Evaluating and Improving Clarifiers:
We'll Never Stop Learning!!!

Presented by
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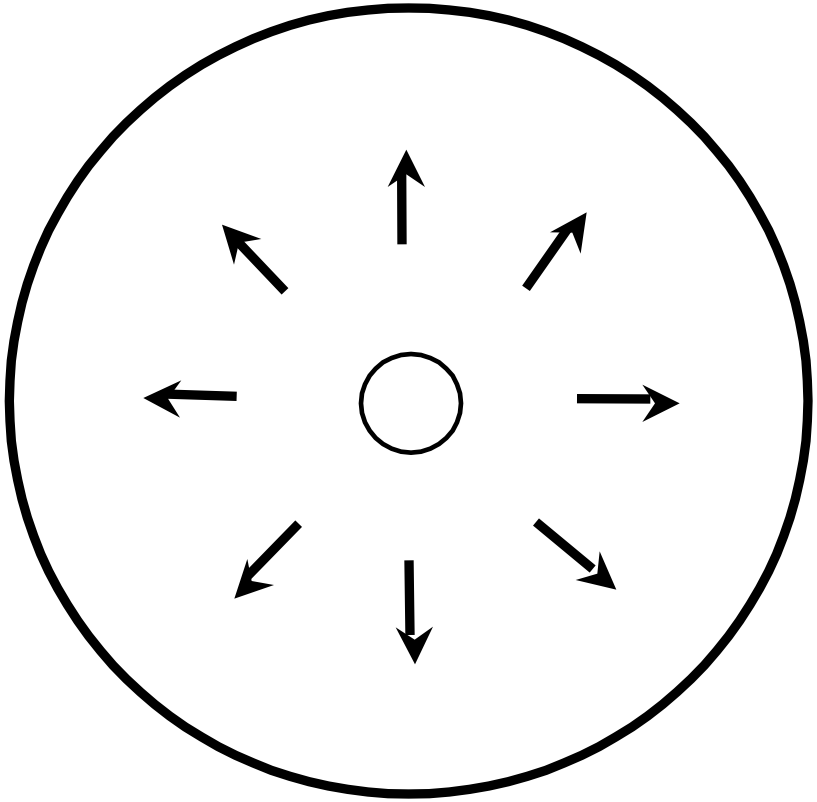
What do we need to know???

- How to Evaluate,
- How to Experiment, and
- How to Learn From Others!!!

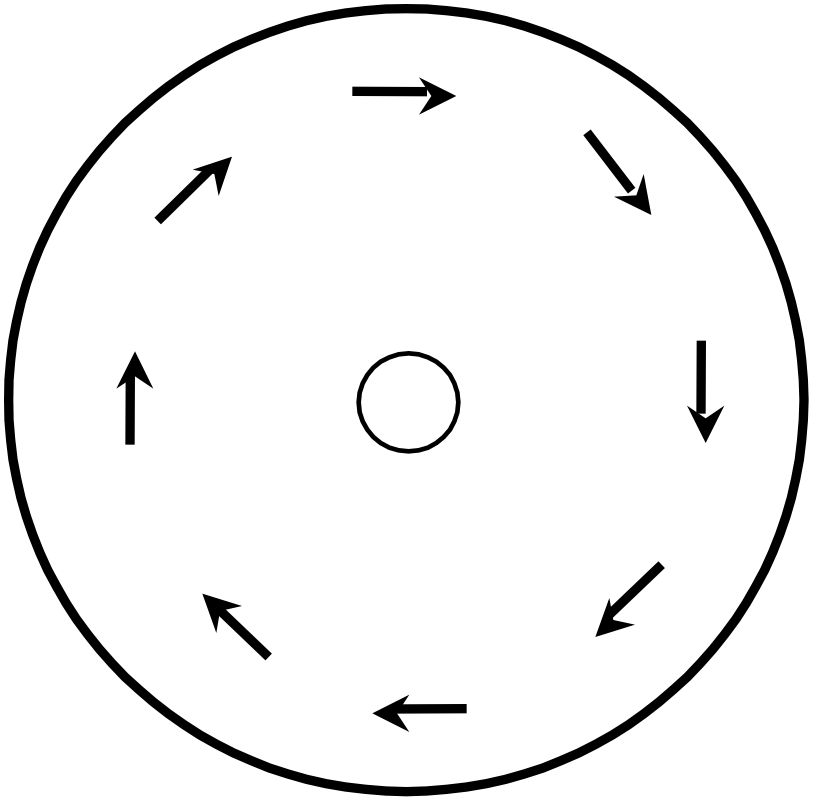
What are the key components???

- the Inlet,
- the "Outlet",
- the sludge collection, and
- The OPERATOR!!!

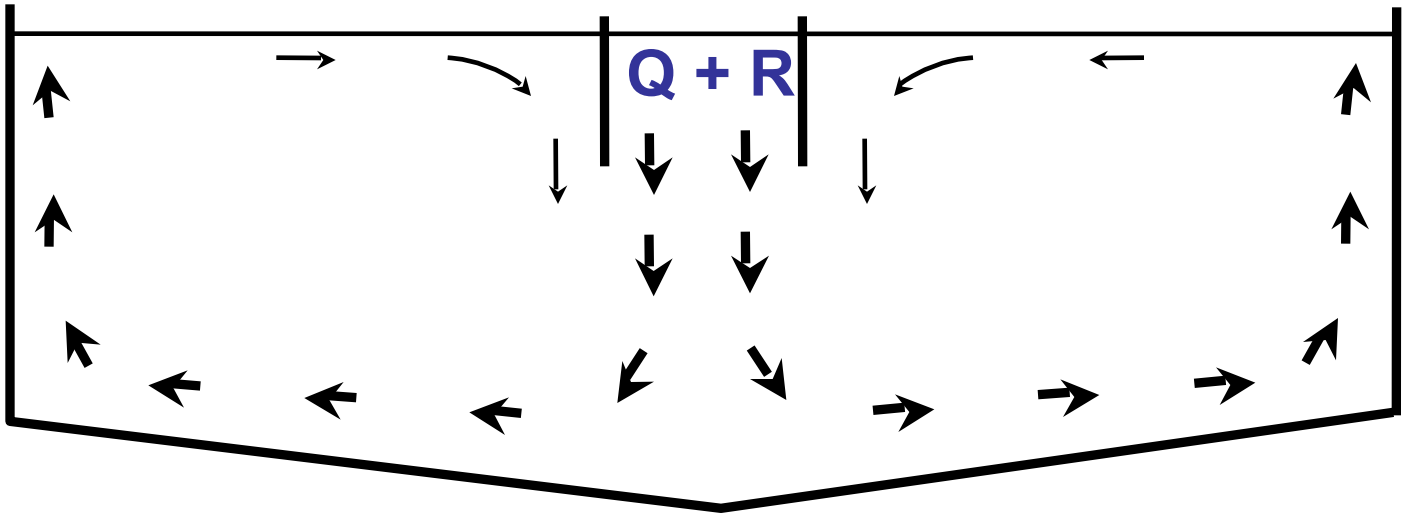
Theoretical Flow Pattern in a Circular Clarifier:



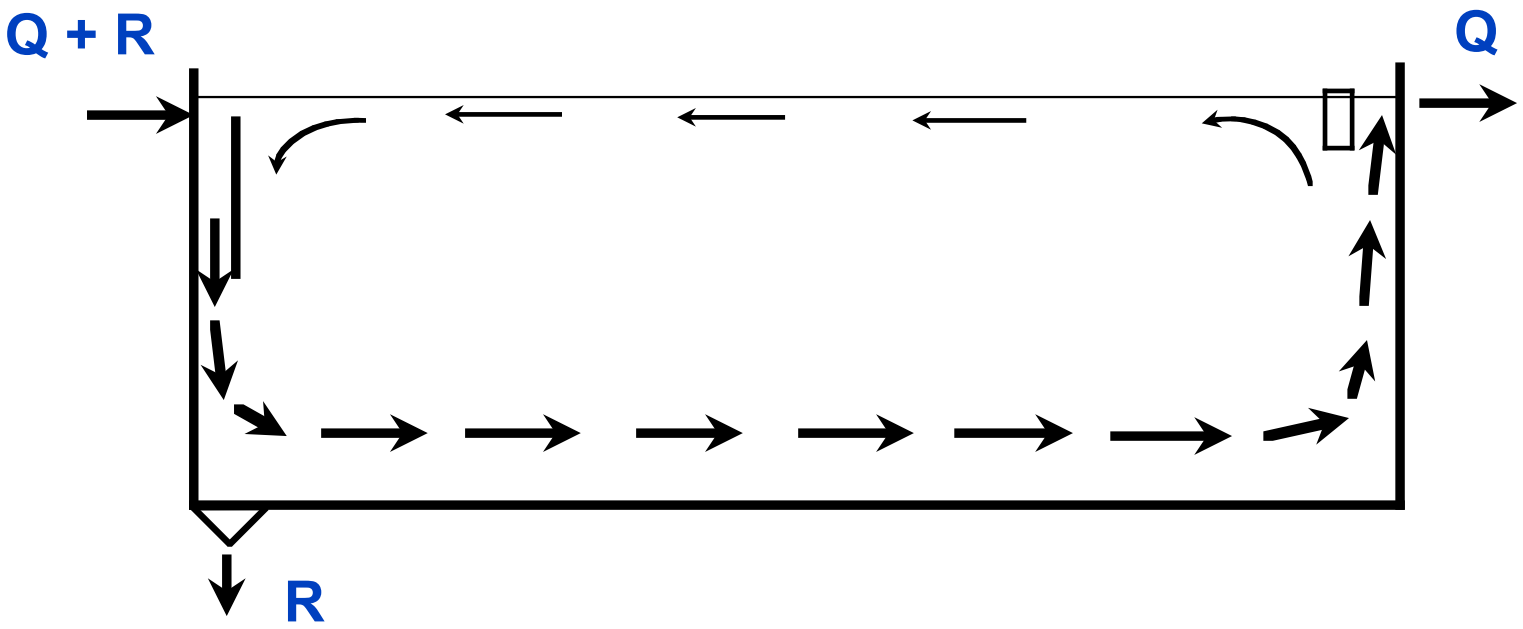
Actual Flow Pattern in a Circular Clarifier:



