

**S&N
AIROFLO**

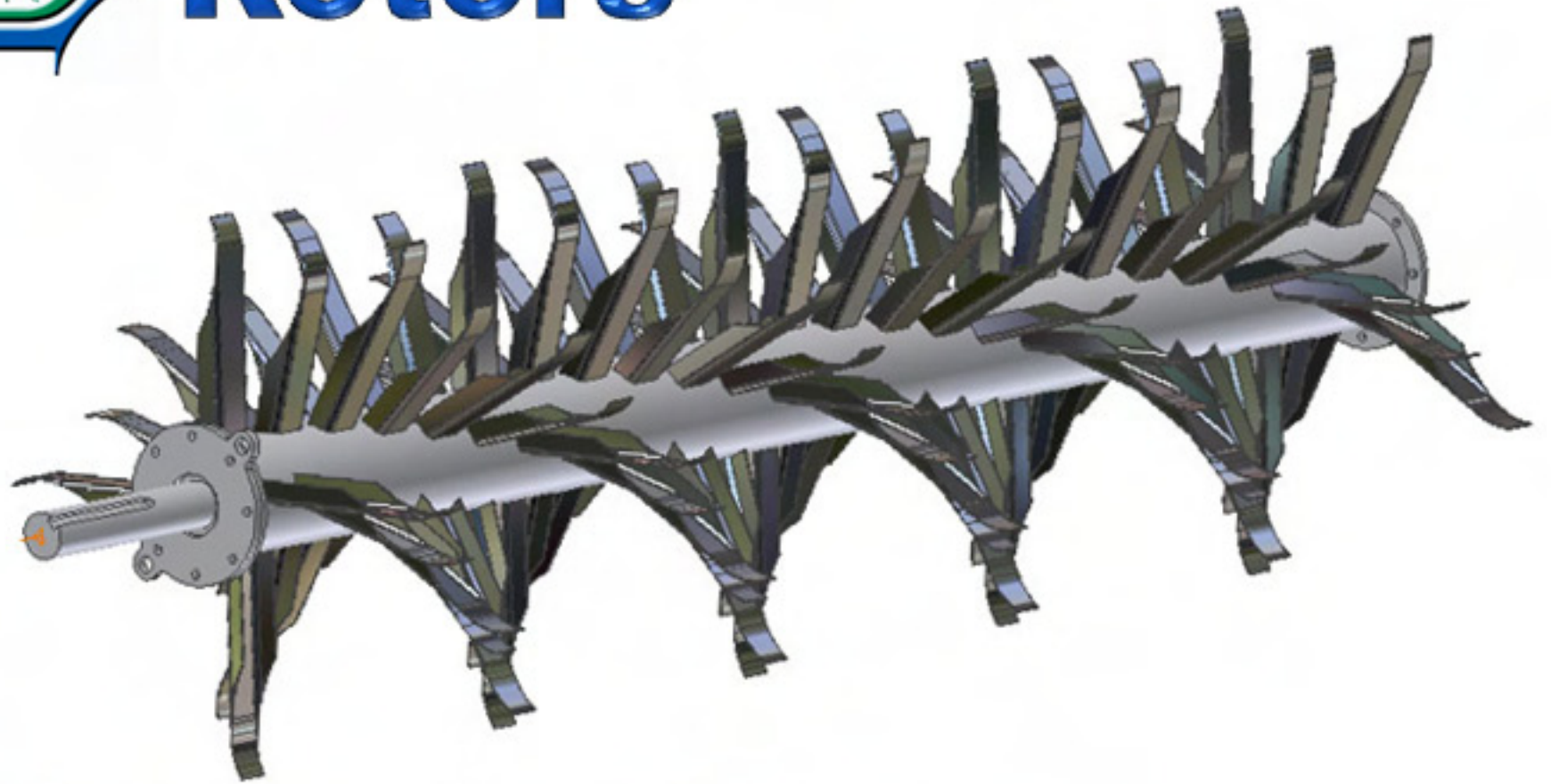


**The Source for Floating WWT Equipment
Brush Rotors - Mixers - Polishing RBCs**


PERFORMANCE

O₂ TRANSFER & MIXING

S&N AIROFLO **Rotors**



S&N AIROFLO  **Rotors** differentiate HP through six different rotor lengths (3.5' to 12.5') and two different diameter (36" and 42")

The offset between the blades in a row is the same on all **S&N AIROFLO**  **Rotors**. The offset was refined to produce an aggressive spiral at maximum submergence for greater pumping.

The **S&N AIROFLO**  **Rotors** alternate blade lengths to enhance O₂ transfer.



BLADE DESIGN ELEMENTS & BENEFITS



Blade Design

C-shaped base extends vertically to form a deeply cupped channel that tapers to a slight curved tip.

