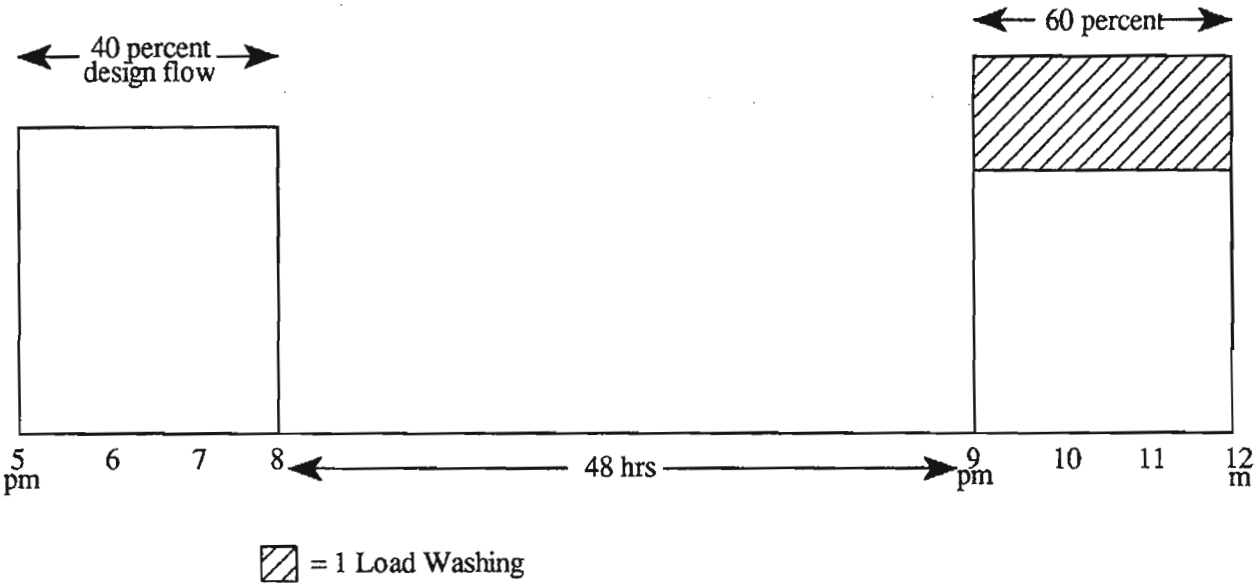
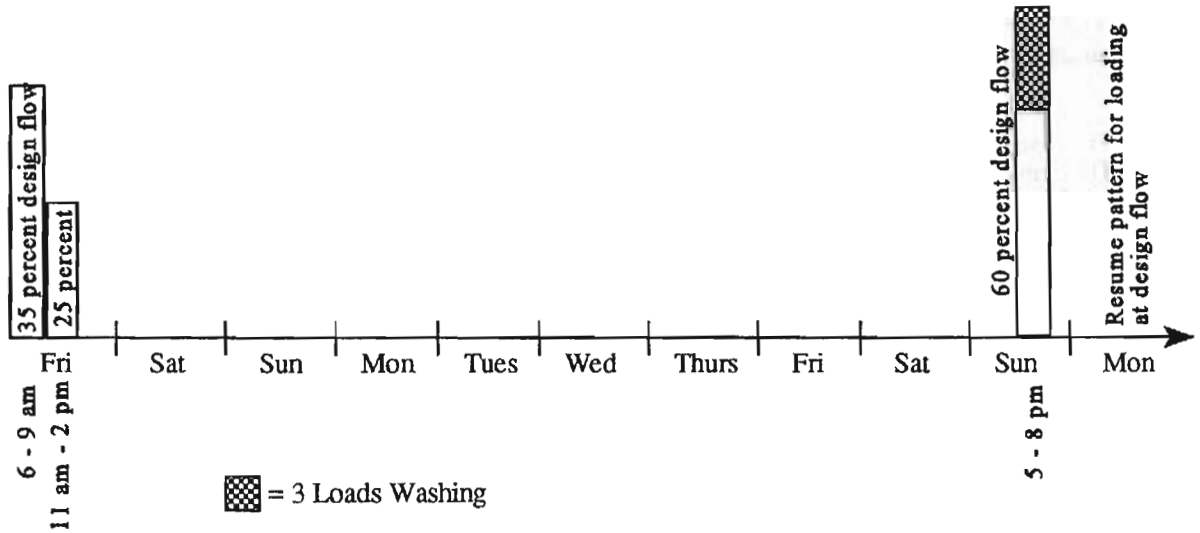


Figure A.4

One Week Vacation
No loading over 9-day period but all power on sudden shock when family returns home



PERFORMANCE REQUIREMENT[6]

5.0 EFFLUENT QUALITY: Plants shall be classified according to the effluent quality results obtained under the loading and operating conditions in Appendix A.