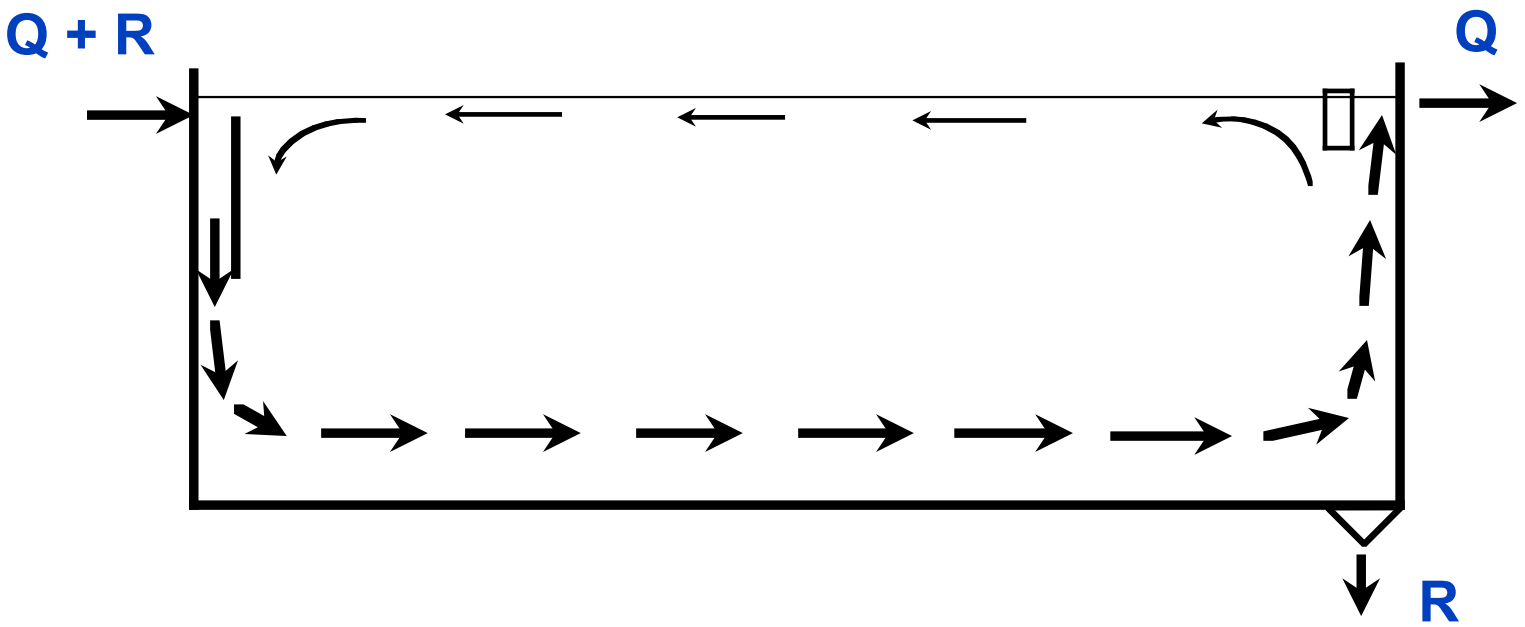
Typical Flow Pattern in an Activated Sludge Circular Clarifier:



Typical Flow Pattern in a Rectangular Clarifier:



Typical Flow Pattern in a Gould Type I Clarifier:



Rule #1: Focus on field testing!!

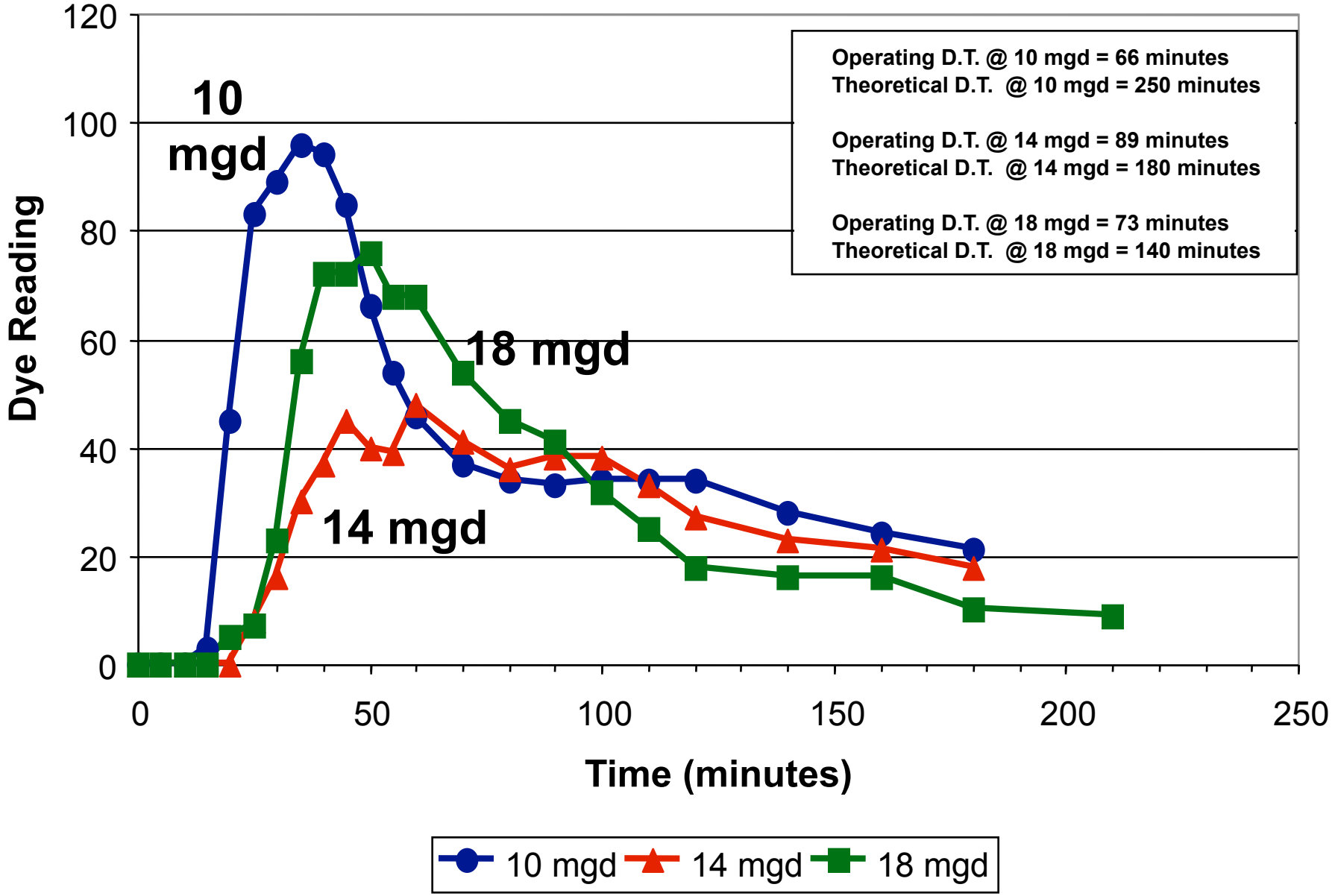
What do we have to evaluate???

- The hydraulic conditions (dye test)
- The currents (drogue test)
- The blanket formation (VSPs)
- Settling characteristics (DSS/FSS)


If this is what you see …..


This is how you react ……
Block off the “offending” weirs!!