Blade Performance

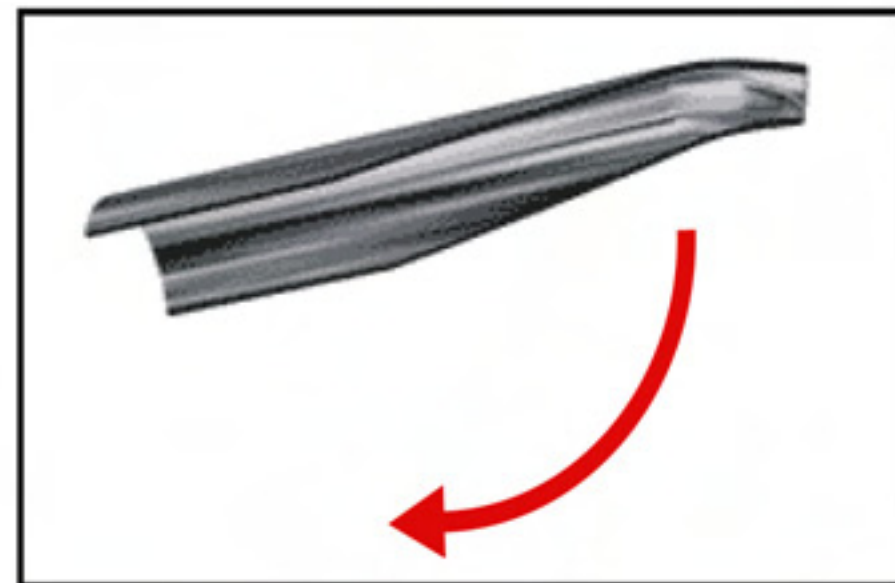
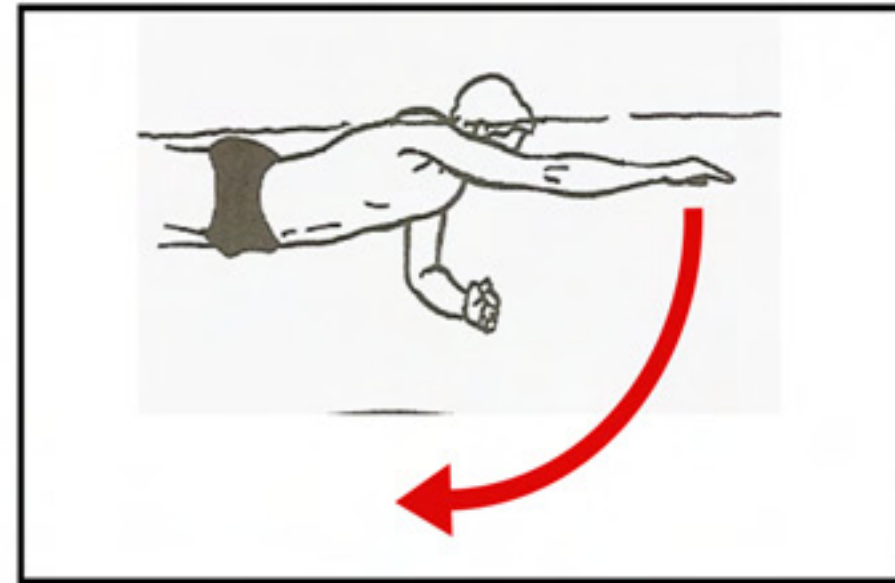
Tapered tip easily transfers energy to the water and the channel shape traps the water and pushes it away from the rotor.

Blade Strength

Sides of the blades serve as gussets to reinforce the vertical strength of the blades and take pressure off of the welded joints.

MAXIMIZING PERFORMANCE

- Like an Olympic swimmer maximizing his stroke, the cupped shaped blade improves the performance.
- Higher O_2 transfer
- Better Mixing



PERFORMANCE SUMMARY

Higher Pumping Rates *DELIVER:*

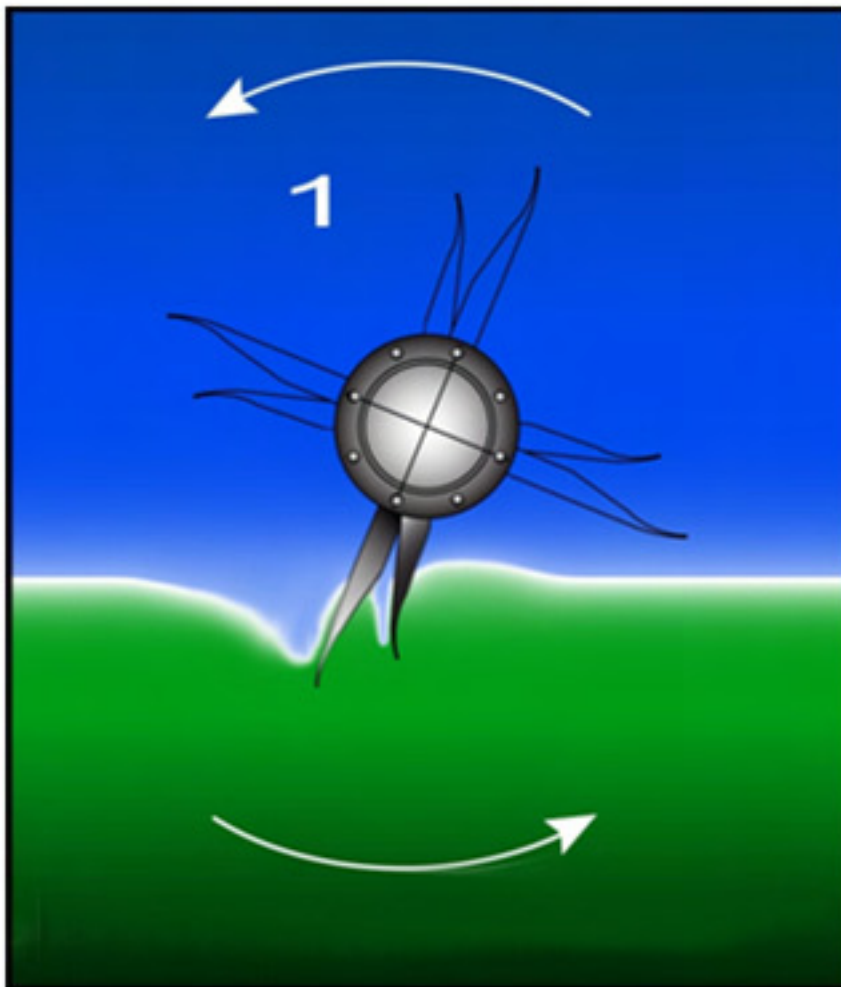
- **Higher O₂ Transfer**
- **Improved Mixing Efficiency**