5.1 CLASS I EFFLUENT: Plants providing a Class I effluent shall be shown to meet EPA Secondary Treatment Guidelines[7] for BOD_5, SS, and pH. These are as follows:

5.1.1 BOD_5 and SS

- Arithmetic mean of all effluent samples collected in a period of 30 consecutive[8] days shall be ≤ 30 mg/L and ≥ 85 percent removal.
- Arithmetic mean of all effluent samples collected in a period of 7 consecutive days shall be ≤ 45 mg/L.
- Individual effluent samples shall not exceed a BOD_5 of 60 mg/L and SS of 100 mg/L.

5.1.2 pH - Effluent values shall remain between 6.0 and 9.0.

5.1.3 Effluent shall be tested three times during the six-month evaluation period for color, odor, oily film, and foam. The effluent shall be diluted 1:1000 with distilled water. Plants tested for Class I effluent characteristics shall not exceed:

- Color - 15 units;
- Threshold Odor - nonoffensive;
- Oily Film - nonvisible evidence other than air bubbles;
- Foam - none.

5.2 CLASS II EFFLUENT: Plants providing a Class II effluent shall be shown to meet an effluent quality level for BOD_5 of 60 mg/L and for SS of 100 mg/L. These maximum values shall not be exceeded more than 10 percent of the time.

5.3 STRESS REQUIREMENTS: Measured values for BOD_5 and SS of effluent composite samples collected beginning 24 hours after completion of each stressing condition (48 hours after the power outage stress), as described in Appendix A, shall not exceed the applicable class effluent requirements in Item 5.1 and 5.2.

5.4 NOISE: Mechanical component parts shall be installed or protected so the noise produced does not exceed 60 dbA when measured 6.0 m (20 feet) from the plant or appurtenances.

5.5 MODIFICATION OF TEST METHODS: The manufacturer shall follow the procedures in Appendix C to request a modification of a specific test method. A request for a modification of a test method may be needed due to the following:

- The design of the plant precludes effective testing in accordance with the Standard.
- The manufacturer submits a design change to a previously tested plant that may not require full performance testing.

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[6]The performance limits set forth in section 5 take into account limitations of the respective analytical techniques relative to precision and accuracy. The limits shall be rigidly applied in the evaluation of test data in lieu of statistical interpretation.

[7]Federal Register, Vol 49, September 20, 1987, Title 40 Protection of Environment, Chapter 1 - EPA, Subchapter D - Water Programs, Part 133 Secondary Treatment Information, Item 133.102 Secondary Treatment.

[8]For Standard 40 applications, consecutive days shall be interpreted as consecutive sampling days.

APPENDIX C

ANALYTICAL RESULTS

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: June 11, 1995 *Plant Code:* 6/139

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	7.5	7.8	7.2	6.8	6.4
	effluent	4.2	4.5	4.7	3.5	3.8
Temperature (°C)	influent	16	16	16	16	17
	aeration chamber	18	18	18	18	18
	effluent	18	18	18	18	18
pH	influent	7.5	7.7	7.5	7.5	7.5
	aeration chamber	7.6	7.6	7.8	7.6	7.6
	effluent	8.1	8.1	8.2	8.0	8.0
Biochemical Oxygen Demand (mg/L)	influent	210	150	200	190	190
	effluent	<5	5	7	6	7
Suspended Solids (mg/L)	influent	210	230	260	240	220
	aeration chamber	250	250	280	280	310
	effluent	7	8	8	6	8
Volatile Suspended Solids (mg/L)	influent	190	200	230	210	190
	aeration chamber	210	200	240	230	250
	effluent	6	7	8	5	6
45 Minute Settleable Solids (mL/L)	aeration chamber	300	430	350	400	380

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: June 18, 1995 *Plant Code:* 6/139

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	7.8	5.5	7.8	6.4	6.2
	effluent	3.2	2.8	2.7	2.5	2.9
Temperature (°C)	influent	17	17	18	18	18
	aeration chamber	18	19	20	20	20
	effluent	18	20	20	20	20
pH	influent	7.5	7.6	7.5	7.6	7.4
	aeration chamber	7.8	7.8	7.7	7.8	7.7
	effluent	8.1	8.1	8.1	8.0	8.1
Biochemical Oxygen Demand (mg/L)	influent	190	190	250	240	260
	effluent	10	12	9	5	6
Suspended Solids (mg/L)	influent	250	310	340	260	370
	aeration chamber	350	360	370	360	420
	effluent	7	5	6	<5	6
Volatile Suspended Solids (mg/L)	influent	220	260	300	230	320
	aeration chamber	300	300	320	320	360
	effluent	6	<5	<5	<5	<5
45 Minute Settleable Solids (mL/L)	aeration chamber	320	380	380	480	650

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: June 25, 1995 *Plant Code:* 6/139

