

Society of Women Engineers
Sonora Region Conference • Saturday, March 5, 2011

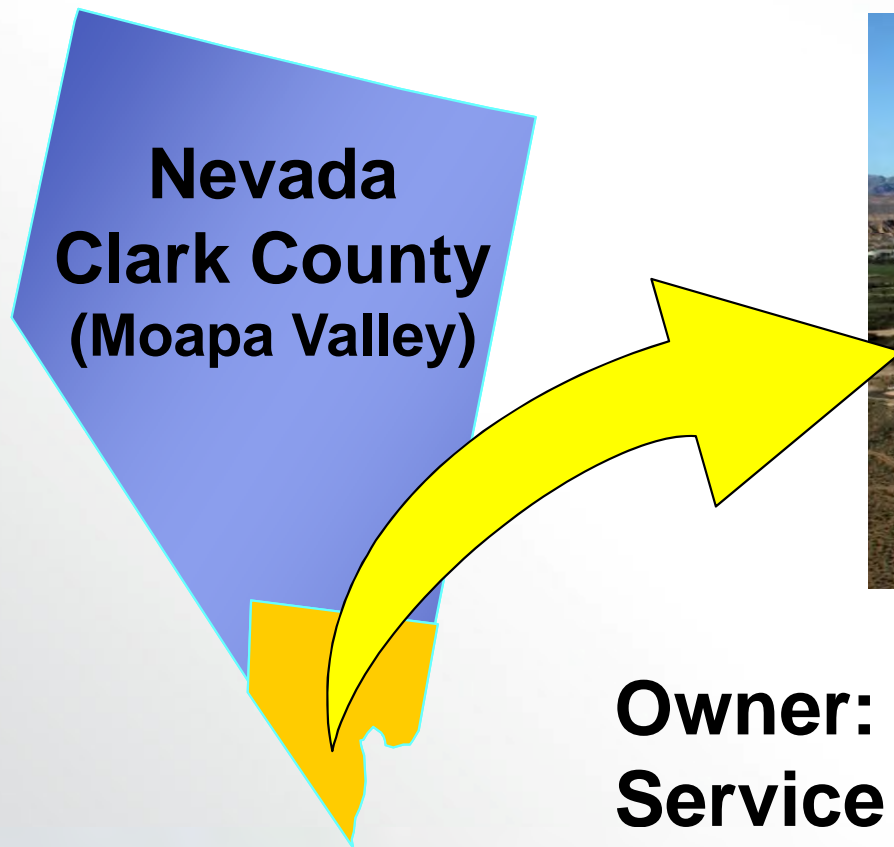
Even Bacteria are 'Down and Out' in a Tough Economy

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Outline

1. Project Overview
2. Facility Start-up
3. Process Performance During Start-up
4. Start-up Troubleshooting
5. Solutions to Start-up Challenges
6. Conclusion and Questions

Moapa Valley Water Resource Center Information



**Nevada
Clark County
(Moapa Valley)**



Owner: Clark County WRD
Service Area: 2.5 square miles
Population: 3,800 people
Collection System: 13 miles of sewer
Current Wastewater Flow: ~0.17 mgd

Facility Background

1. Original Construction: 1985
2. Aerated and Facultative Lagoons
3. Effluent Discharge through Evaporation and Infiltration
4. Permitted Discharge: 0.35 mgd
5. Monitor Nitrates in Adjacent Monitoring Wells