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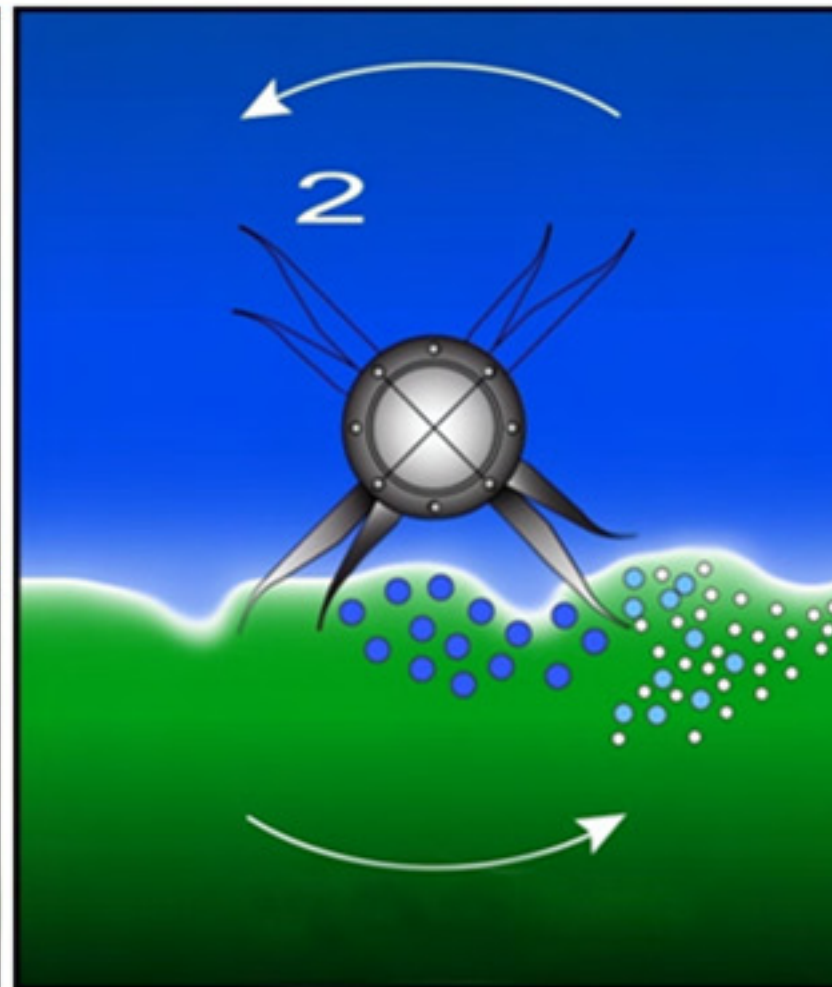


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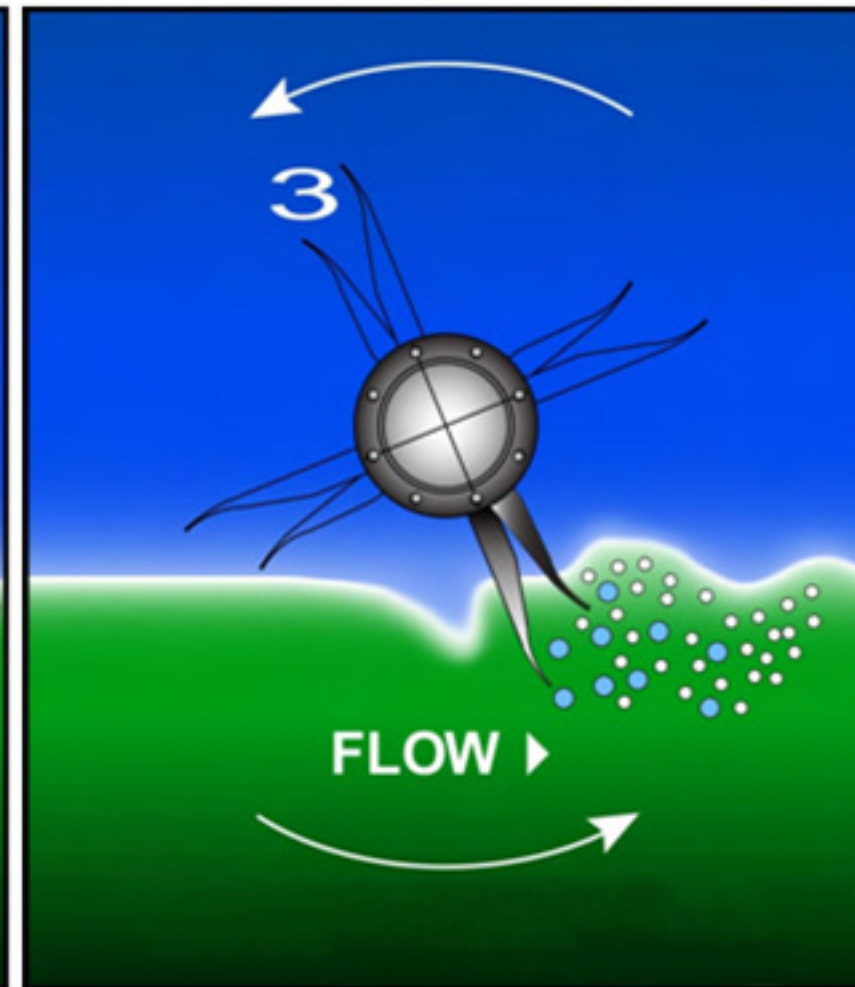
Primary Phase of the Oxygen Transfer Process



Air cavity forms behind blades entering water.