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	6.2	5.6	6.6	6.4	6.5
	effluent	2.0	2.1	2.1	2.2	2.0
Temperature (°C)	influent	18	18	18	18	19
	aeration chamber	21	21	21	21	20
	effluent	21	21	21	21	20
pH	influent	7.4	7.5	7.6	7.5	7.5
	aeration chamber	7.7	7.8	7.8	7.7	7.7
	effluent	8.0	7.9	7.9	7.9	8.0
Biochemical Oxygen Demand (mg/L)	influent	210	210	170	120	210
	effluent	<5	<5	<5	<5	<5
Suspended Solids (mg/L)	influent	370	370	270	210	310
	aeration chamber	450	440	410	420	400
	effluent	<5	<5	<5	<5	<5
Volatile Suspended Solids (mg/L)	influent	290	290	210	180	270
	aeration chamber	360	360	350	350	360
	effluent	<5	<5	<5	<5	<5
45 Minute Settleable Solids (mL/L)	aeration chamber	480	550	500	600	700

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: July 2, 1995 *Plant Code:* 6/139

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	5.9	5.4	5.9	5.2	3.9
	effluent	1.3	1.0	1.3	1.2	1.1
Temperature (°C)	influent	18	18	19	19	19
	aeration chamber	20	20	20	20	20
	effluent	20	20	20	20	20
pH	influent	7.8	7.8	7.8	7.6	7.7
	aeration chamber	7.5	7.7	7.7	7.6	7.6
	effluent	8.0	7.9	7.9	8.0	8.0
Biochemical Oxygen Demand (mg/L)	influent	160	170	170	150	160
	effluent	5	<5	<5	<5	<5
Suspended Solids (mg/L)	influent	160	180	180	180	190
	aeration chamber	460	480	490	460	480
	effluent	6	<5	<5	<5	<5
Volatile Suspended Solids (mg/L)	influent	140	150	150	150	170
	aeration chamber	380	420	430	380	410
	effluent	<5	<5	<5	<5	<5
45 Minute Settleable Solids (mL/L)	aeration chamber	800	950	900	850	1000

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: July 9, 1995 *Plant Code:* 6/139

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	5.8	5.5	5.2	4.2	4.2
	Effluent	1.7	1.9	1.6	1.7	1.9
Temperature (°C)	influent	(1)	19	19	20	19
	aeration chamber	20	20	20	20	21
	effluent	20	20	20	20	21
pH	influent	(1)	7.9	7.7	7.8	(1)
	aeration chamber	7.8	7.7	7.6	7.8	(1)
	effluent	7.9	7.9	7.9	8.1	(1)
Biochemical Oxygen Demand (mg/L)	influent	(1)	150	200	200	170
	effluent	<5	<5	<5	<5	<5
Suspended Solids (mg/L)	influent	(1)	220	190	260	220
	aeration chamber	490	420	420	450	460
	effluent	6	<5	<5	<5	<5
Volatile Suspended Solids (mg/L)	influent	(1)	190	170	220	190
	aeration chamber	430	360	360	370	400
	effluent	6	<5	<5	<5	<5
45 Minute Settleable Solids (mL/L)	aeration chamber	700	350	280	270	300

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: No influent sample on 7/10 because of sampler problem; no pH readings on 7/14 because of malfunction of the pH meter.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: July 16, 1995 *Plant Code:* 6/139

Weeks Into Test: 6

Weekend Dosing: Sunday - 412 gallons Saturday - 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	275	412	500	500
Dissolved Oxygen (mg/L)	aeration chamber	6.0	4.8	5.4	5.9	5.6
	effluent	2.5	2.0	1.9	2.4	2.4
Temperature (°C)	influent	20	20	20	19	19
	aeration chamber	22	22	22	22	22
	effluent	22	22	22	22	22
pH	influent	7.5	7.6	7.6	7.6	7.5
	aeration chamber	7.7	7.5	7.6	7.5	7.4
	effluent	7.9	7.9	7.9	7.9	7.8
Biochemical Oxygen Demand (mg/L)	influent	220	160	310	200	170
	effluent	<5	<5	<5	<5	5
Suspended Solids (mg/L)	influent	280	210	300	270	190
	aeration chamber	390	430	380	350	440
	effluent	<5	<5	<5	<5	9
Volatile Suspended Solids (mg/L)	influent	230	180	260	220	170
	aeration chamber	340	370	340	300	380
	effluent	<5	<5	<5	<5	8
45 Minute Settleable Solids (mL/L)	aeration chamber	320	480	300	300	410

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Low dosing on 7/16, 7/18 and 7/19 caused by problem with influent pumps.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: July 23, 1995 *Plant Code:* 6/139

Weeks Into Test: 7

Weekend Dosing: Sunday - 269 gallons Saturday - 125 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		469	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	6.8	6.4	5.9	5.6	5.4
	effluent	(1)	2.3	3.0	2.8	2.4
Temperature (°C)	influent	20	20	20	20	19
	aeration chamber	22	22	22	22	22
	effluent	(1)	22	22	22	22
pH	influent	7.5	7.6	7.4	7.5	7.5
	aeration chamber	7.5	7.6	7.5	7.5	7.6
	effluent	(1)	7.9	7.8	7.8	8.0
Biochemical Oxygen Demand (mg/L)	influent	220	150	150	160	150
	effluent	(1)	5	<5	<5	5
Suspended Solids (mg/L)	influent	180	240	160	190	150
	aeration chamber	(1)	300	280	310	310
	effluent	(1)	15	8	9	9
Volatile Suspended Solids (mg/L)	influent	150	190	140	170	140
	aeration chamber	(1)	260	240	270	260
	effluent	(1)	13	7	8	8
45 Minute Settleable Solids (mL/L)	aeration chamber	160	120	100	125	130