NE WWTF Clarifier #3 Detention Time Comparison



Drogue Testing:

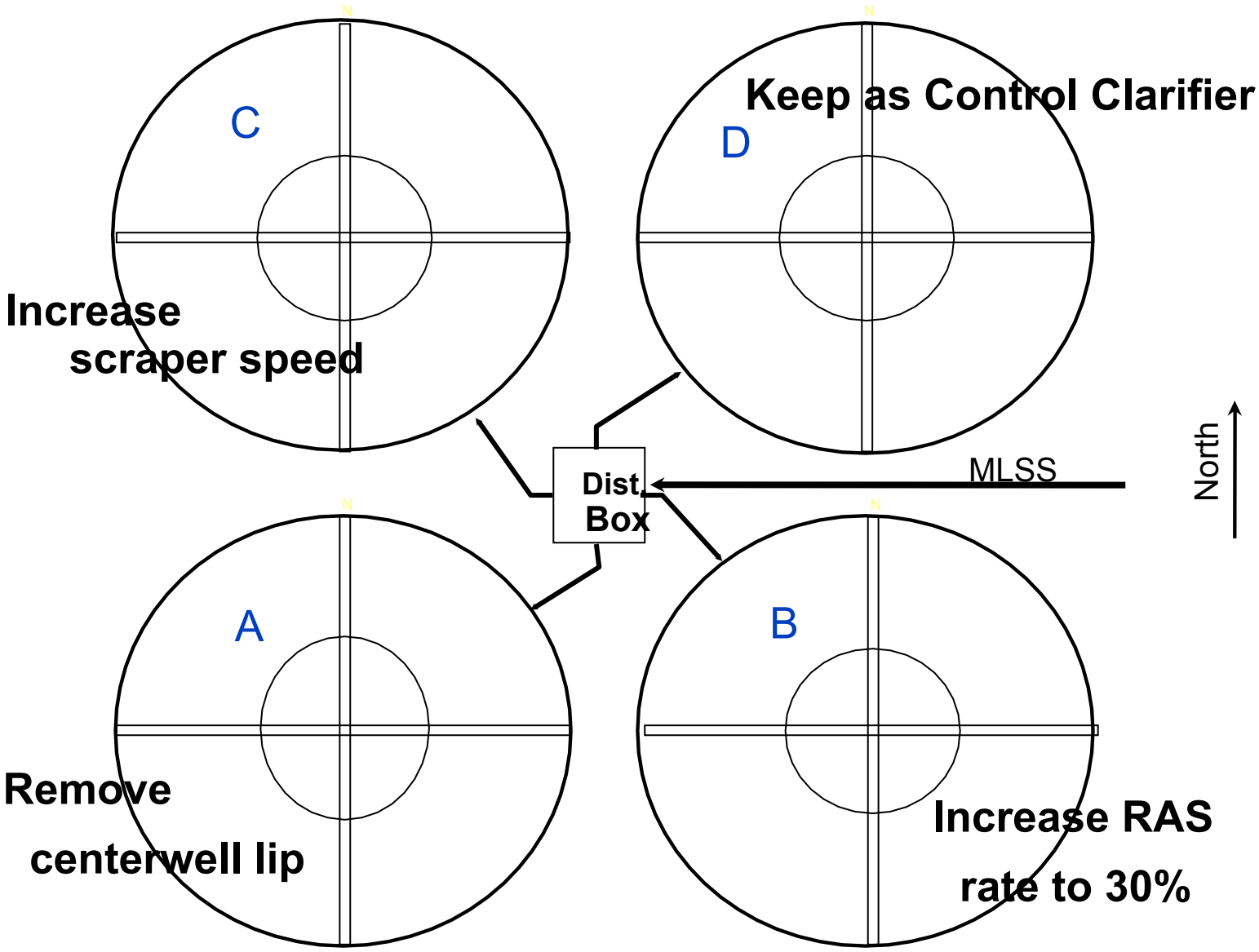
- A drogue is a simple device used to measure the current in a bay or a stream ….. or in a clarifier.

Ed Crevetti (Amesbury, MA) prepares the drogue for a test run…..

9/15 @ 0700 hrs #3FC @ 10 mgd

LOCATION	7’	12’	15’	45’	70’	
-1’	.92	.85	.04	.03	.03	
-2’	.85	.84	.04	.03	.03	
-3’	.80	.84	.04	.03	.03	
-4’	.80	.85	.04	.03	.03	
-5’	.80	.85	.04	.03	.03	
-6’	.78	.84	.04	.03	.04	
-7’	.69	.82	.04	.03	.04	
-8’	.69	.80	.04	.03	.05	
-9’	.68	.76	.04	.03	.05	
-10’	.65	.71	.03	.04	.05	
-11’	.63	.67	.03	.04	.05	
-12’	.62	.65	.47	1.20	5.10	
-13’	.61	.55	.58 ?	3.40		
-14’	.64 ?	.65 ?	.59			
-15’	.66	.65				
TOTALS	12	13	2	5	5	37