The air cavity is dispersed into bubbles by the trailing blades.



Oxygen transferred to water flows away as the next cycle of blades prepares to enter the water.



Secondary Phase of the Oxygen Transfer Process

Spraying water into the air provides a second source of aeration, making the equipment highly efficient for O₂ transfer.





The **Floating Brush Rotors enhance biological treatment using less HP than most conventional mechanical aerators**

High oxygen transfer rates

- **3.0 lb oxygen/HP-hr ASCE (clean water test)**
- **2.3 lb oxygen/HP-hr (field adjusted transfer rate)**

Excellent mixing and high pumping rates

- **2100 gpm per HP (field adjusted pumping rate)**

Energy savings

- **30 to 60% lower HP requirements for oxygen demand**
- **50% less HP required for pumping/mixing**
- **Operates at 90% of rated HP**

GSEE ENVIRONMENTAL CONSULTANTS

April 17, 2003

S&N Airoflo

Ms. Laura Hong
P.O. Box 1994
Greenwood, MS 38935

CONFIDENTIAL

RE: March, 2003 20HP AERATOR Test Results

Dear Ms. Hong:

Attached are the results of the three (3) certified tests completed on the 20HP 65.6 RPM Aerator. The results of the certified tests are summarized below. The detailed data and plots are attached.

**TABLE 1
TEST RESULTS**

Run	SWD ft	BP PSIA	WT °C	$K_L a_T$ hr^{-1}	$K_L a_{20}$ hr^{-1}	SOTR #O ₂ /hr	SAE #O ₂ /hr HP _{sh}	C^*_{20} mg/L	Power HP _{water}	Power HP _{wee}
Non Linear Regression Analysis										
5 - 20 HP - 65.6 RPM	5.00	14.49	20.45	7.25	7.17	50.48	3.04	2.77	9.49	16.58
6 - 20 HP - 65.6 RPM	5.00	14.50	19.08	7.07	7.23	50.88	3.06	2.78	9.27	16.65
7 - 20 HP - 65.6 RPM	5.00	14.47	21.14	7.15	6.96	49.01	2.87	2.62	9.52	17.05
Average	5.00	14.49	20.22	7.16	7.12	50.12	2.89	2.72	9.43	16.76
Linear Regression Analysis										
5 - 20 HP - 65.6 RPM	5.00	14.49	20.45	6.94	6.87	48.36	2.92	2.65	9.49	16.58
6 - 20 HP - 65.6 RPM	5.00	14.50	19.08	7.07	7.23	50.87	3.06	2.78	9.27	16.65
7 - 20 HP - 65.6 RPM	5.00	14.47	21.14	7.19	7.00	49.29	2.89	2.63	9.52	17.05
Average	5.00	14.49	20.22	7.07	7.03	49.51	2.95	2.69	9.43	16.76

All tests were analyzed according to the most recent ASCE Clean Water Oxygen Transfer conducted in the S&N Airoflo test basin at a liquid depth of ~5 feet. GSEE INC. cert results shown above represent the efficiency of the unit at the test conditions.

If you have any questions regarding these results, please don't hesitate to give us a call.

Sincerely,

GSEE, Inc.