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Low dosing on 7/23 and 7/24 caused by problem with float in dosing tank; low doses on 7/30 caused by problem with influent pump. No final effluent sample on 7/25 because of sampler problem.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: July 30, 1995 *Plant Code:* 6/139

Weeks Into Test: 8

Weekend Dosing: Sunday - 500 gallons Saturday - 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	450	500
Dissolved Oxygen (mg/L)	aeration chamber	5.7	5.4	5.7	5.0	5.4
	effluent	2.4	2.1	2.4	2.2	2.1
Temperature (°C)	influent	20	20	20	20	20
	aeration chamber	22	22	22	22	22
	effluent	22	22	22	23	23
pH	influent	7.7	7.5	7.5	7.5	7.4
	aeration chamber	7.7	7.7	7.7	7.6	7.7
	effluent	7.9	7.9	7.8	7.8	7.8
Biochemical Oxygen Demand (mg/L)	influent	190	150	150	150	120
	effluent	5	<5	6	6	6
Suspended Solids (mg/L)	influent	200	230	280	220	150
	aeration chamber	280	320	310	330	300
	effluent	10	23	16	13	11
Volatile Suspended Solids (mg/L)	influent	160	210	210	170	120
	aeration chamber	240	270	250	280	260
	effluent	10	18	14	11	10
45 Minute Settleable Solids (mL/L)	aeration chamber	150	150	210	120	50

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Dosing shortage on 8/3 caused by float problem in the Chelsea site dosing system.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: August 6, 1995 *Plant Code:* 6/139

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	5.0	4.4	4.6	4.8	5.3
	effluent	1.9	1.5	1.6	1.5	1.4
Temperature (°C)	influent	20	20	20	20	20
	aeration chamber	22	22	22	22	22
	effluent	22	22	22	22	22
pH	influent	7.4	7.5	7.6	7.7	7.5
	aeration chamber	7.7	7.7	7.7	7.7	7.6
	effluent	7.9	7.9	7.9	8.0	7.9
Biochemical Oxygen Demand (mg/L)	influent	150	160	190	360	160
	effluent	6	<5	<5	<5	<5
Suspended Solids (mg/L)	influent	150	200	220	280	180
	aeration chamber	430	510	470	510	500
	effluent	6	7	<5	5	<5
Volatile Suspended Solids (mg/L)	influent	130	170	190	240	160
	aeration chamber	360	430	400	340	440
	effluent	<5	7	<5	<5	<5
45 Minute Settleable Solids (mL/L)	aeration chamber	280	500	580	500	600

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: August 13, 1995 *Plant Code:* 6/139

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	4.3	3.9	3.7	4.0	3.6
	effluent	1.1	1.0	1.1	1.3	1.3
Temperature (°C)	influent	20	20	20	20	20
	aeration chamber	23	23	23	23	23
	effluent	23	23	23	23	23
pH	influent	7.6	7.5	7.5	7.7	7.7
	aeration chamber	7.7	7.6	7.6	7.7	7.7
	effluent	7.9	7.8	7.9	8.0	7.9
Biochemical Oxygen Demand (mg/L)	influent	210	190	190	190	140
	effluent	<5	<5	6	5	6
Suspended Solids (mg/L)	influent	240	290	260	210	280
	aeration chamber	630	630	610	580	620
	effluent	6	6	6	8	8
Volatile Suspended Solids (mg/L)	influent	210	250	230	180	210
	aeration chamber	520	520	510	490	510
	effluent	5	<5	6	7	7
45 Minute Settleable Solids (mL/L)	aeration chamber	580	460	510	620	500

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: August 20, 1995 *Plant Code:* 6/139

Weeks Into Test: 11

Weekend Dosing: *Sunday -* 500 gallons *Saturday -* 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		463	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	4.3	4.3	3.7	4.6	4.1
	effluent	1.3	1.7	1.0	1.0	1.2
Temperature (°C)	influent	20	20	20	20	20
	aeration chamber	23	23	23	23	23
	effluent	23	23	23	23	23
pH	influent	7.7	7.7	7.7	7.6	7.5
	aeration chamber	7.7	7.7	7.7	7.7	7.7
	effluent	7.9	7.9	7.9	7.9	7.8
Biochemical Oxygen Demand (mg/L)	influent	190	190	180	200	200
	effluent	<5	<5	<5	<5	<5
Suspended Solids (mg/L)	influent	290	240	210	270	290
	aeration chamber	620	590	620	660	660
	effluent	7	6	5	7	7
Volatile Suspended Solids (mg/L)	influent	250	210	200	240	250
	aeration chamber	500	480	510	540	540
	effluent	7	<5	<5	6	6
45 Minute Settleable Solids (mL/L)	aeration chamber	800	800	900	790	700