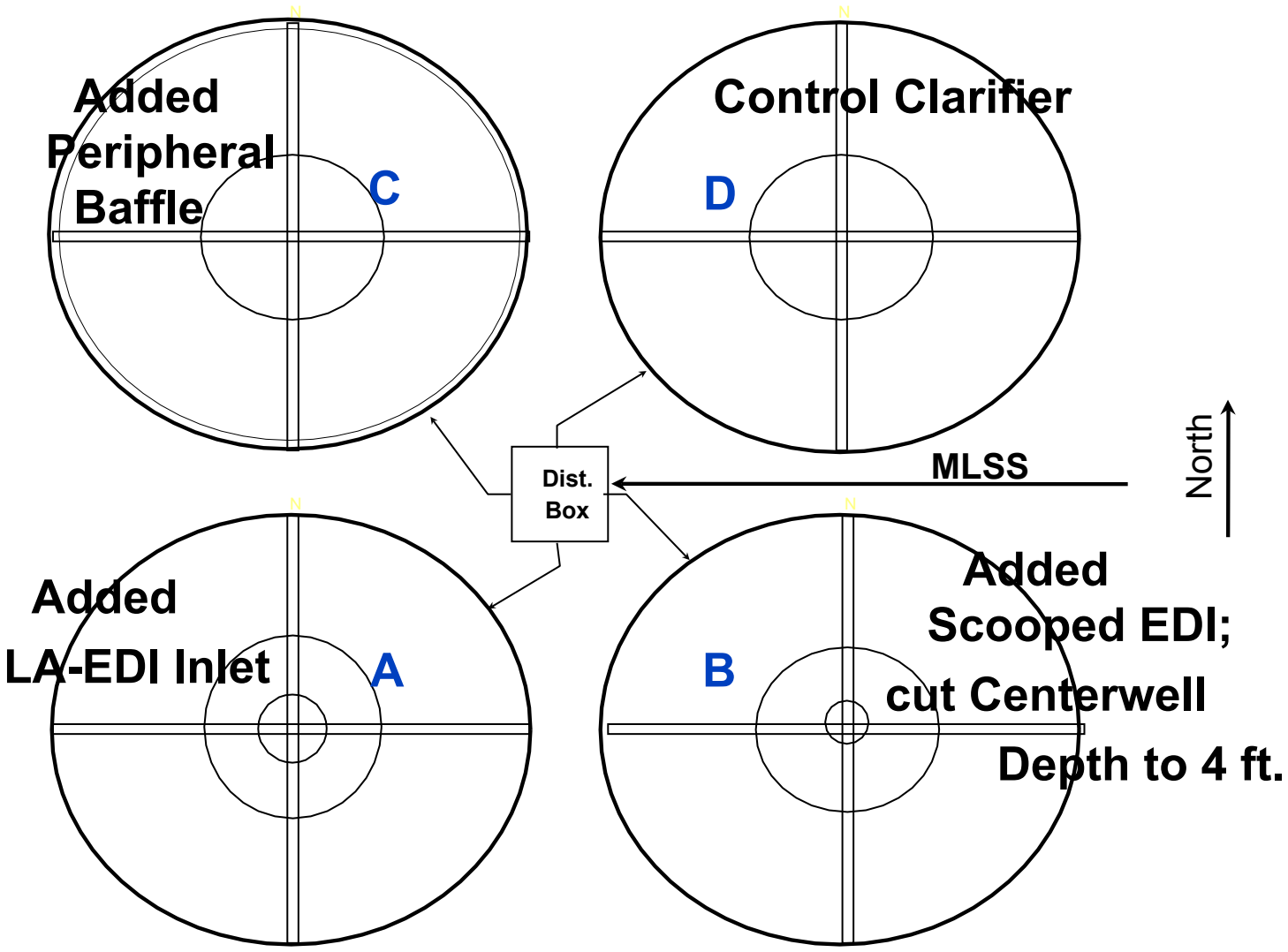
Initial Clarifier Changes



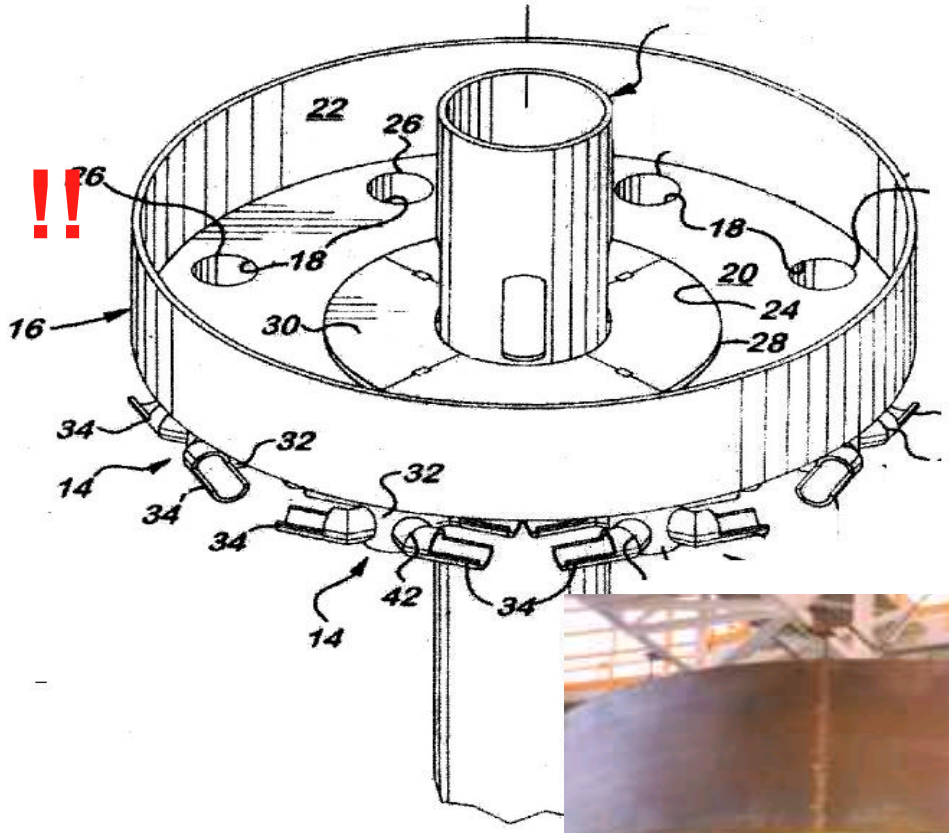
Oooooops!

They all failed just like before!!!


Now what do we do???


Added
Peripheral
Baffle
C
Control Clarifier
D
Dist.
Box
MLSS
North
Added
LA-EDI Inlet
A
B
Added
Scooped EDI;
cut Centerwell
Depth to 4 ft.

The solution??
Modify the inlet !!



"The LA-EDI was shown to double the capacity at LA-Hyperion"

WEFTEC*2005


Orlando - LA-EDI Type I

NYC-DEP Jamaica

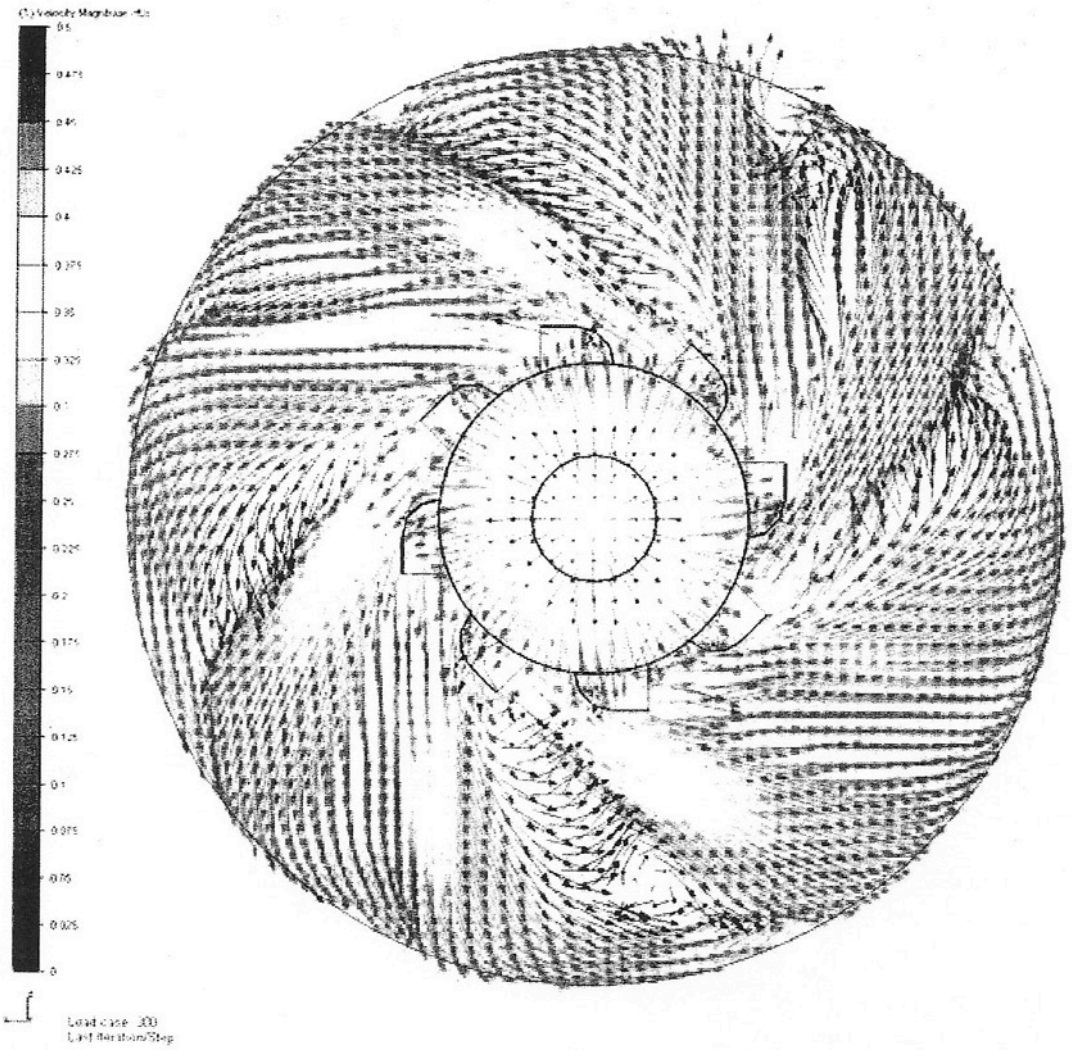

New Rochelle, NY


Billerica, MA

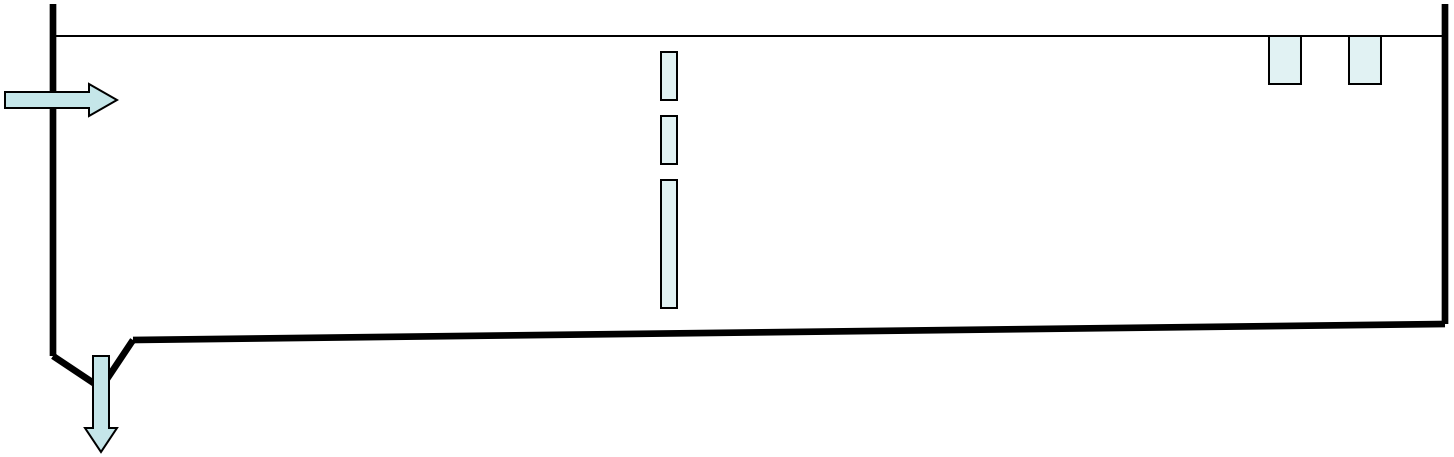

West Lebanon, NH


Never use this type EDI !!!

