

# Take it to the Limit

## Plant Hydraulic Testing at Maximum Instantaneous Capacity

PNWS April 2022

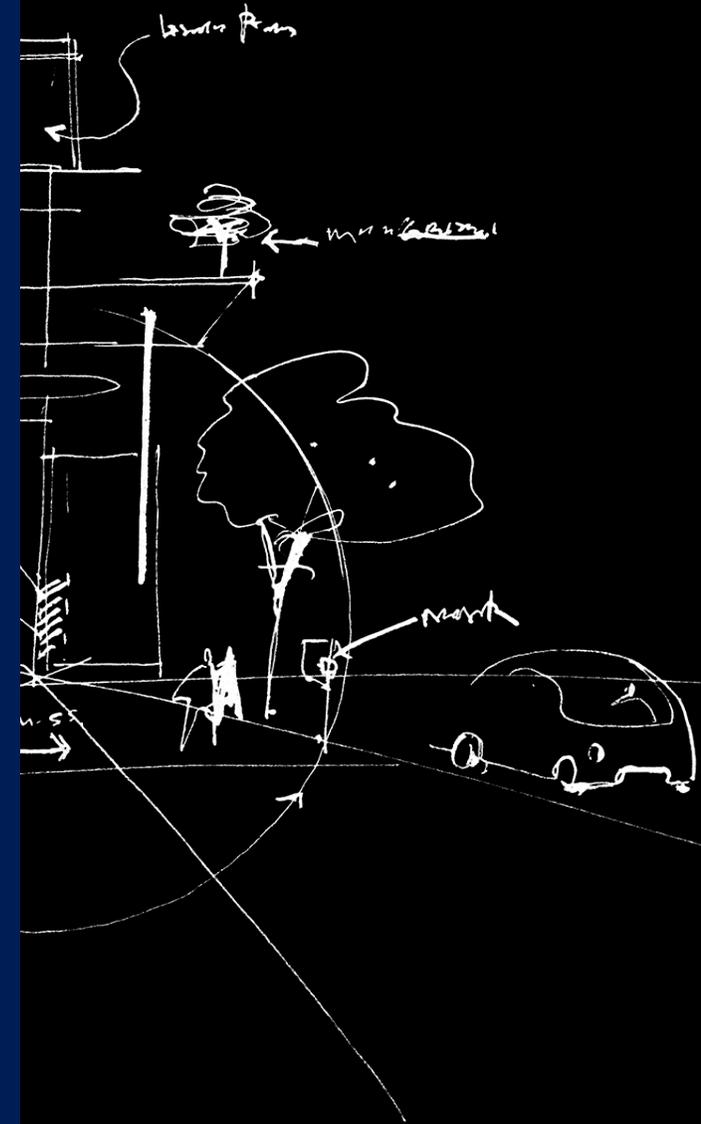
# What's Your Capacity



# Roadmap

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- Hydraulic Models
- Master Planning
- Planning the Test
- Evaluating the Risks
- Conducting the Test



# Gwinnett County Water Production

- Gwinnett County, Georgia
- Atlanta Metro Area
- Lanier Filter Plant – 150 MGD
- Shoal Creek Filter Plant– 98 MGD
- Pre-Ozone Disinfection
- Direct Filtration
- High-Rate Filtration





Filter Building 2

37 MG Reservoir

Pretreatment

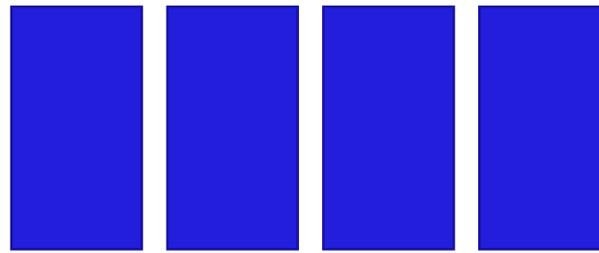
Finished Water Storage And High Service Pumping