Gerald L. Shell

Gerald L. Shell, P.E.
President

4/17/03



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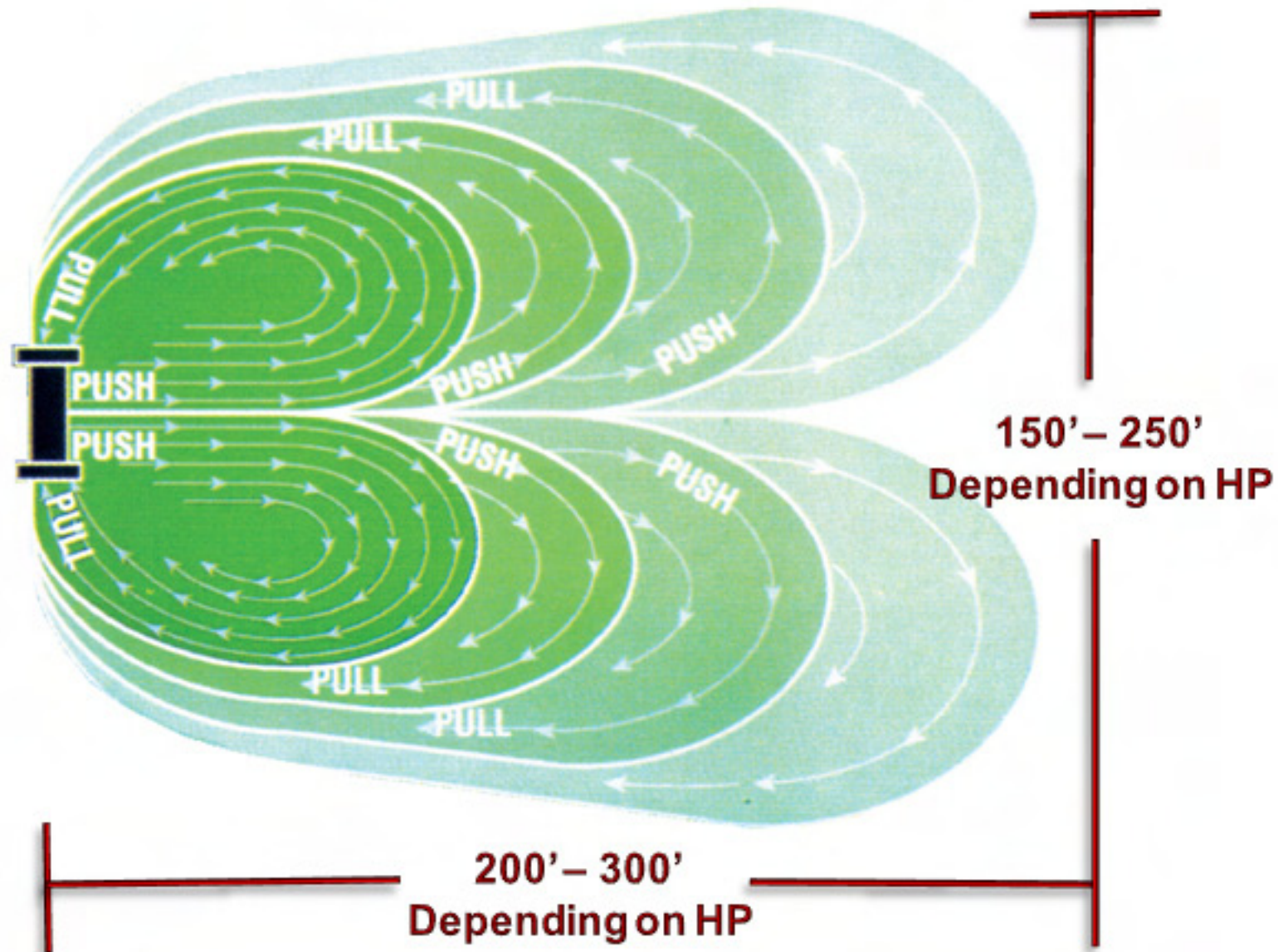
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- In 1989, S&N Airoflo requested an approval for the use of its rotors at 4 HP/mg vs. the state standard of 8 HP/mg.
- S&N Airoflo supplied O2 transfer and mixing tests performed at Auburn University to the Mississippi Department of Natural Resources, who in turn forwarded the information to Region IV Department of Environmental Quality in Atlanta, Ga.
- **S&N Airoflo units approved for 4 hp/mil gal partial mix – one half of the original 8 hp/mil gal.**
- Ruleville, MS – first WW installation. MDEQ suggested S&N equipment. Add 200 households to system.

Active Mixing Zone in Open Basis or Lagoon





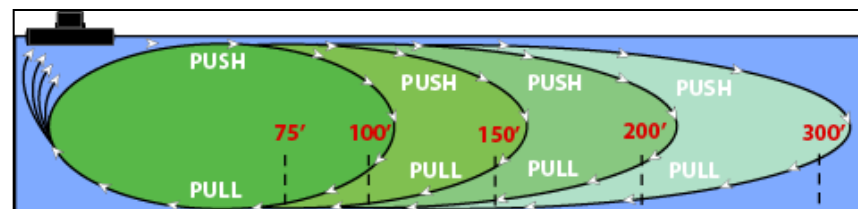
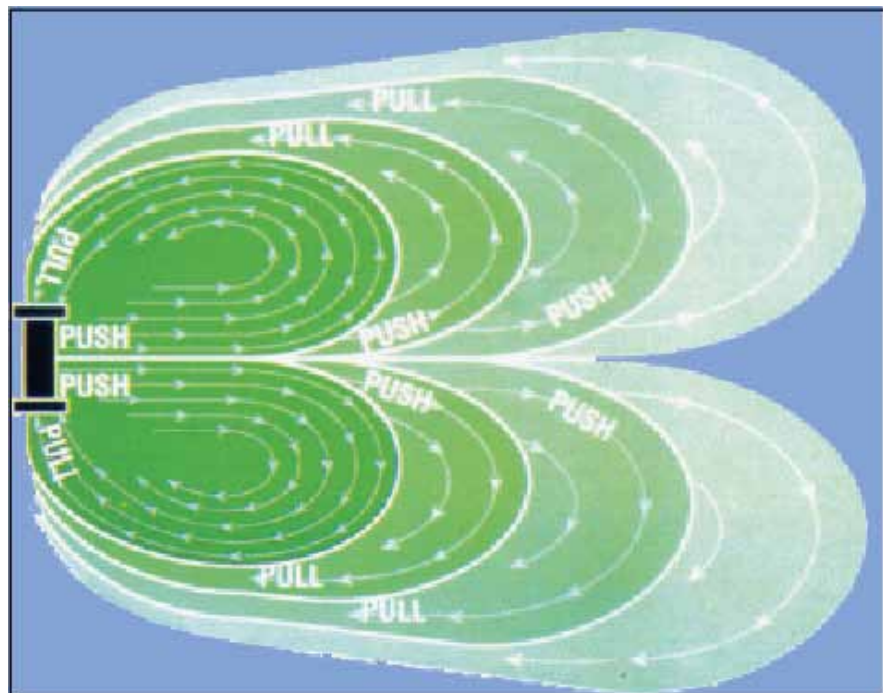
Verification of Increased DO Readings Establishes the Size of the Active Mixing Zone