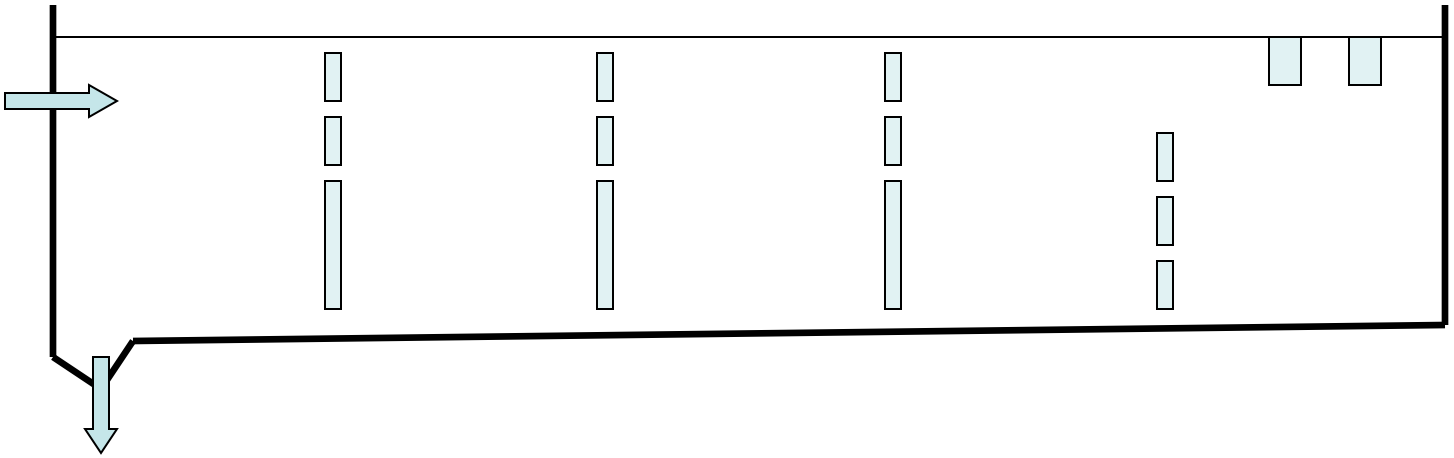
Figure 2: Flow Vectors CSE IDW XZ Plane



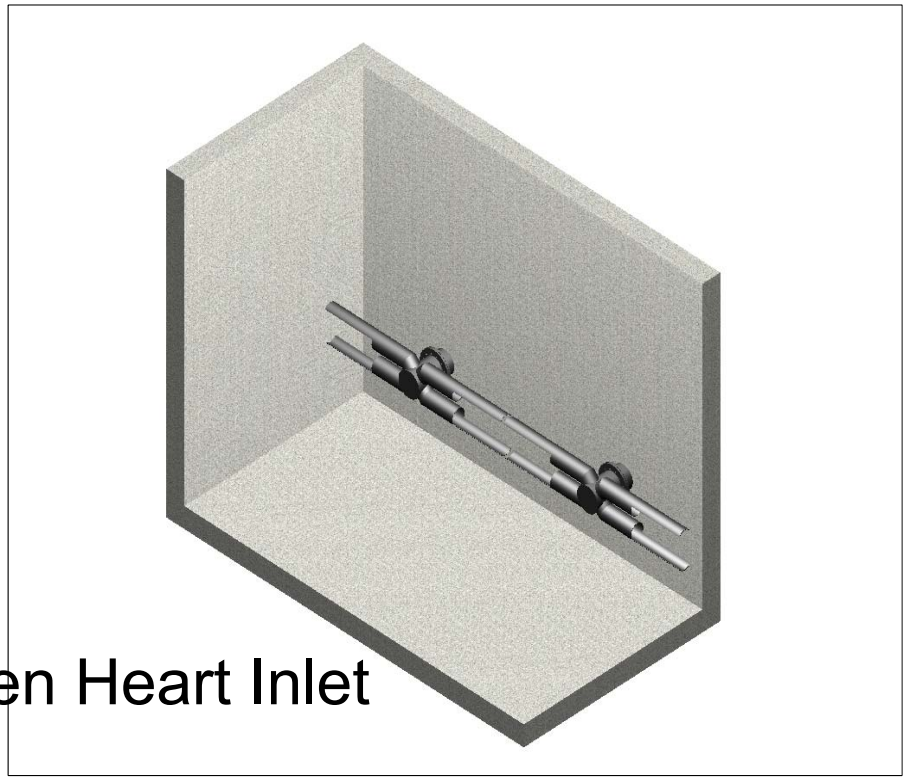
Single Mid-Tank Baffle



Multiple Baffles



Typical L.A Inlet Nozzles



Sample Golden Heart Inlet Rendering

Figure 1

Golden Heart Test Baffle Locations

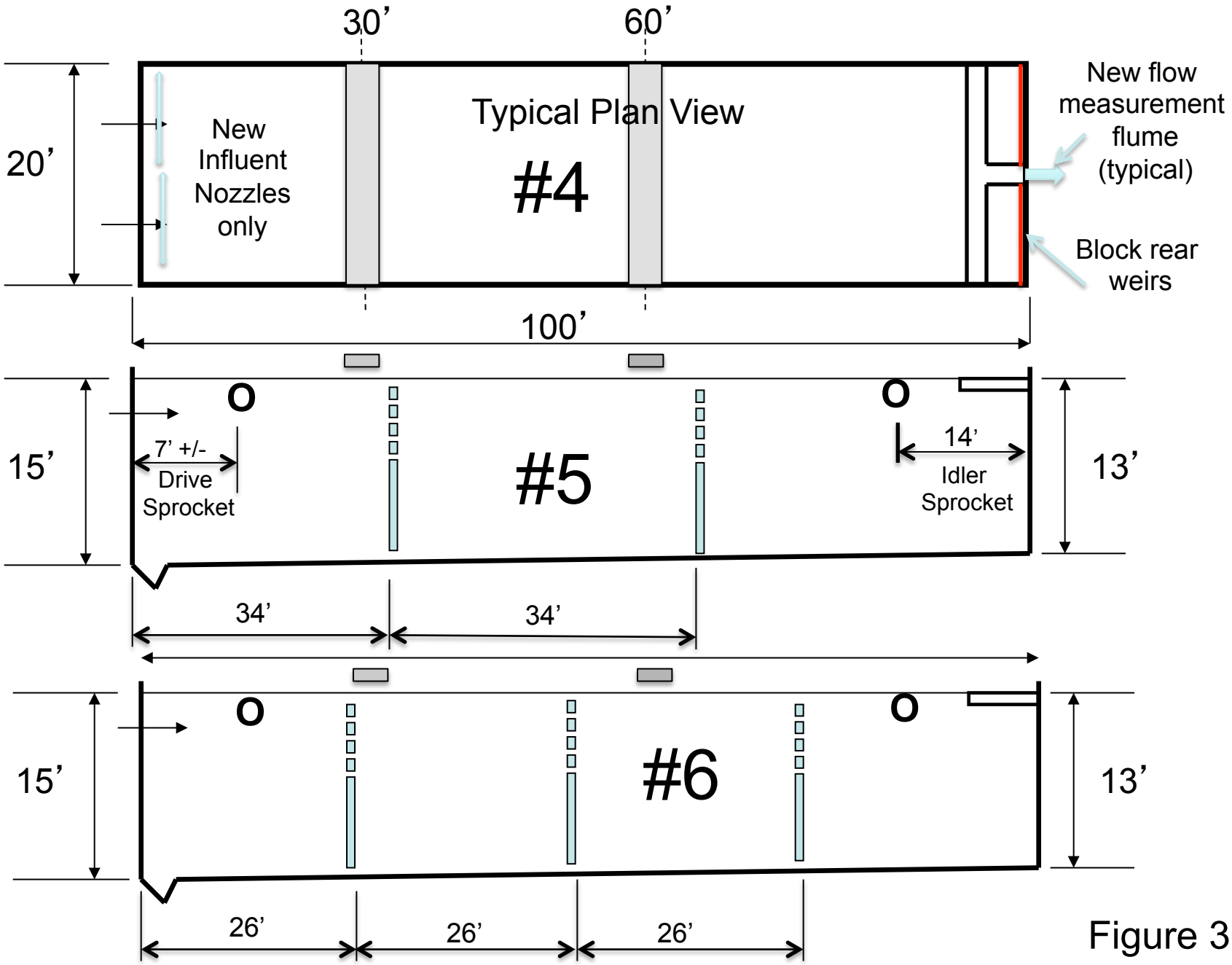
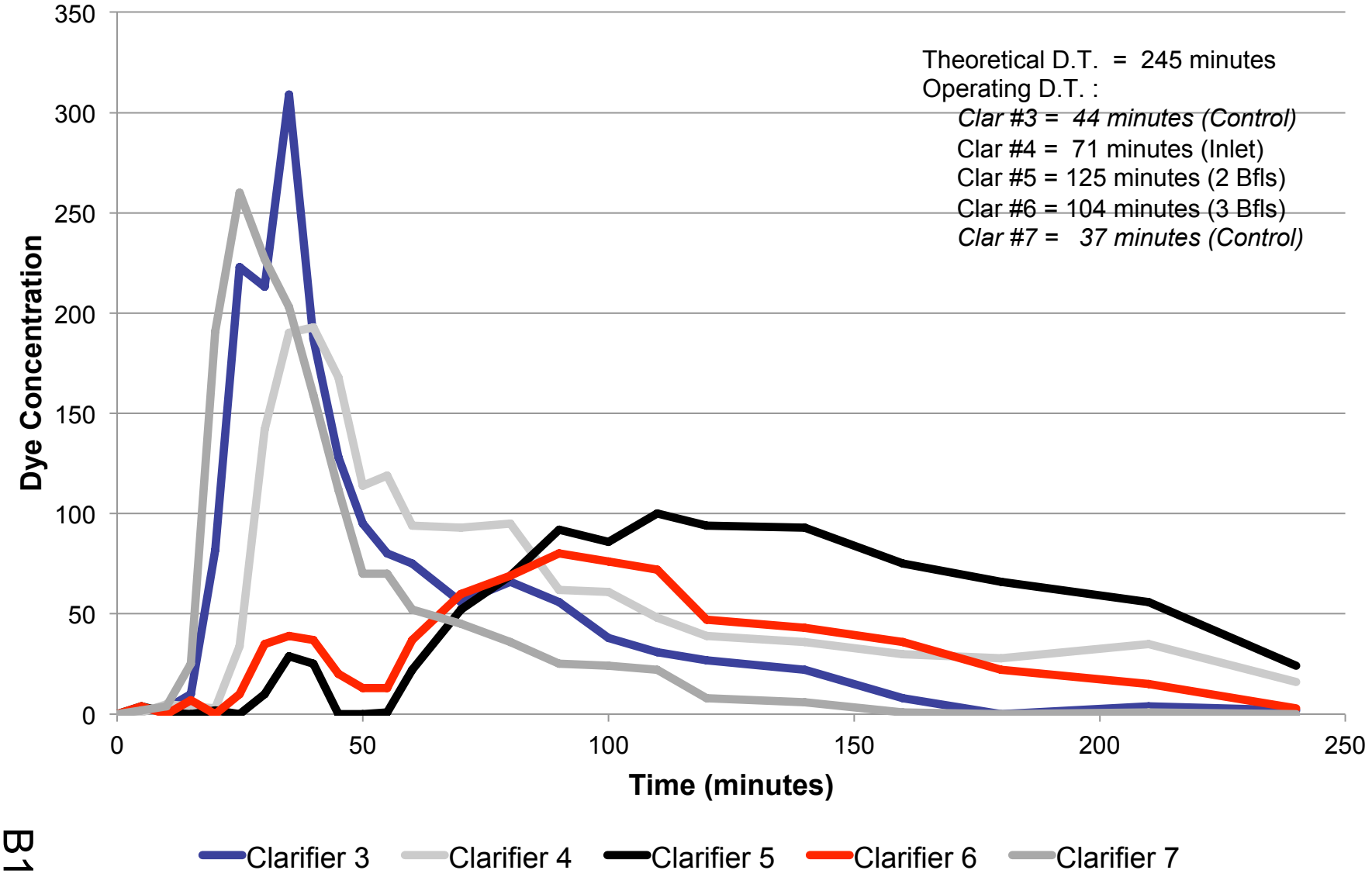