Ozone

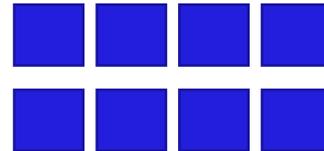
Filter Building 1

Residuals

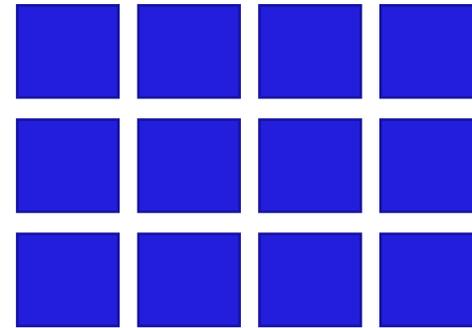
Ozone Contactors



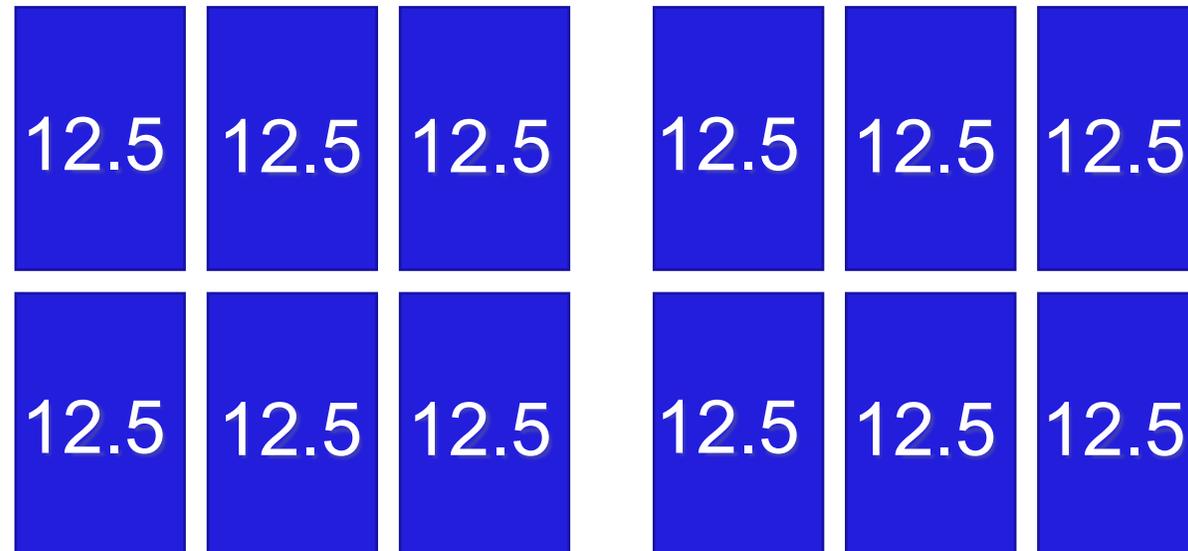
Rapid Mix/Flash Mix



Flocculation



Filters

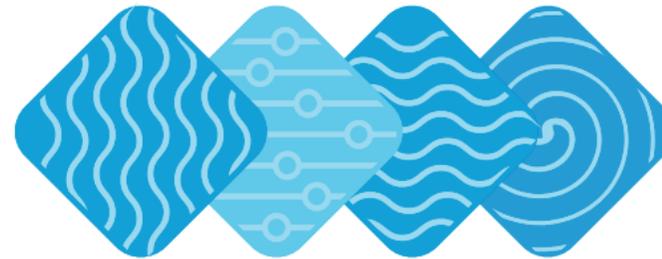


Lanier Filter Plant

12.5 MGD  
x 12 Filters  
150 MGD

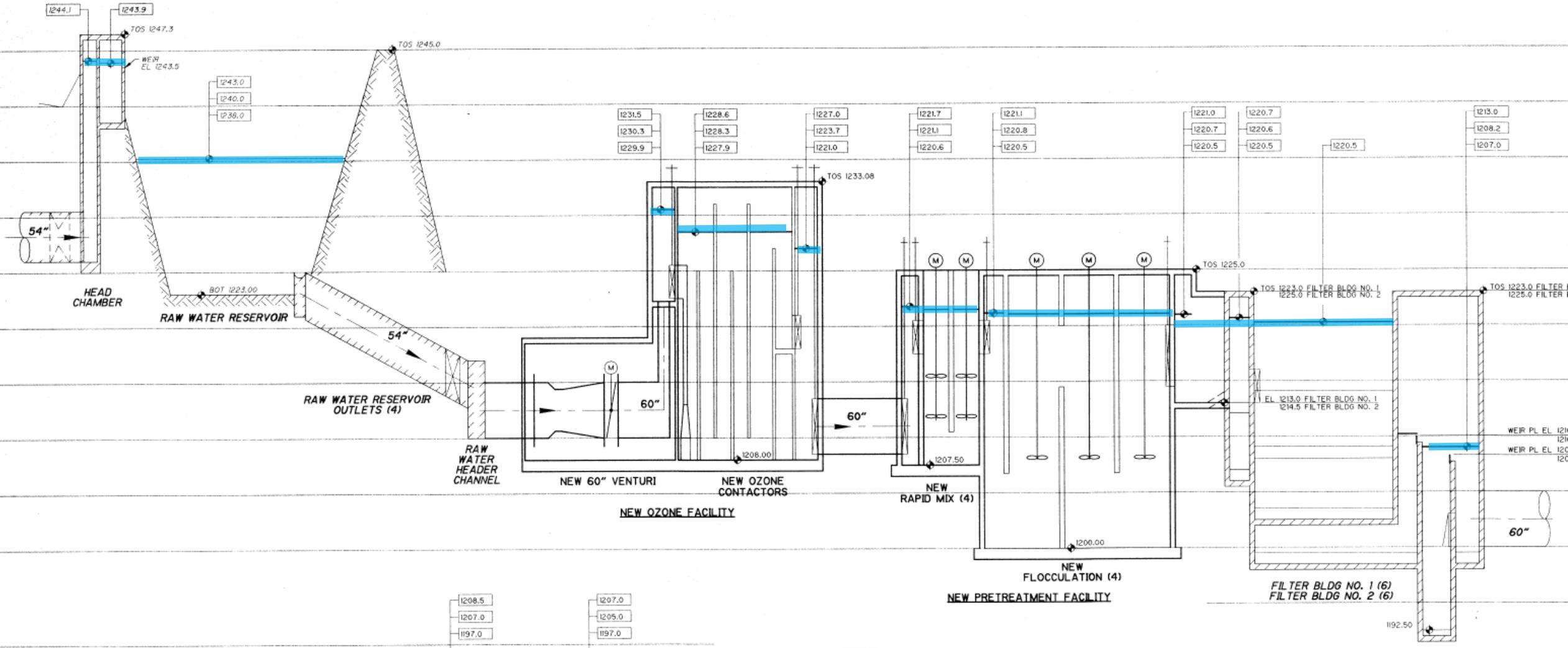
# Hydraulic Modelling

- Models for Design and Planning
  - Equipment Selection
  - Hydraulic Analysis
  - Control Strategies
- Modelling for Optimization
  - Confirm Limitations
  - Offline Analysis
  - Operator Training
  - Develop Operational Procedures
- Dynamic Process Simulation
- Theoretical Models
  - Ideal Conditions
- Calibrated Models
  - Validated