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Dosing shortage on 8/21 due to a problem with the Chelsea site dosing system.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: August 27, 1995 *Plant Code:* 6/139

Weeks Into Test: 12

Weekend Dosing: *Sunday -* 263 gallons *Saturday -* 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	4.5	4.0	4.2	3.3	3.9
	effluent	1.5	1.2	1.1	1.0	1.5
Temperature (°C)	influent	20	21	20	21	20
	aeration chamber	23	23	23	23	23
	effluent	23	23	23	23	23
pH	influent	7.5	7.6	7.7	7.7	7.7
	aeration chamber	7.7	7.7	7.7	7.6	7.7
	effluent	8.0	7.9	7.9	8.0	7.9
Biochemical Oxygen Demand (mg/L)	influent	230	200	200	250	160
	effluent	5	5	5	<5	5
Suspended Solids (mg/L)	influent	440	250	330	450	270
	aeration chamber	720	680	640	760	700
	effluent	9	14	10	8	7
Volatile Suspended Solids (mg/L)	influent	370	200	280	360	200
	aeration chamber	600	540	510	610	540
	effluent	8	10	8	6	6
45 Minute Settleable Solids (mL/L)	aeration chamber	800	560	700	500	780

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Dosing shortage on 8/27 due to a plugged Chelsea site influent pump.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: September 3, 1995 *Plant Code:* 6/139

Weeks Into Test: 13

Weekend Dosing: Sunday - 500 gallons Saturday - 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	481	500
Dissolved Oxygen (mg/L)	aeration chamber	4.3	3.6	3.9	3.3	2.8
	effluent	1.1	1.3	1.1	1.0	1.4
Temperature (°C)	influent	19	20	20	21	20
	aeration chamber	23	23	23	23	23
	effluent	23	23	23	23	23
pH	influent	7.7	7.7	7.7	7.6	7.7
	aeration chamber	7.6	7.7	7.6	7.7	7.6
	effluent	7.8	8.0	7.9	8.0	7.8
Biochemical Oxygen Demand (mg/L)	influent	(4)	190	220	250	220
	effluent	(4)	<5	5	7	8
Suspended Solids (mg/L)	influent	(4)	360	320	350	310
	aeration chamber	(4)	810	810	880	900
	effluent	(4)	7	8	13	12
Volatile Suspended Solids (mg/L)	influent	(4)	330	270	310	260
	aeration chamber	(4)	660	640	700	720
	effluent	(4)	6	6	11	12
45 Minute Settleable Solids (mL/L)	aeration chamber	680	600	520	800	700

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Dosing shortage on 9/7 due to a plugged Chelsea site influent pump. Samples lost due to laboratory error on 9/4.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: September 10, 1995 *Plant Code:* 6/139

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	4.2	3.2	4.1	3.4	4.4
	effluent	1.8	1.7	1.6	1.5	1.6
Temperature (°C)	influent	20	20	20	20	20
	aeration chamber	22	22	21	21	21
	effluent	22	21	21	21	21
pH	influent	7.7	7.7	7.7	7.6	7.6
	aeration chamber	7.6	7.6	7.5	7.5	7.5
	effluent	7.9	7.9	7.8	7.9	7.9
Biochemical Oxygen Demand (mg/L)	influent	190	160	160	180	170
	effluent	8	6	7	9	8
Suspended Solids (mg/L)	influent	230	250	210	180	200
	aeration chamber	890	910	920	980	880
	effluent	14	13	16	20	16
Volatile Suspended Solids (mg/L)	influent	190	230	180	160	170
	aeration chamber	700	720	730	770	710
	effluent	12	12	13	16	12
45 Minute Settleable Solids (mL/L)	aeration chamber	490	500	700	500	570

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: September 17, 1995 *Plant Code:* 6/139

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	3.8	4.4	4.4	4.3	5.0
	effluent	1.4	1.7	1.5	1.9	1.5
Temperature (°C)	influent	20	20	20	20	20
	aeration chamber	21	21	21	21	20
	effluent	21	21	21	21	20
pH	influent	7.6	7.6	7.7	7.6	7.7
	aeration chamber	7.6	7.7	7.6	7.6	7.6
	effluent	7.9	7.8	7.9	7.9	7.9
Biochemical Oxygen Demand (mg/L)	influent	210	160	160	140	160
	effluent	6	7	7	5	6
Suspended Solids (mg/L)	influent	240	190	180	200	200
	aeration chamber	1000	1000	1100	1100	1200
	effluent	14	20	14	15	16
Volatile Suspended Solids (mg/L)	influent	240	170	160	170	170
	aeration chamber	800	810	840	840	920
	effluent	10	18	11	12	12
45 Minute Settleable Solids (mL/L)	aeration chamber	540	500	650	620	550

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: September 24, 1995 *Plant Code:* 6/139