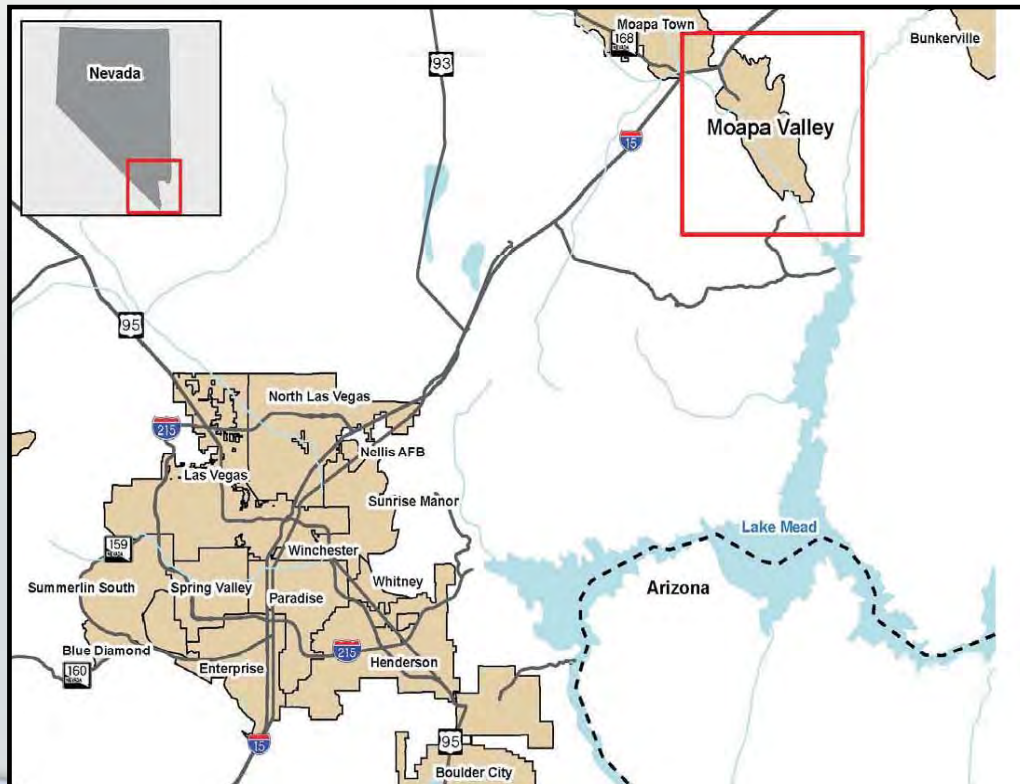


Planning and Design Criteria

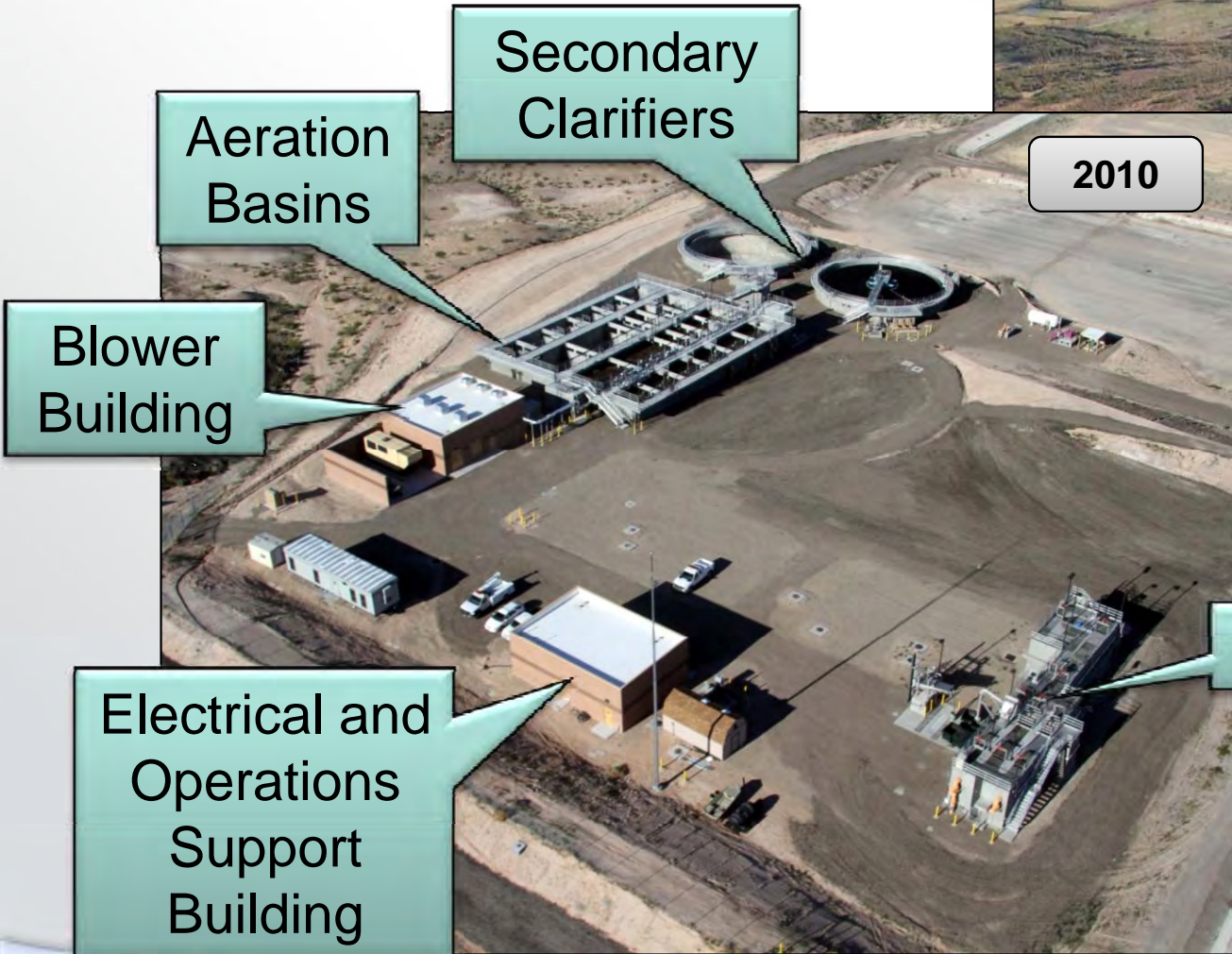
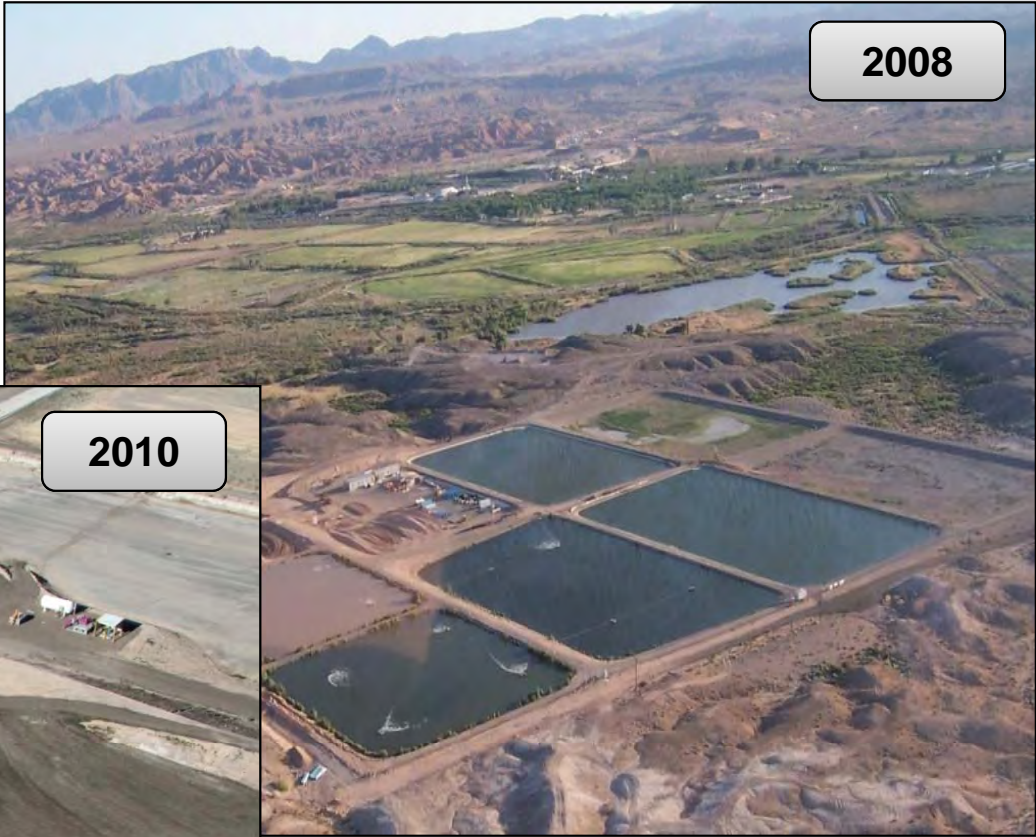
Treatment Goals	Effluent Concentrations
BOD 5 (mg/L)	30
TSS (mg/L)	30
Ammonia (mg/L)	0.45
TIN (mg/L)	7.0
Total P (mg/L)*	0.3
EDC and PPCP*	TBD
*Not required at startup	