15 HP Floating Brush Rotor @ 83 RPM

* Average Depth of Lagoon – 7 feet

Plan View

Elevation View



250'

LOCATION:	centerline	centerline	centerline	centerline	centerline
02/27/2008 WITHOUT AERATOR: (mg/L)	.72	.82	.91	1.04	1.08
02/28/2008 WITH AERATOR: (mg/L)	3.49	3.22	3.09	3.54	1.67
02/29/2008 WITH AERATOR: (mg/L)	3.42	3.14	3.20	3.47	1.36

300'

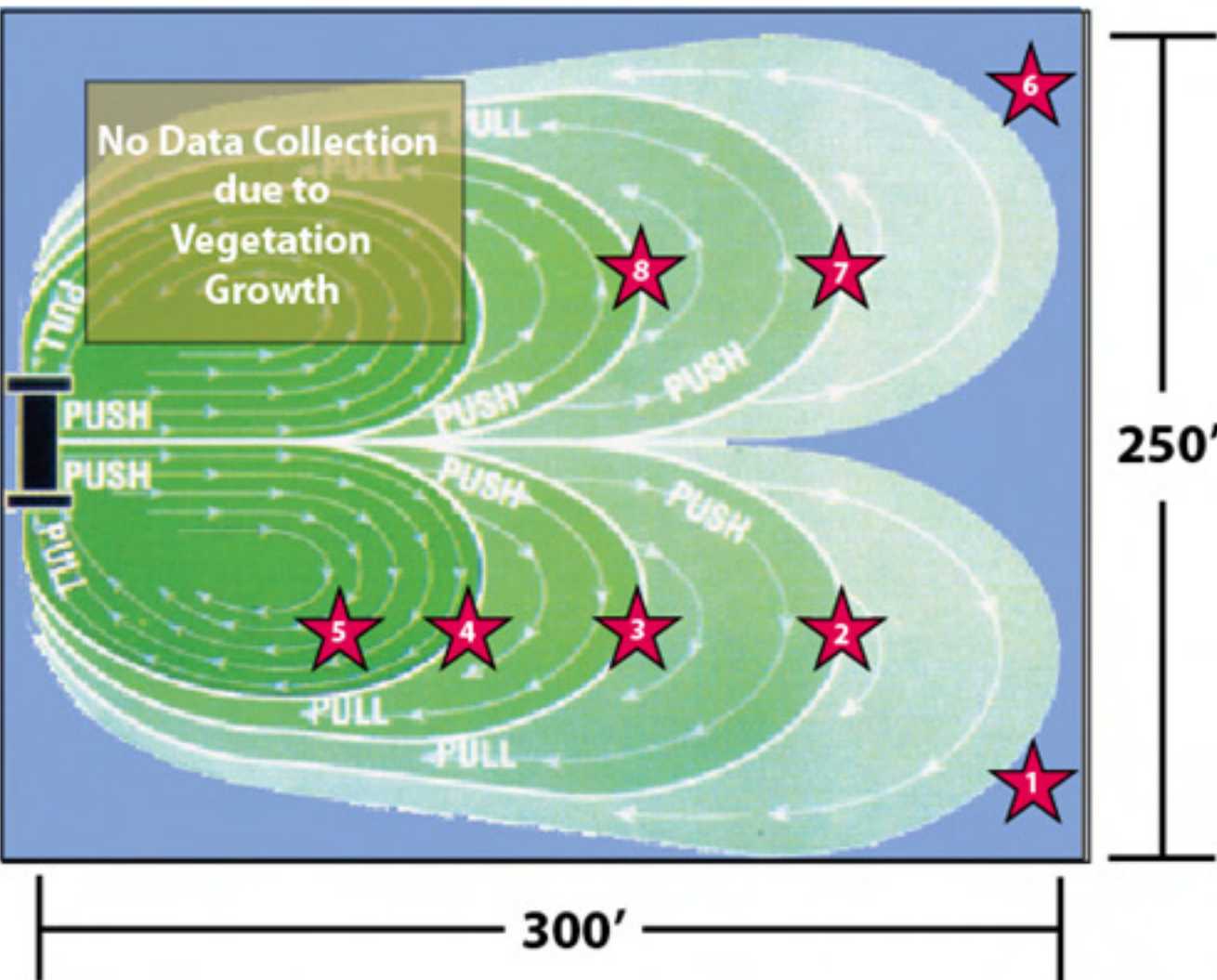
* Testing performed by AquAeTer, Brentwood, TN, at a large paper mill.



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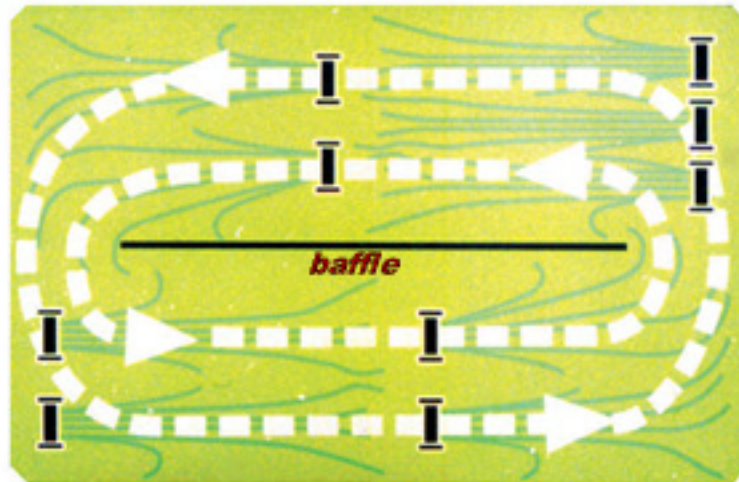
Plan View