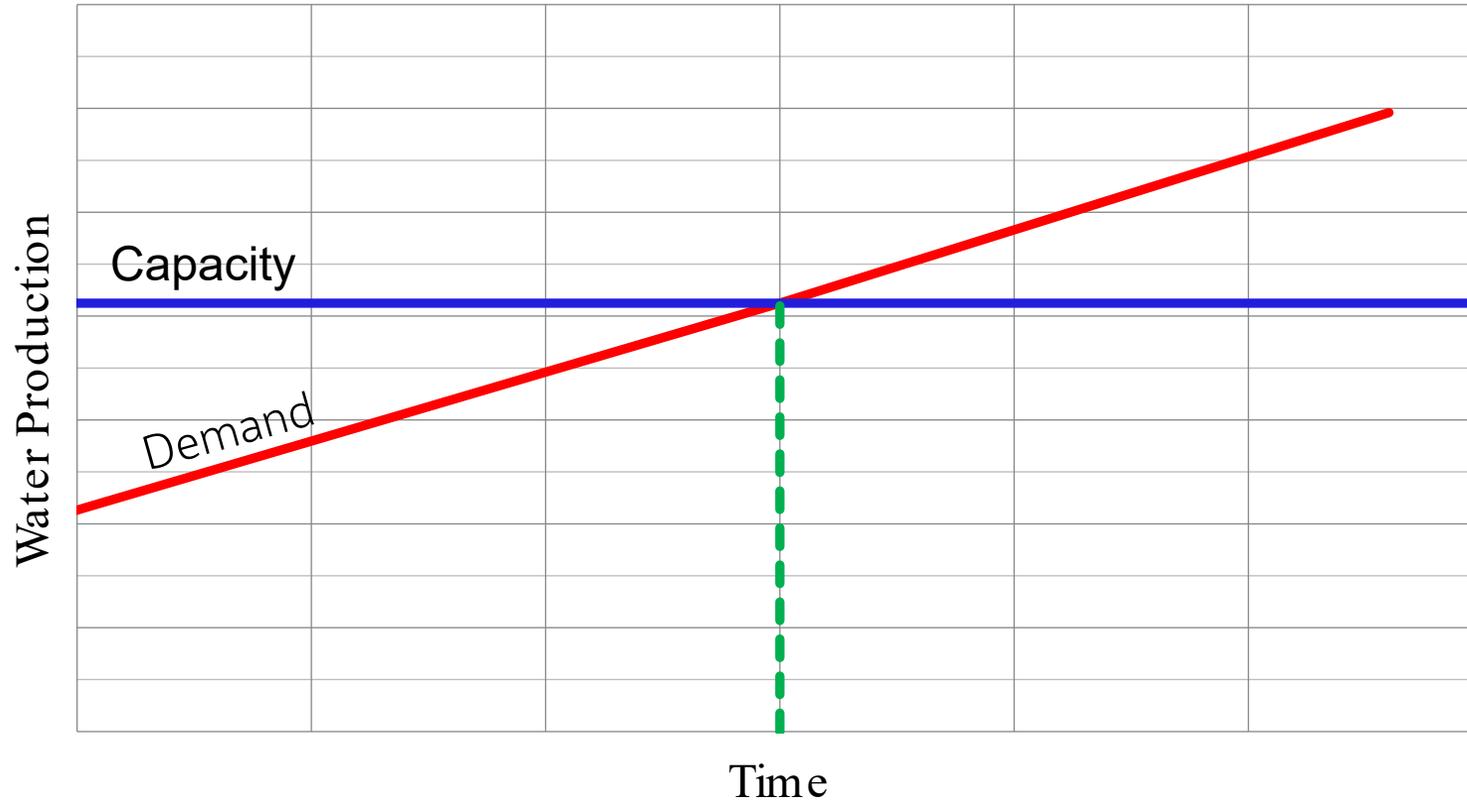


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# Plant Hydraulic Profile



# Master Planning



- Demand vs. Capacity
- Per Capita Use is Down...
- ...but Population is Growing

# Planning the Test

- Stakeholders
- Success Factors
- Risks
- Test Procedure
  - Go / No-Go
  - Alarm Reactions
  - Data Collection



# Stakeholders

- Operations
- Maintenance
- Instrumentation
- Engineering
- Modelling
- Regulators



# Success Factors



- Validate Specific Hydraulic Components of the Model
- Demonstrate Peak Filtration Rate
- Don't Break Anything