Drivers for Upgrade and Expansion

1. Rapid Area Growth = Increased Flow & Loading
2. Increased Groundwater Nitrate Concentrations
3. Notification from NDEP of Consent Decree
4. Potential Future Discharge Options/Requirements



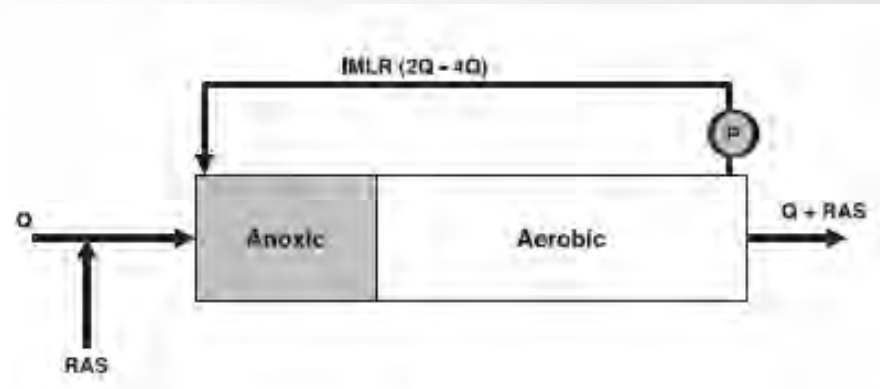
Facility Upgraded to Accommodate Future Demands