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	4.4	4.6	4.0	5.0	4.4
	effluent	1.4	2.0	1.4	1.4	1.9
Temperature (°C)	influent	19	19	19	19	19
	aeration chamber	19	19	19	19	19
	effluent	19	19	19	19	19
pH	influent	7.7	7.7	7.8	7.7	7.7
	aeration chamber	7.7	7.6	7.6	7.7	7.7
	effluent	8.0	8.0	7.9	7.8	7.9
Biochemical Oxygen Demand (mg/L)	influent	160	160	180	200	210
	effluent	7	6	7	7	9
Suspended Solids (mg/L)	influent	220	250	240	220	200
	aeration chamber	1000	1000	1000	1100	1100
	effluent	20	18	19	18	18
Volatile Suspended Solids (mg/L)	influent	190	220	210	200	180
	aeration chamber	810	830	820	880	880
	effluent	16	16	16	16	14
45 Minute Settleable Solids (mL/L)	aeration chamber	540	450	330	400	590

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: October 1, 1995 *Plant Code:* 6/139

Weeks Into Test: 17

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		431	463	431	463	431	463	506
Dissolved Oxygen (mg/L)	*aeration chamber*		4.5					
	effluent		1.5					
Temperature (°C)	*influent*		19					
	aeration chamber		20					
	effluent		19					
pH	*influent*		7.6					
	aeration chamber		7.7					
	effluent		7.9		8.0		7.9	
Biochemical Oxygen Demand (mg/L)	*influent*		220		170		150	
	effluent		7		6		8	
Suspended Solids (mg/L)	*influent*		260		240		260	
	aeration chamber		1100					
	effluent		15		12		18	
Volatile Suspended Solids (mg/L)	*influent*		220		210		220	
	aeration chamber		840					
	effluent		12		12		12	
45 Minute Settleable Solids (mL/L)	*aeration chamber*		450					

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Wash day stress 10/2 through 10/6.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: October 8, 1995 *Plant Code:* 6/139

Weeks Into Test: 18

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		500	500	500	500	500	500	463
Dissolved Oxygen (mg/L)	*aeration chamber*	5.5	5.0	5.2	4.5	5.0	5.5	5.8
	effluent	2.0	2.2	2.0	2.2	2.2	2.5	2.0
Temperature (°C)	*influent*	18	19	19	19	19	18	18
	aeration chamber	19	18	18	18	18	19	19
	effluent	18	18	18	18	18	18	18
pH	*influent*	7.8	7.5	7.5	7.5	7.5	7.6	7.5
	aeration chamber	7.6	7.6	7.5	7.5	7.5	7.5	7.5
	effluent	7.9	7.9	7.8	7.9	7.8	8.0	7.9
Biochemical Oxygen Demand (mg/L)	*influent*	140	190	200	180	170	150	180
	effluent	<5	<5	<5	<5	<5	<5	<5
Suspended Solids (mg/L)	*influent*	140	220	220	240	200	180	210
	aeration chamber	820	880	960	980	1000	1100	1100
	effluent	8	10	8	10	11	9	7
Volatile Suspended Solids (mg/L)	*influent*	120	200	190	210	170	160	190
	aeration chamber	620	680	760	780	810	880	860
	effluent	6	8	8	8	9	8	6
45 Minute Settleable Solids (mL/L)	*aeration chamber*	520	340	380	400	510	440	450

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Working parent stress started 10/14.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: October 15, 1995 *Plant Code:* 6/139

Weeks Into Test: 19

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		463	463	463	438	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber						4.7	4.2
	effluent						1.6	1.2
Temperature (°C)	influent						18	17
	aeration chamber						18	18
	effluent						18	18
pH	influent						7.7	7.9
	aeration chamber						7.6	7.5
	effluent		7.9		8.0		7.9	7.9
Biochemical Oxygen Demand (mg/L)	influent		170		170		160	180
	effluent		<5		5		<5	<5
Suspended Solids (mg/L)	influent		170		230		260	250
	aeration chamber						1100	1200
	effluent		9		12		12	8
Volatile Suspended Solids (mg/L)	influent		160		210		220	210
	aeration chamber						860	900
	effluent		8		10		10	6
45 Minute Settleable Solids (mL/L)	aeration chamber						640	680

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Working parent stress ended 10/18.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: October 22, 1995 *Plant Code:* 6/139

Weeks Into Test: 20

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		506	500	500	500	325	0	438
Dissolved Oxygen (mg/L)	aeration chamber	4.4	6.0	4.7	5.1	5.8		
	effluent	1.3	1.5	1.4	1.4	1.5		
Temperature (°C)	influent	17	18	18	18	17		
	aeration chamber	17	17	17	17	17		
	effluent	17	17	17	17	17		
pH	influent	7.9	7.5	7.9	7.7	7.8		
	aeration chamber	7.6	7.6	7.6	7.5	7.6		
	effluent	8.0	8.0	8.0	7.8	7.9		
Biochemical Oxygen Demand (mg/L)	influent	140	170	170	180	180		
	effluent	<5	<5	<5	<5	6		
Suspended Solids (mg/L)	influent	150	220	270	320	280		
	aeration chamber	1000	1100	1300	1200	1100		
	effluent	8	8	8	10	9		
Volatile Suspended Solids (mg/L)	influent	130	190	220	250	210		
	aeration chamber	820	840	990	930	880		
	effluent	6	6	7	8	8		
45 Minute Settleable Solids (mL/L)	aeration chamber	500	640	590	580	520		