	LOCATION:	02/27/2008 WITHOUT AERATOR: (mg/L)	02/28/2008 WITH AERATOR: (mg/L)	02/29/2008 WITH AERATOR: (mg/L)
★ 1	150' west of 300' centerline	1.02	1.62	1.75
★ 2	75' west of 200' centerline	.86	3.26	3.18
★ 3	75' west of 150' centerline	.80	3.43	3.33
★ 4	75' west of 100' centerline	.68	3.23	3.26
★ 5	75' west of 75' centerline	.64	3.18	2.82
★ 6	150' east of 300' centerline	.97	1.64	1.35
★ 7	75' east of 200' centerline	1.13	2.31	2.96
★ 8	75' east of 150' centerline	1.06	2.57	3.02

* Testing performed by AquAeTer, Brentwood, TN, at a large paper mill.

Placement Effects on Treatment

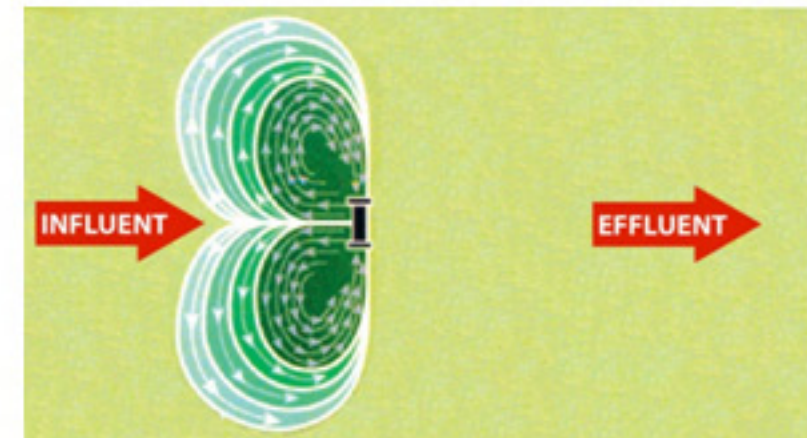


Modified Raceway -

- 7 acre facultative lagoon converted to raceway design

Influence of Placement -

- Eliminates Short-Circuiting
- Completely mixes the influent and exposes it to O₂



Serpentine Flow Pattern -

- Water moves from unit to unit
- Independent Mixing Zones
- Creates separate zones of mixing and treatment
- Prevents Short-Circuiting



Multi-Cell Facility: Soft Drink Plant

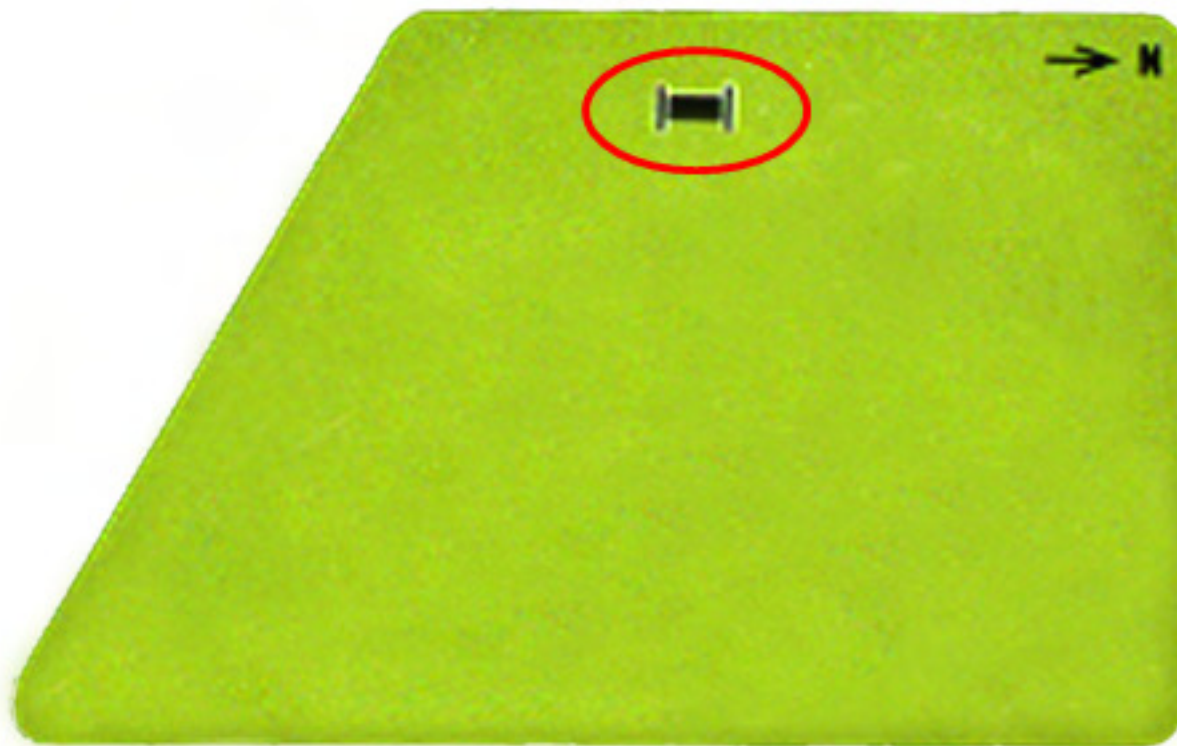
Gulf State Cannery, Inc. - Clinton, MS



Velocity Test

Performed by:

Dennis D. Truax, PhD., P.E., D.E.E.
Department of Civil Engineering
Mississippi State University



- One 10 HP unit operating.
- Approx. 0.4 surface acres (0.7 mil gal @ 14HP/mg)
- Approx. 7 ft at deepest point.
- Velocity & sludge accumulation measured.
- Collected at 7 points by two people in a rope-stabilized boat using a digital velocity meter.