# Risk Categories

## Operational

SCADA  
Personnel Available

## Chemical

Automation  
Flow Pacing

## Water Quality

Inline or Grab Sampling  
Filter Runtime

## Residuals Handling

## Hydraulic

Mechanical Equipment  
Overflows  
Finished Water Storage

# Risk Analysis

- Risk Register
- Probability
- Impact (or Consequence)

		Impact									
		1	2	3	4	5	6	7	8	9	10
Probability	1	1	2	3	4	5	6	7	8	9	10
	2	2	4	6	8	10	12	14	16	18	20
	3	3	6	9	12	15	18	21	24	27	30
	4	4	8	12	16	20	24	28	32	36	40
	5	5	10	15	20	25	30	35	40	45	50
	6	6	12	18	24	30	36	42	48	54	60
	7	7	14	21	28	35	42	49	56	63	70
	8	8	16	24	32	40	48	56	64	72	80
	9	9	18	27	36	45	54	63	72	81	90
	10	10	20	30	40	50	60	70	80	90	100

		Risk Rating				
		Consequences / Severity				
		Insignificant	Minor	Moderate	Major	Catastrophic
Probability	Rare	Low	Low	Low	Medium	Medium
	Unlikely	Low	Low	Medium	Medium	High
	Possible	Low	Medium	Medium	High	High
	Likely	Medium	Medium	High	High	Very High
	Frequent	Medium	High	High	Very High	Extreme

# Alarm Reactions

- Respond to Conditions
- Filter Effluent Turbidity
- Water Levels

# Test Procedure

- Sequencing
- Go / No-Go Checklist
- Schedule
- Assignments
- Response Plan
- Data Collection Logs

No.	Activity
1	Go/No-Go Meeting
2	Close Rapid Mix and Floc Trains Train 2
3	Record Baseline Water Levels
4	Close Filter Effluent Valves Train 2
5	Increase plant rate
6	Stabilize at higher plant rate
7	Continue incremental plant rate increase upto max
8	Record water levels during test
9	Discontinue test, ReOpen Train 2 Filter Effluent Valves
10	Reduce plant flow to normal operation