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Power failure stress 10/26 through 10/28.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: October 29, 1995 *Plant Code:* 6/139

Weeks Into Test: 21

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		500	500	500	500	506	500	500
Dissolved Oxygen (mg/L)	aeration chamber		6.2	5.9	6.4	5.9	5.9	4.1
	effluent		1.6	1.5	1.9	1.4	1.9	1.5
Temperature (°C)	influent		18	17	18	17	17	16
	aeration chamber		16	15	16	16	16	16
	effluent		16	16	16	16	16	16
pH	influent		7.7	7.9	7.8	7.6	7.6	7.8
	aeration chamber		7.7	7.5	7.7	7.6	7.5	7.4
	effluent	7.9	8.0	7.9	8.0	8.0	7.9	7.7
Biochemical Oxygen Demand (mg/L)	influent	160	200	160	150	170	140	160
	effluent	10	5	<5	<5	<5	5	7
Suspended Solids (mg/L)	influent	180	220	170	200	250	200	160
	aeration chamber		930	880	880	890	940	940
	effluent	18	9	9	8	10	8	6
Volatile Suspended Solids (mg/L)	influent	160	190	160	170	210	160	140
	aeration chamber		730	700	680	690	730	750
	effluent	15	6	7	6	6	6	<5
45 Minute Settleable Solids (mL/L)	aeration chamber		540	350	500	330	490	460

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: November 5, 1995 *Plant Code:* 6/139

Weeks Into Test: 22

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		325	0	0	0	0	0	0
Dissolved Oxygen (mg/L)	aeration chamber	4.5						
	effluent	1.8						
Temperature (°C)	influent	16						
	aeration chamber	16						
	effluent	15						
pH	influent	7.8						
	aeration chamber	7.5						
	effluent	7.7						
Biochemical Oxygen Demand (mg/L)	influent	170						
	effluent	<5						
Suspended Solids (mg/L)	influent	150						
	aeration chamber	1000						
	effluent	7						
Volatile Suspended Solids (mg/L)	influent	140						
	aeration chamber	800						
	effluent	6						
45 Minute Settleable Solids (mL/L)	aeration chamber	580						

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Vacation stress started 11/5.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: November 12, 1995 *Plant Code:* 6/139

Weeks Into Test: 23

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		0	0	369	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber					8.4	8.7	8.1
	effluent					3.0	4.1	3.4
Temperature (°C)	influent					16	16	15
	aeration chamber					13	13	13
	effluent					12	13	12
pH	influent					7.7	7.7	7.8
	aeration chamber					7.8	7.7	7.7
	effluent				8.0	8.0	7.8	8.0
Biochemical Oxygen Demand (mg/L)	influent				160	150	150	150
	effluent				14	20	15	14
Suspended Solids (mg/L)	influent				190	180	180	200
	aeration chamber					640	600	600
	effluent				31	33	26	18
Volatile Suspended Solids (mg/L)	influent				160	160	160	180
	aeration chamber					480	440	480
	effluent				22	25	18	16
45 Minute Settleable Solids (mL/L)	aeration chamber					160	160	200

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Vacation stress ended 11/14/95.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Stress Test Evaluation

Week Beginning: November 19, 1995 *Plant Code:* 6/139

Weeks Into Test: 24

		Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Dosed Volume (gallons)		500	500	500	500	450	500	500
Dissolved Oxygen (mg/L)	aeration chamber	6.8	5.5	6.8	7.0	7.8	7.8	
	effluent	2.7	2.4	2.2	2.2	2.1	2.4	
Temperature (°C)	influent	14	15	16	15	15	14	
	aeration chamber	12	13	13	13	12	12	
	effluent	12	12	12	12	12	12	
pH	influent	7.8	7.7	7.8	7.9	7.8	7.8	
	aeration chamber	7.7	7.7	7.6	7.8	7.7	7.6	
	effluent	7.9	8.0	8.0	7.9	8.0	7.9	
Biochemical Oxygen Demand (mg/L)	influent	130	170	170	180	150	260	
	effluent	9	7	6	5	6	7	
Suspended Solids (mg/L)	influent	170	220	230	220	170	300	
	aeration chamber	570	810	770	560	580	570	
	effluent	13	10	9	8	10	8	
Volatile Suspended Solids (mg/L)	influent	150	200	210	190	160	270	
	aeration chamber	480	640	600	420	460	470	
	effluent	12	8	8	6	8	8	
45 Minute Settleable Solids (mL/L)	aeration chamber	200	280	260	180	150	200	