Test Results:



1

Water Depth: 5 feet
Sludge Accumulation: None

Distance below surface	Velocity (fps)
0.2 ft.	2.5
1.0 ft.	2.1
2.0 ft.	1.5
3.0 ft.	1.1
4.0 ft.	0.5

Average Velocity: 1.54 fps

2

Water Depth: 4 feet
Sludge Accumulation: None

Distance below surface	Velocity (fps)
0.2 ft.	0.5
1.0 ft.	0.6
2.0 ft.	0.4
3.0 ft.	0.5

Average Velocity: 0.50 fps

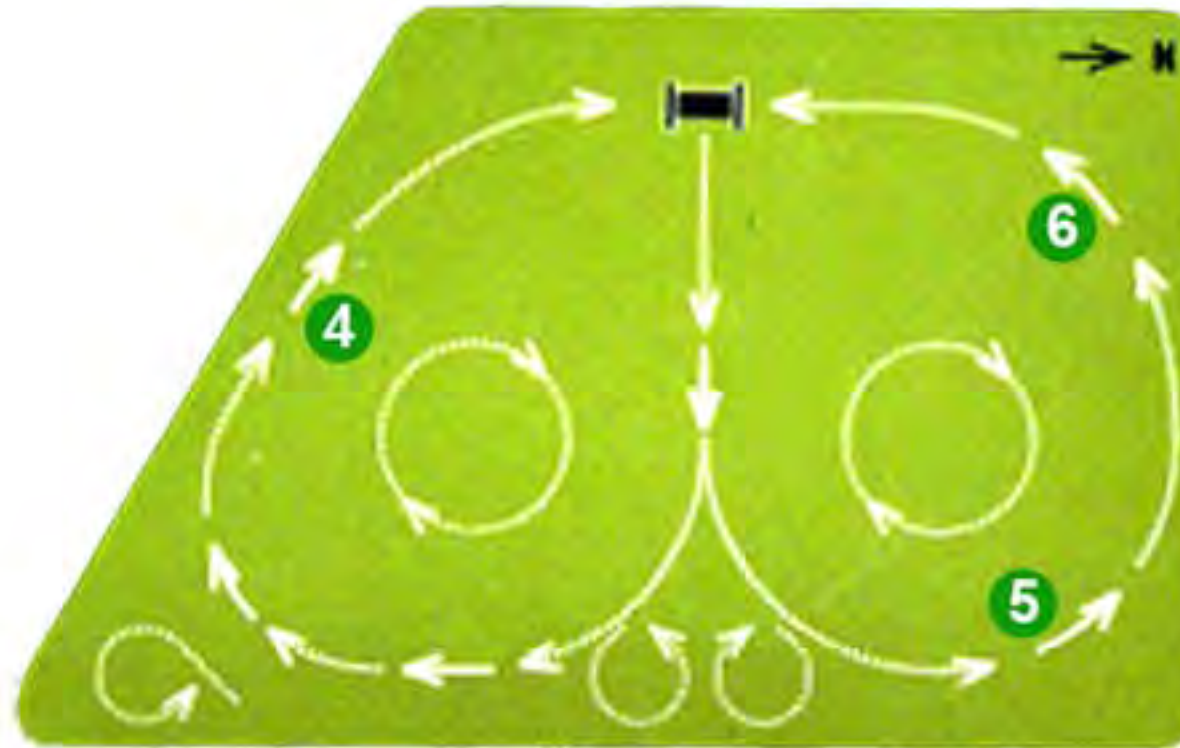
3

Water Depth: 5.3 feet
Sludge Accumulation: None

Distance below surface	Velocity (fps)
0.2 ft.	0.6
1.0 ft.	0.5
2.0 ft.	0.6
3.0 ft.	0.5
4.0 ft.	0.6

Average Velocity: 0.50 fps

Test Results:



4

Water Depth: 4.5 feet
Sludge Accumulation: 0.5 feet

Distance below surface	Velocity (fps)
0.2 ft.	0.5
1.0 ft.	0.5
2.0 ft.	0.6
3.0 ft.	0.4

Average Velocity: 0.50 fps

5

Water Depth: 5.5 feet
Sludge Accumulation: 0.25 feet

Distance below surface	Velocity (fps)
0.2 ft.	0.7
1.0 ft.	0.6
2.0 ft.	0.5
3.0 ft.	0.5
4.0 ft.	0.5

Average Velocity: 0.50 fps

6

Water Depth: 6.8 feet
Sludge Accumulation: 0.75 feet

Distance below surface	Velocity (fps)
0.2 ft.	0.5
1.0 ft.	0.5
2.0 ft.	0.5
3.0 ft.	0.4
4.0 ft.	0.5

Average Velocity: 0.48 fps

Test Results:



7

Water Depth: 6.8 feet

Sludge Accumulation: 0.75 feet

Current direction constantly changing.
Velocities above sludge varied between 0.1
and 0.5 fps, with higher values near
surface.