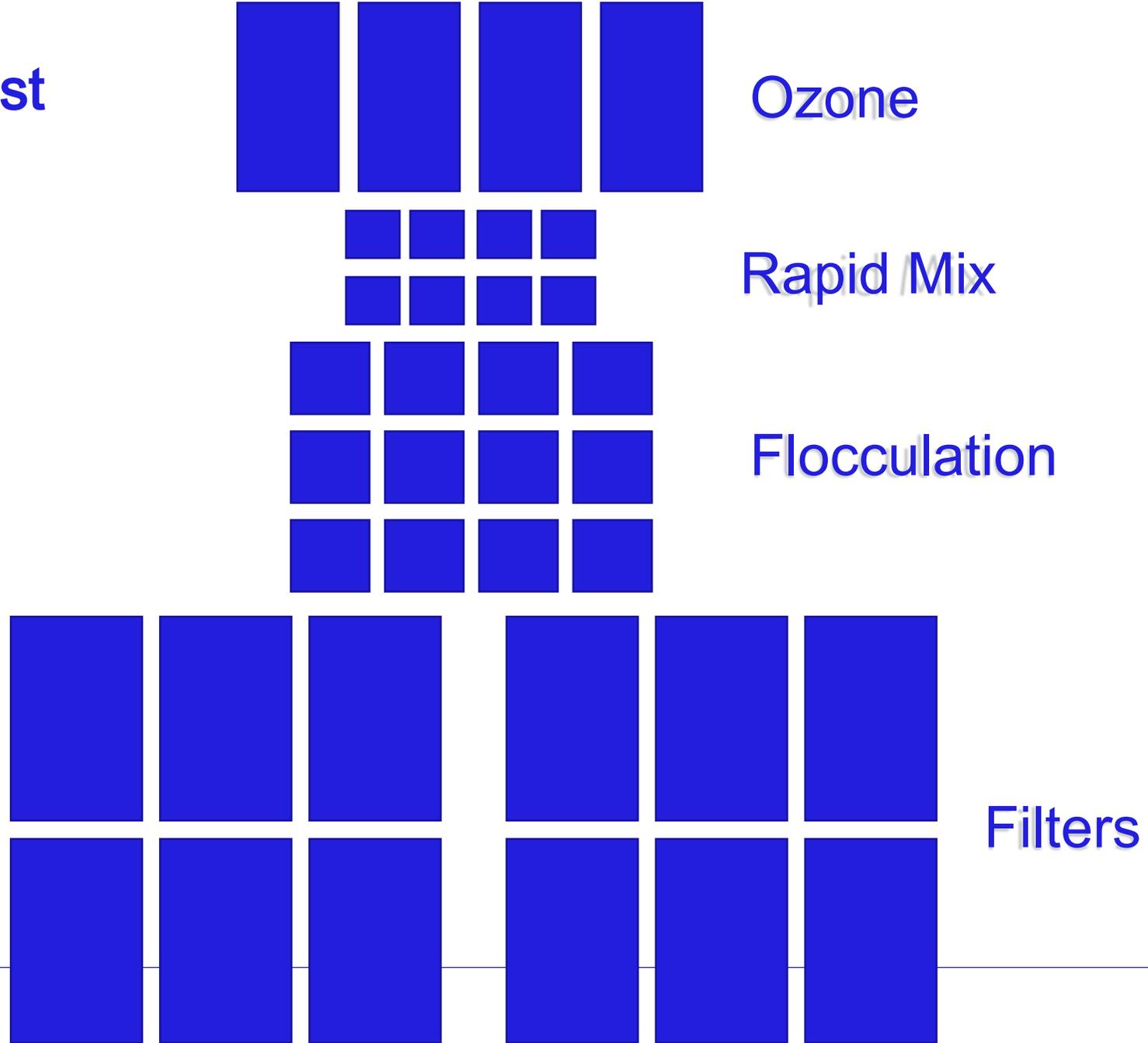
# Go / No-Go

- Checklist
- Reservoir Levels
- Equipment Status
- Go / No-Go Meeting
  - Stakeholders
  - Speak Up

Process/Facility	LFP	SCFP	Go/No-Go
RW Pump Stations	Maintain full reservoir	n/a	
RW Reservoirs/Diversion/Tanks	Maintain full reservoir	n/a	
Ozone	All contactors/generators online	n/a	
Pretreatment Influent Splitter Box	Temporary level gauges installed	n/a	
Pretreatment Overflow Channel	Key on operator to close valve	n/a	
Rapid Mix	1, 2 in Service; 3, 4 OOS	n/a	
Flocculation	1, 2 in Service; 3, 4 OOS	n/a	
Flocculation Effluent Channel	Isolation gate open	n/a	
Filters/Pipe Gallery	All filters in service, low hours	n/a	
Backwash System	On hold, no washing during test		
Clearwells	Confirm levels for capacity	n/a	
Chemical Feed Systems	Monitor Chlorine dose	n/a	
High Service Pump Station	n/a		
Backwash EQ Tanks	n/a	n/a	
Residuals Preclar/Sedimentation	n/a	n/a	
Residuals Dewatering	n/a	n/a	
Dist. System Tanks and Booster PS	n/a		
Construction Projects Ongoing	Notify Contractors on site of test	n/a	
Staffing	See Staff assignments	On-call	
SCADA/Instrumentation	No Current Alarms	PLC upgrades in progress	
Plant Security	Gates Closed During Test	n/a	