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Dosing shortage on 11/23 due to a problem with the Chelsea site dosing system.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: November 26, 1995 *Plant Code:* 6/139

Weeks Into Test: 25

Weekend Dosing: Sunday - 500 gallons Saturday - 500 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	238
Dissolved Oxygen (mg/L)	aeration chamber	7.9	9.0	7.5	7.1	7.8
	effluent	2.1	2.5	2.4	2.5	2.7
Temperature (°C)	influent	15	15	15	15	15
	aeration chamber	12	12	12	12	12
	effluent	12	12	12	12	12
pH	influent	7.8	7.7	7.8	7.8	7.8
	aeration chamber	7.6	7.7	7.6	7.7	7.7
	effluent	8.0	8.0	7.9	8.0	7.9
Biochemical Oxygen Demand (mg/L)	influent	200	200	170	150	160
	effluent	7	11	10	6	6
Suspended Solids (mg/L)	influent	270	260	290	230	200
	aeration chamber	660	700	670	680	580
	effluent	9	12	8	10	10
Volatile Suspended Solids (mg/L)	influent	230	210	240	190	180
	aeration chamber	640	530	540	530	470
	effluent	7	8	7	8	8
45 Minute Settleable Solids (mL/L)	aeration chamber	200	190	200	200	180

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes: Dosing shortage on 12/1 caused by a clogged Chelsea site influent pump.

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: December 3, 1995 *Plant Code:* 6/139

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	8.1	7.6	8.4	7.6	8.0
	effluent	2.6	2.3	2.8	3.0	3.1
Temperature (°C)	influent	15	15	15	15	14
	aeration chamber	12	12	12	12	11
	effluent	12	12	12	11	11
pH	influent	7.6	7.8	7.8	7.7	7.8
	aeration chamber	7.7	7.7	7.7	7.7	7.7
	effluent	7.9	7.9	8.0	7.9	8.0
Biochemical Oxygen Demand (mg/L)	influent	230	160	210	220	190
	effluent	7	7	10	18	10
Suspended Solids (mg/L)	influent	220	240	230	270	200
	aeration chamber	600	730	720	650	620
	effluent	12	18	16	37	14
Volatile Suspended Solids (mg/L)	influent	200	200	200	240	170
	aeration chamber	480	580	570	520	490
	effluent	10	14	12	30	12
45 Minute Settleable Solids (mL/L)	aeration chamber	150	200	190	150	160

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: December 10, 1995 *Plant Code:* 6/139

Weeks Into Test: 27

Weekend Dosing: *Sunday -* 500 gallons *Saturday -* 506 gallons

		Monday	Tuesday	Wednesday	Thursday	Friday
Dosed Volume (gallons)		500	500	500	500	500
Dissolved Oxygen (mg/L)	aeration chamber	8.6	8.4	8.8	8.6	8.4
	effluent	3.3	3.4	3.4	3.1	3.5
Temperature (°C)	influent	14	13	14	14	13
	aeration chamber	11	10	10	10	10
	effluent	10	11	10	10	10
pH	influent	7.8	7.8	7.9	7.8	7.8
	aeration chamber	7.7	7.7	7.7	7.6	7.6
	effluent	7.9	7.9	7.9	7.9	7.8
Biochemical Oxygen Demand (mg/L)	influent	190	170	170	180	170
	effluent	8	8	10	9	10
Suspended Solids (mg/L)	influent	210	210	230	210	250
	aeration chamber	540	560	580	550	580
	effluent	16	15	18	16	17
Volatile Suspended Solids (mg/L)	influent	190	180	200	180	210
	aeration chamber	460	460	480	440	470
	effluent	16	12	14	13	12
45 Minute Settleable Solids (mL/L)	aeration chamber	130	130	125	120	130

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92

NSF *International*
Standard 40 - Individual Wastewater Treatment Plants
Plant Effluent

Week Beginning: December 17, 1995 *Plant Code:* 6/139

Weeks Into Test: 28

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	8.5	8.5	7.7	8.3	7.6
	effluent	3.9	3.4	3.3	3.5	3.0
Temperature (°C)	influent	14	14	13	13	13
	aeration chamber	10	10	10	10	10
	effluent	10	10	10	10	10
pH	influent	7.8	7.8	7.8	7.9	7.7
	aeration chamber	7.7	7.7	7.7	7.7	7.7
	effluent	7.8	7.9	7.8	7.9	7.9
Biochemical Oxygen Demand (mg/L)	influent	210	200	230	200	210
	effluent	11	10	10	10	12
Suspended Solids (mg/L)	influent	200	300	290	260	210
	aeration chamber	540	570	560	580	650
	effluent	27	23	18	19	23
Volatile Suspended Solids (mg/L)	influent	180	250	260	230	180
	aeration chamber	440	460	480	480	520
	effluent	23	18	17	16	17
45 Minute Settleable Solids (mL/L)	aeration chamber	130	120	120	120	130

(1) Site problem
(2) Malfunction of system under test
(3) Weather problem
(4) Other

Notes:

TGS/3-92