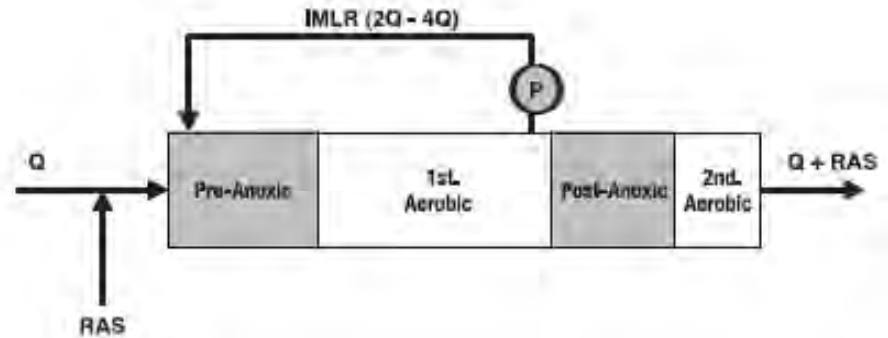
Headworks

Biological Nitrogen Removal - Processes

Modified Ludzack-Ettinger

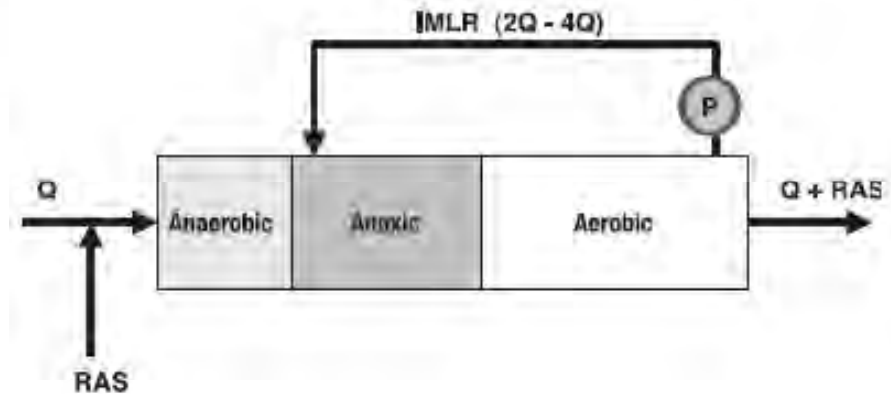


4-Stage Bardenpho

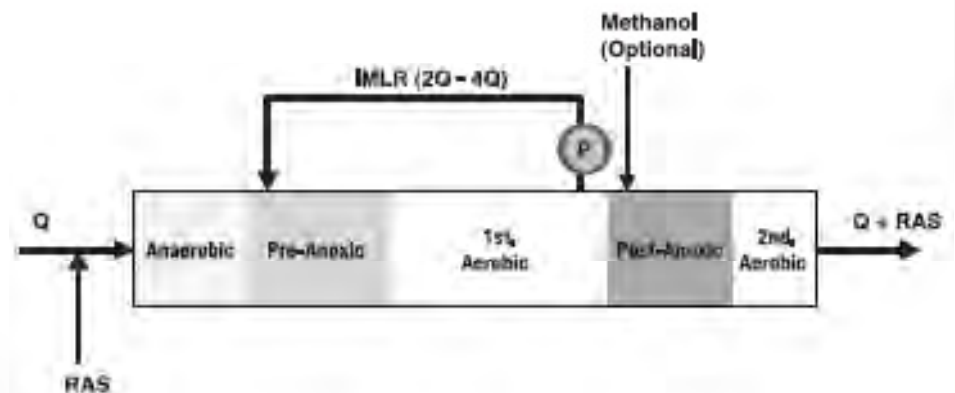


Biological Nitrogen and Phosphorus Removal - Processes

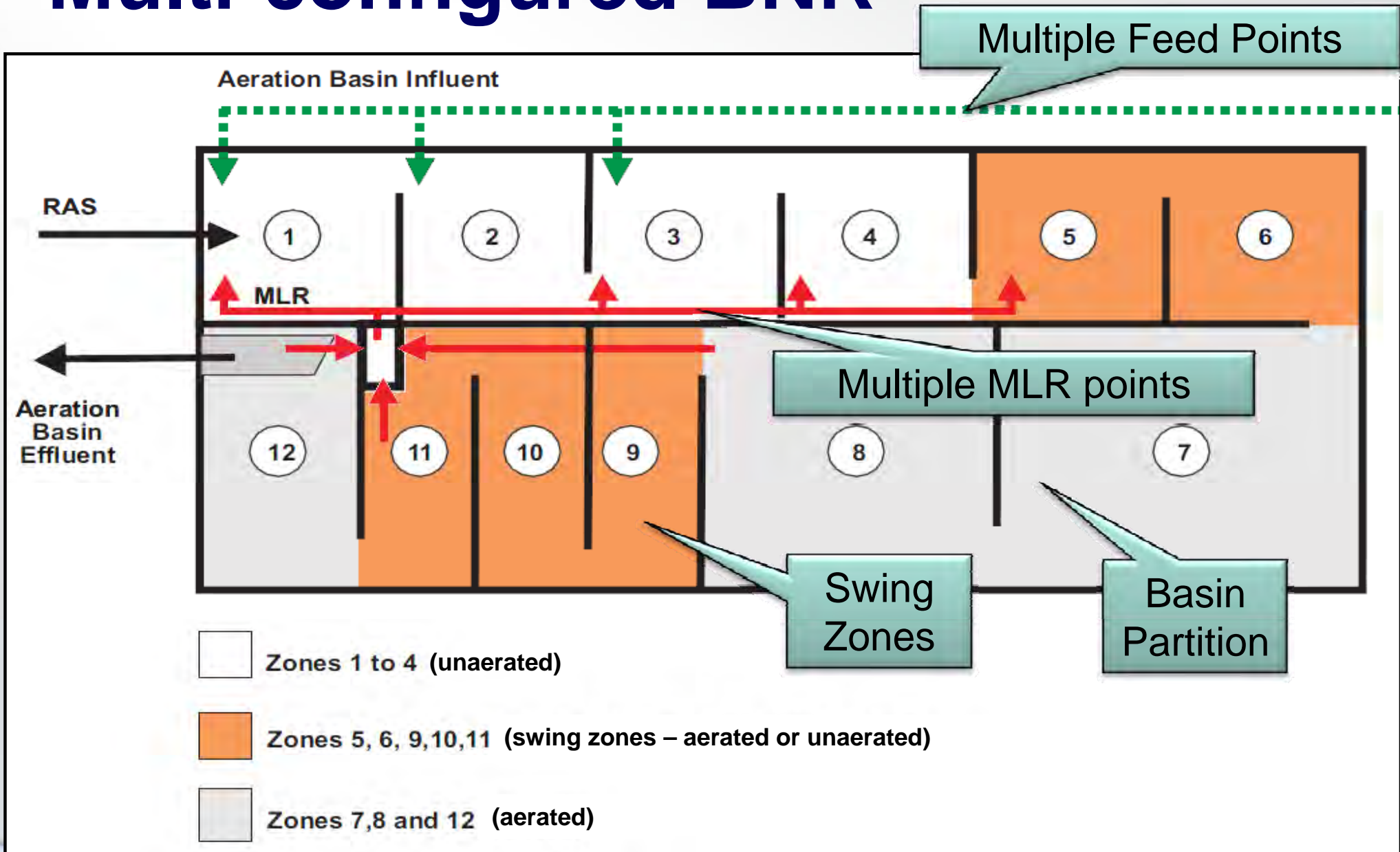
A²O



5-Stage Bardenpho



Activated Sludge System Design - Multi-configured BNR



Facility Start-up Challenges

1. Facility Start-up: Aug '09