Figure 3

Fairbanks Clarifier Dye Curve Comparison at 1.3 mgd/clarifier
SOR = 650 gal/sq ft/day



B1

Evaluating the "World's Worst Clarifier"

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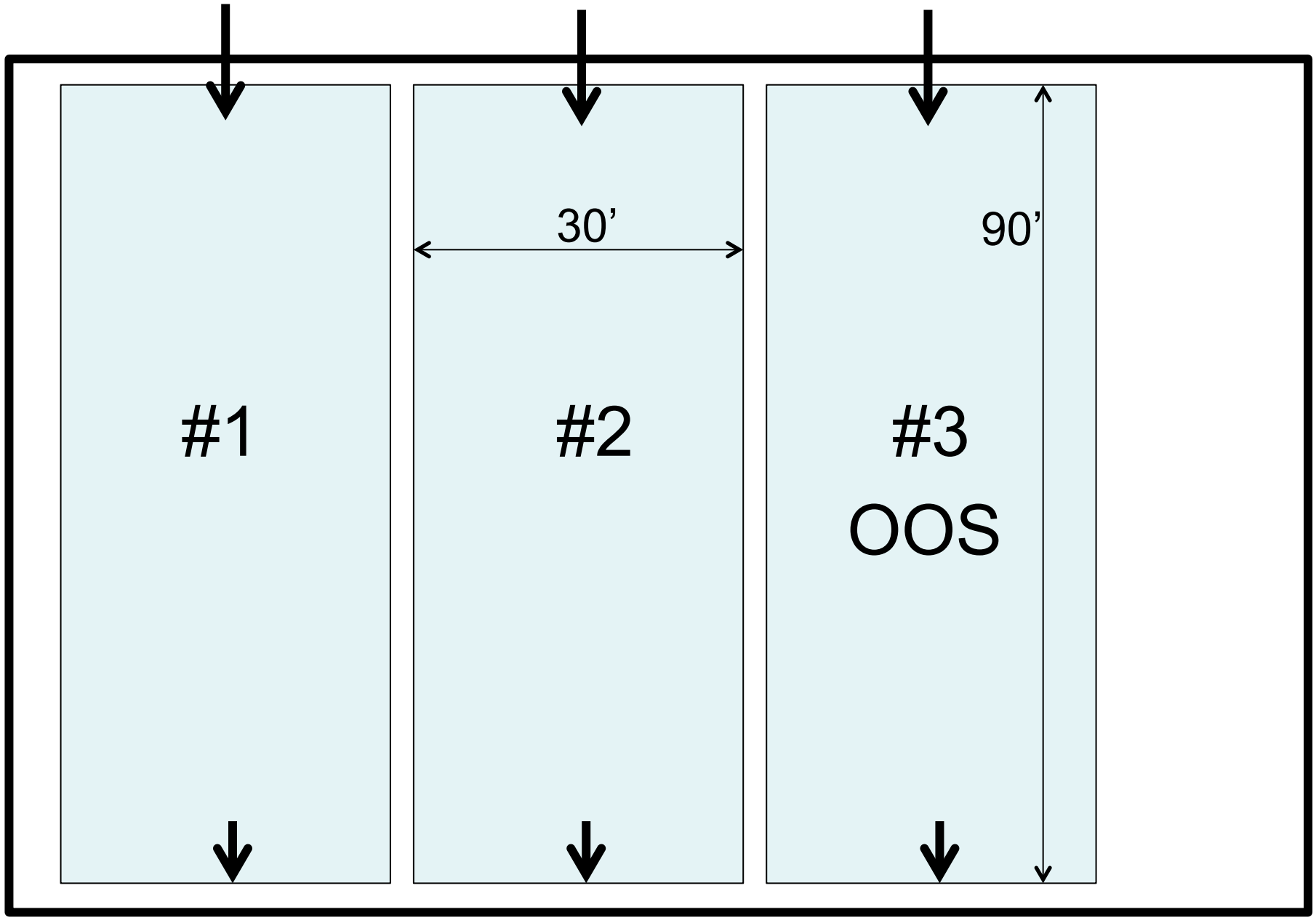
C.P.E., Inc. / Clarifiers, Inc.
Enfield, NH


30’
90’
#1
#2
#3
OOS


THE BAFFLE IS ROUGHLY 7.5' OFF THE FLOOR, WHAT HEIGHT MIGHT BE THE BEST?
THE HEIGHT OF THE FLIGHT AND CHAIN ASSEMBLY IS ROUGHLY 10.25"

Now …… what can we do????