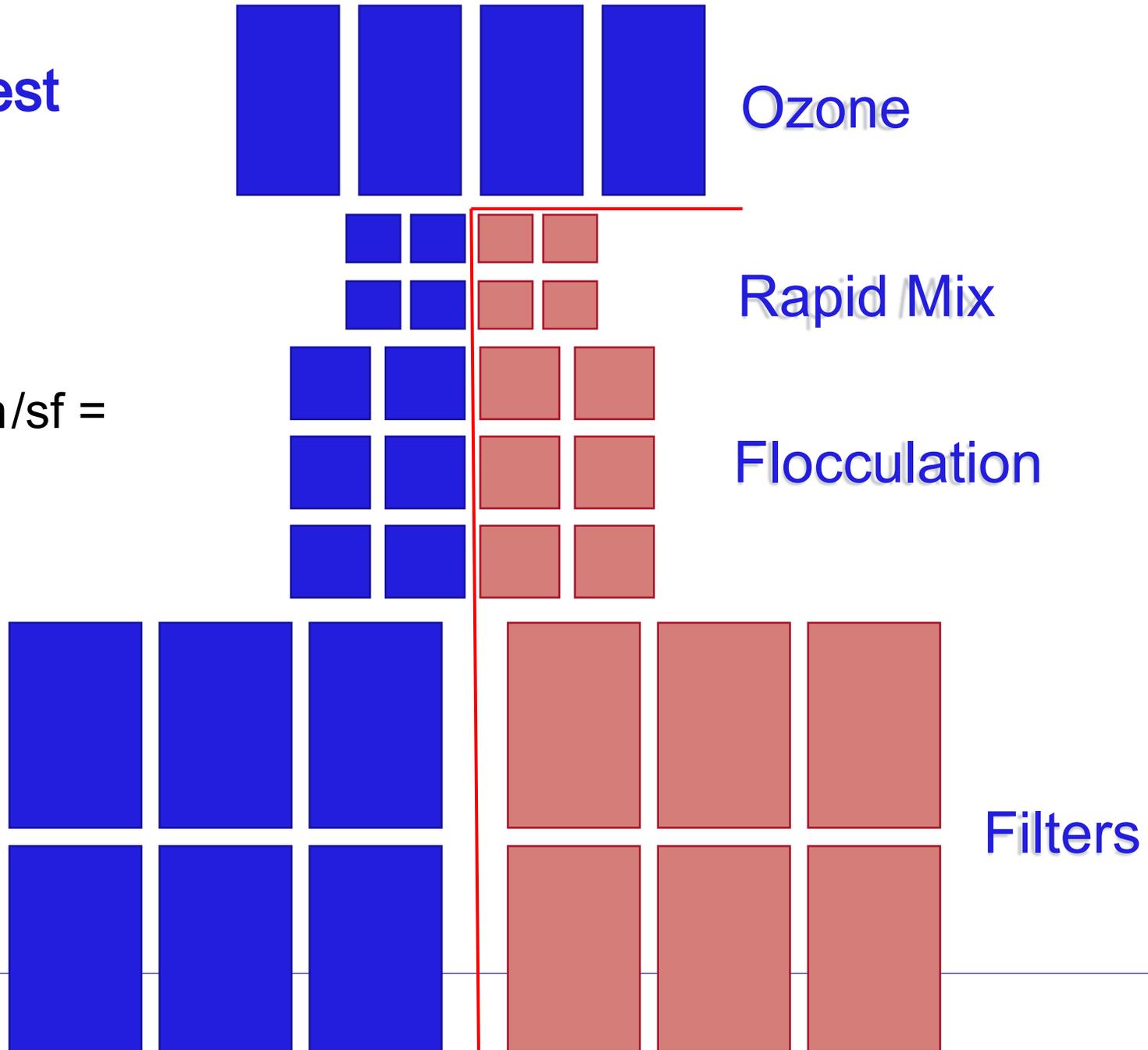
# Conducting the Test

- Goal: 7.5gpm/sf
- Risk Mitigation

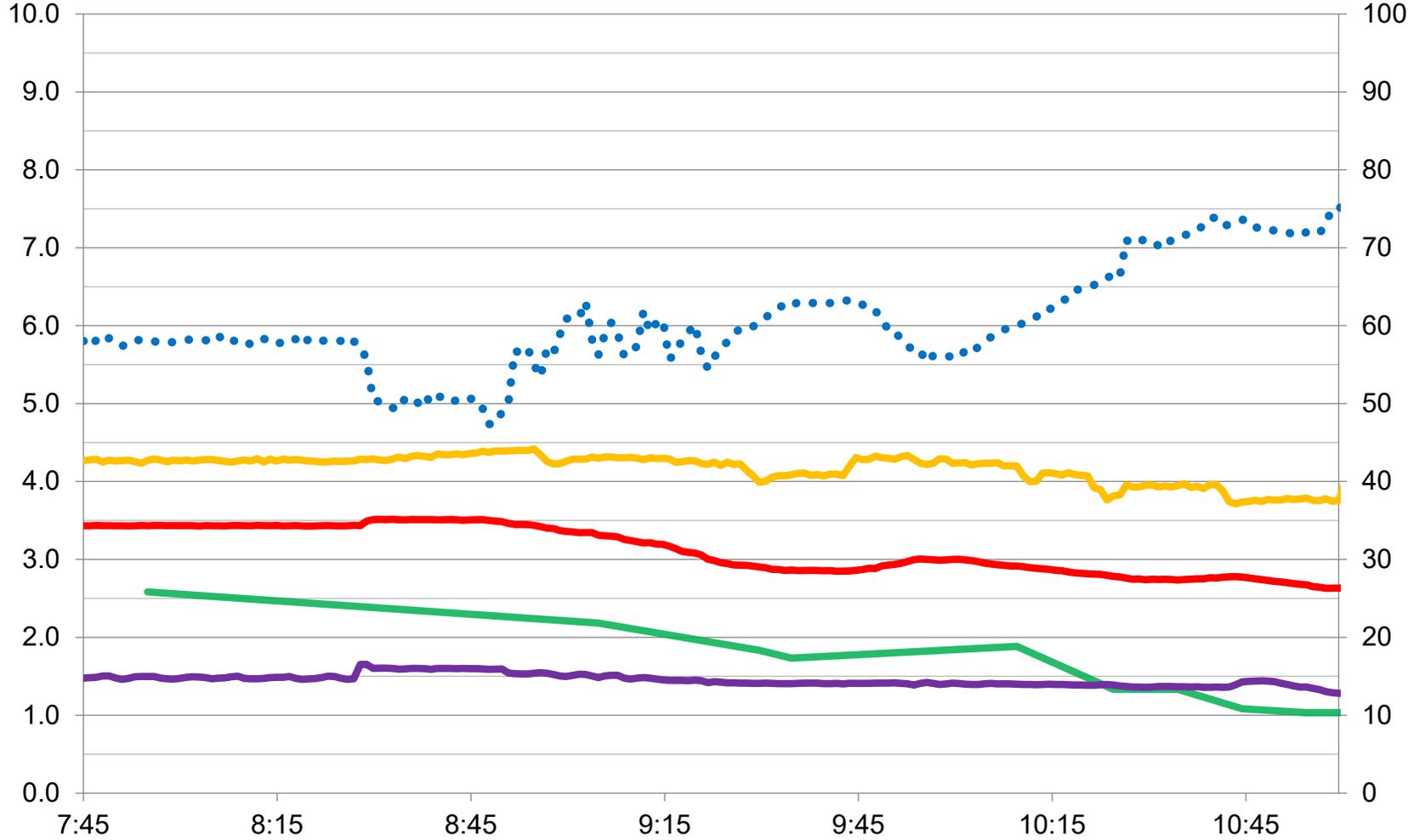


# Conducting the Test

- Goal: 7.5 gpm/sf
- Risk Mitigation
- All Ozone Online
- 6 Filters at 7.5 gpm/sf = 75 MGD



# Data Collection



## Test Results

- 7.5 gpm/sf Achieved
- Turbidity Stayed in Spec
- Water Levels Matched the Model
- We Didn't Break Anything



# Take-Aways

- Validate Your Model
- Confidence in Master Planning
- What You Learn is Worth it



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