AERATION AIR
11/20/2015 12:06

T.S.S. and V.S. Bench Sheet

(Standard Methods 2540 D)

Analyst: Curt

Date: 12-9-15 **Time In:** 08:53-09:55 **Time out:** 09:25-11:25 Time in2: 10:55 Time out2: 11:55

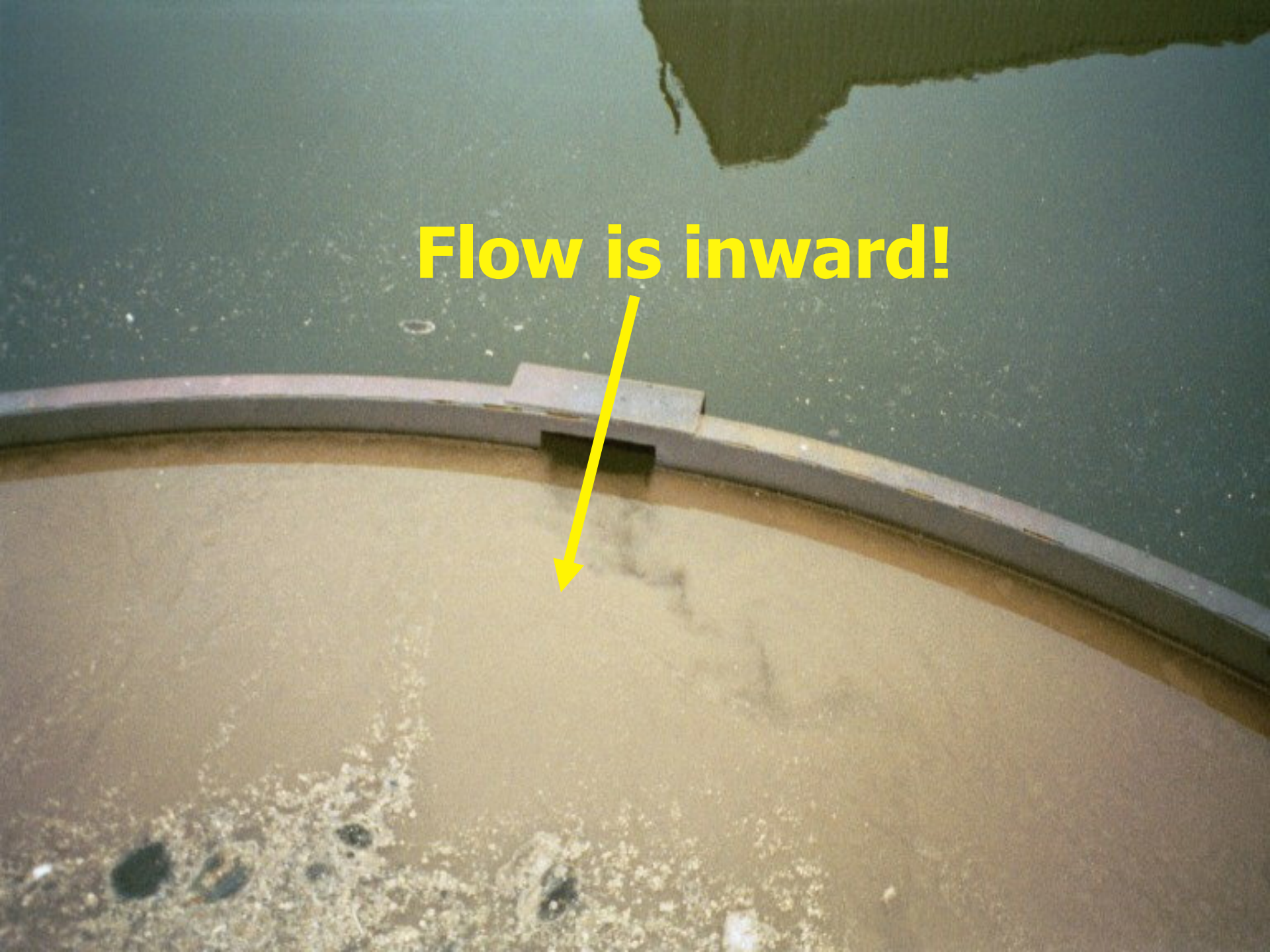
Sample/Sample Date			#3 2° comp. 12-8		30 min. settleometer 12-8		30 min. wahlometer 12-8			
mLs of Sample Filtered			100	100	100	100	100	100		
Filter #			1	2	3	4	5	6		
Filter and dry sample Wt. (g)			0.1115	0.1116	0.1104	0.1110	0.1109	0.1110		
Filter Wt. (g)			0.1110	0.1112	0.1102	0.1107	0.1106	0.1108		
Dry Sample Wt. (g)			0.0005	0.0004	0.0002	0.0003	0.0003	0.0002		
TSS (mg/L)			5	4	2	3	3	2		
Average TSS (mg/L)			4.5		2.5		2.5			
Ash and Filter Wt. (g)										
VSS Wt. (g)										
VSS (mg/L)										
Average VSS (mg/L)										
% VSS										
% Reduction										

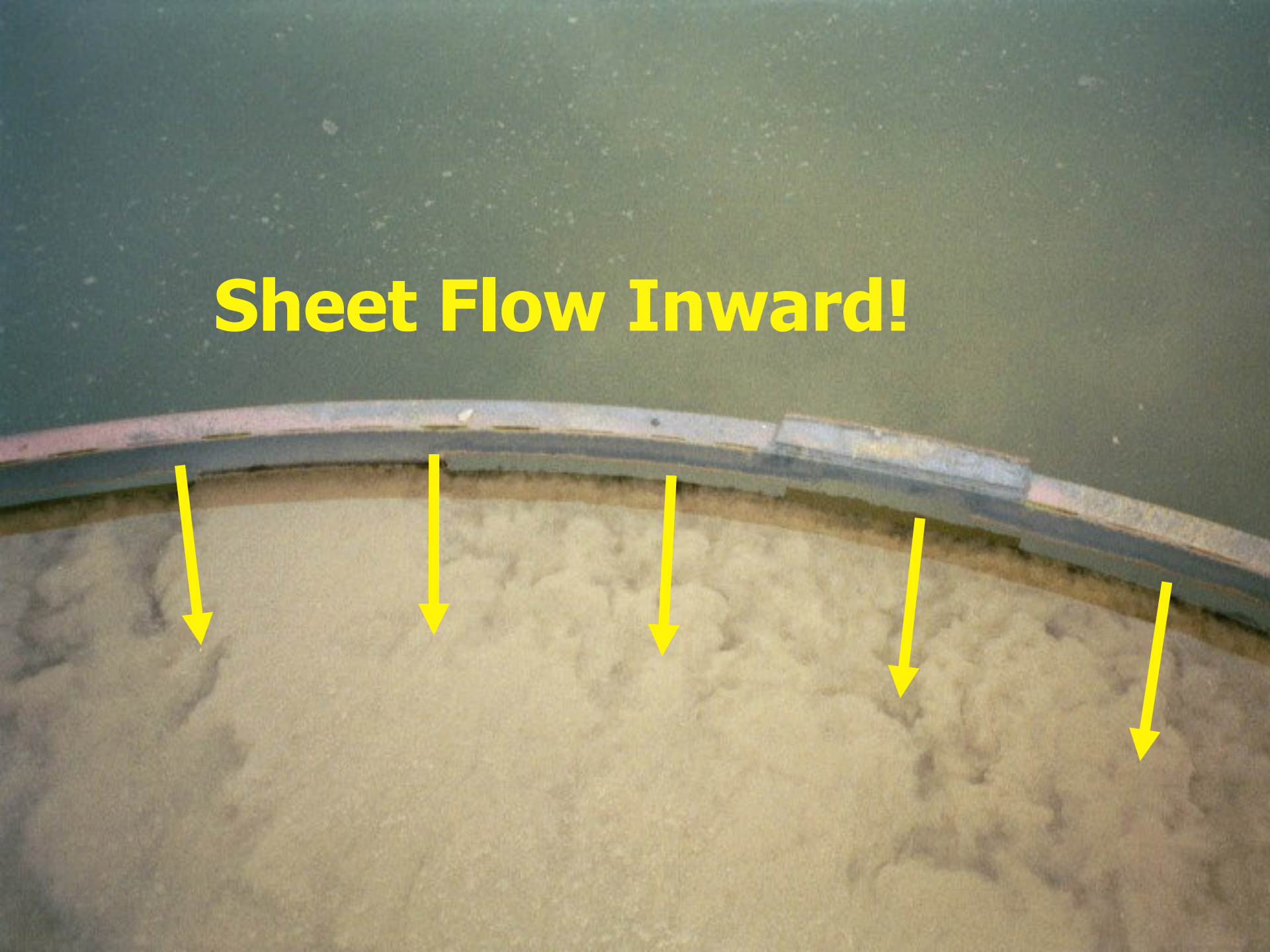
QC Checked by: _____ Date: _____ Lab Supervisor: _____ Date: _____ % Reduction: _____

C:\Documents and Settings\All Users\Documents\Lab\Emmet lab forms and SOPS\Emmett benchsheet mastercopies\Solids

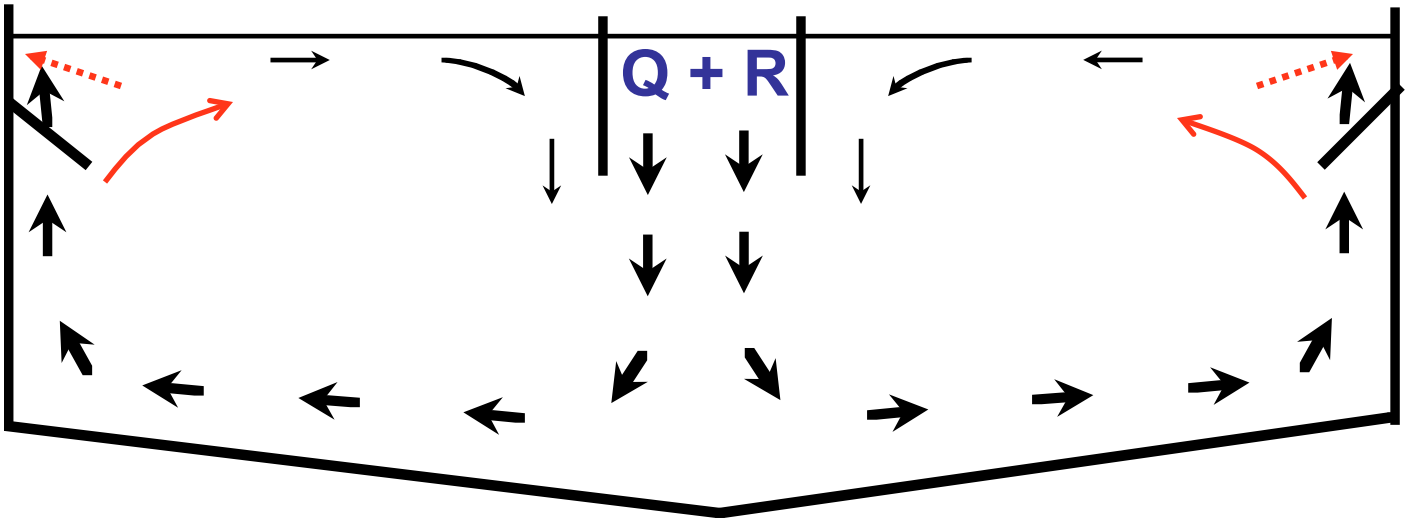

What to do about
Centerwell Scum ??

Submerged Centerwells?


Flow is inward!


Sheet Flow Inward!

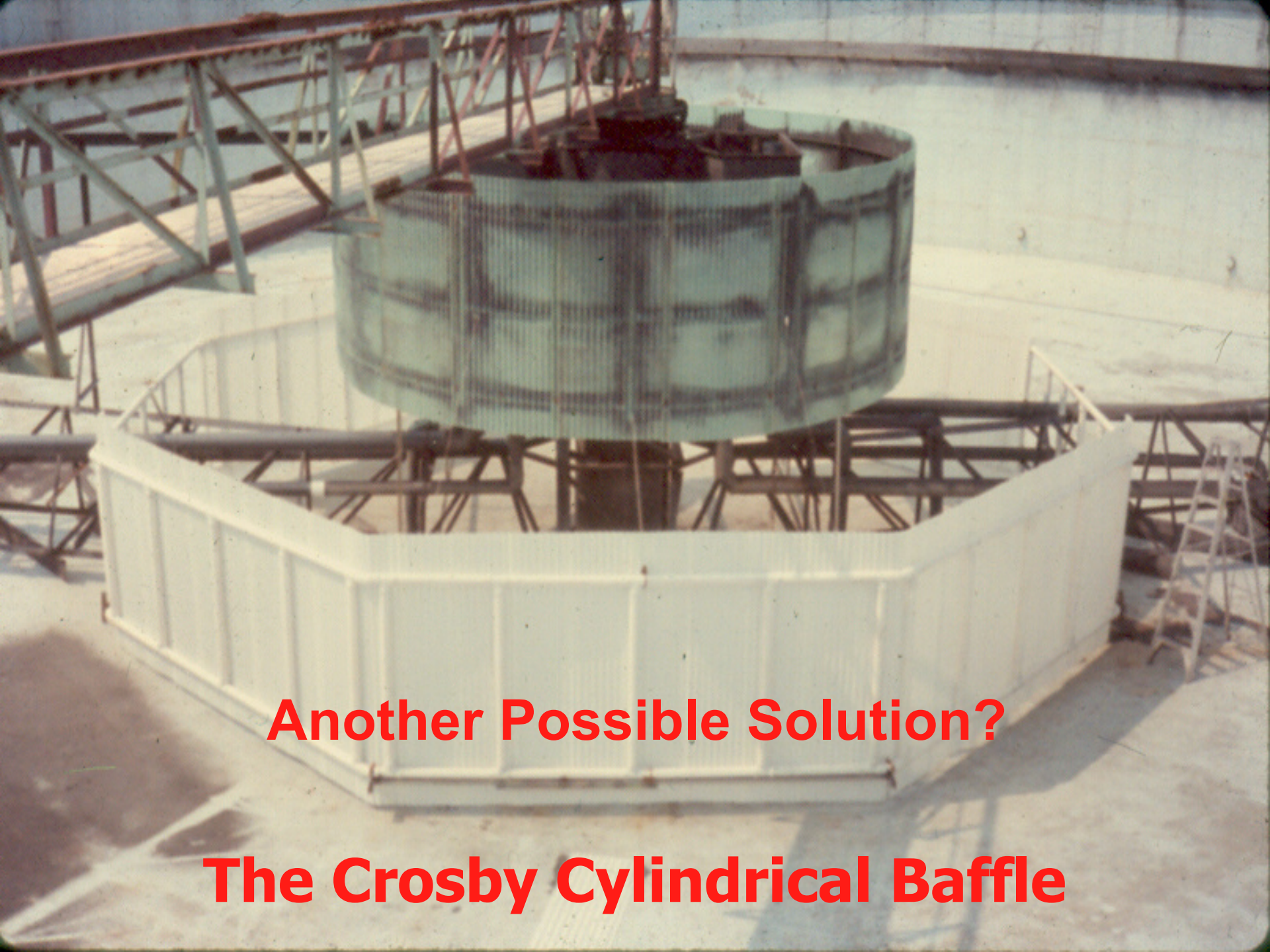
Modifying the
Typical Flow Pattern
in a Circular Clarifier:



…… with a Crosby (Stamford) peripheral baffle.

Too much of a good thing!!

Miami South plant

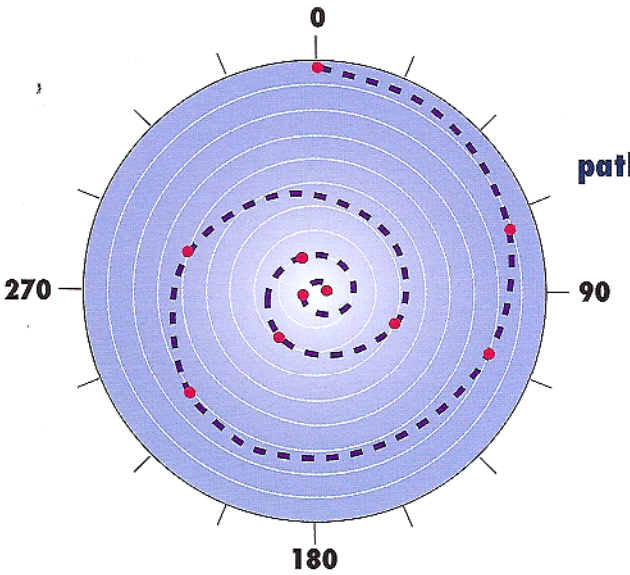

Another Possible Solution?
The Crosby Cylindrical Baffle


Norwalk, CT


KOMATSU


These scrapers are NOT
the major motive force
for the RAS flow!

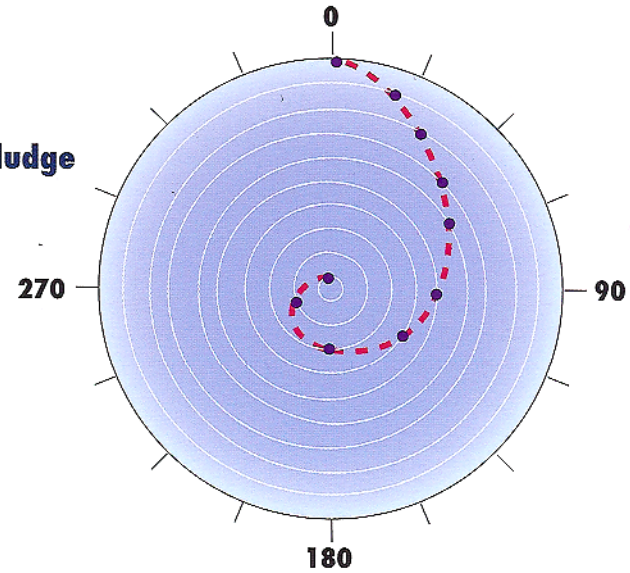
6. CUSTOMIZED SPIRAL RAKE BLADES



path of sludge

CONVENTIONAL SLUDGE TRANSPORT

Diameter = 200 ft
Tip Speed = 10 fpm
Time = 4.6 hours



SPIRAL TRANSPORT

Diameter = 200 ft
Tip Speed = 12.5 fpm
Time = 1.1 hours

A tapered spiral blade rake arm can increase sludge transport capacity by four to five times over conventional segmented rakes.

The World's Biggest Paperweight???


Solids plume at wall!
WHY??


The solution??
Standard Scrapers!!


Passaic Valley, NJ
2012.02.17 15:01


There’s more to life than clarifiers!

WWW.CLARIFIERS.COM