2. Recession Had Severe Effect on Region
 - Unemployment: 14.6%
 - Foreclosures: #1 in US
3. Start-up Flows & Loads Below Design Values
4. Start-up Was Affected



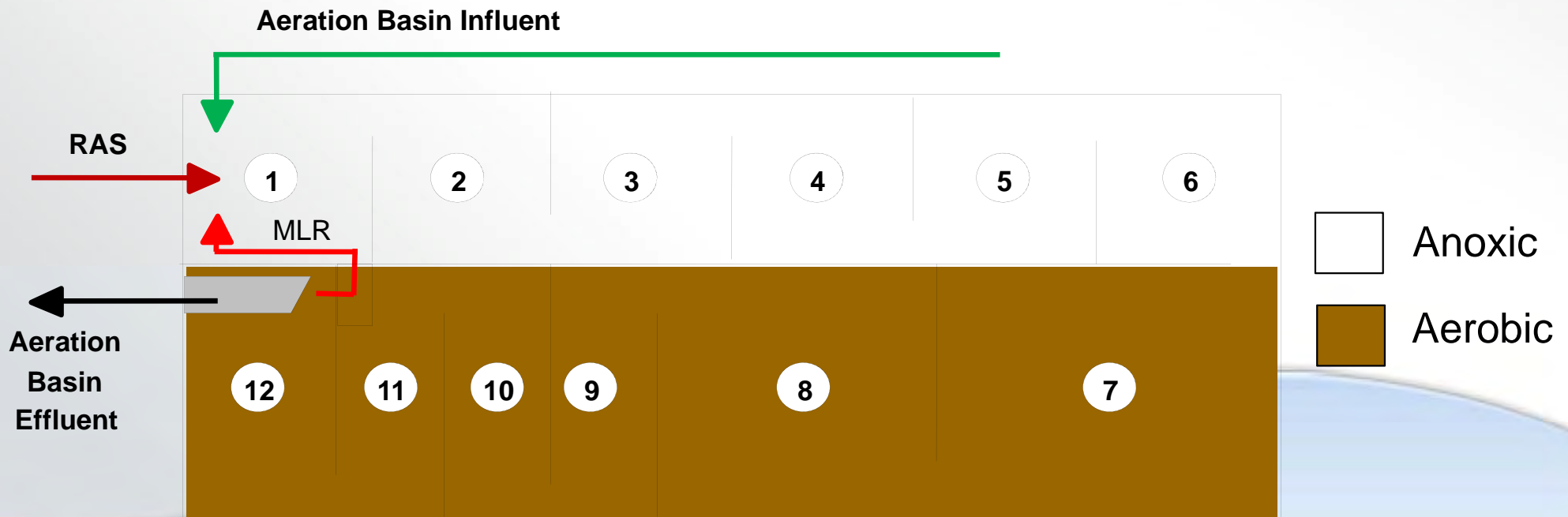
Start-up Conditions

Influent Characteristics	Start-up (Average)	Design (max. month)
Flow (mgd)	0.16	1.0
BOD Load (lbs/day)	214	1,604
TSS Load (lbs/day)	200	1,764
TKN Load (lbs/day)	70	320

Flow: 6x Reduction
Organic Loading: 8X Reduction

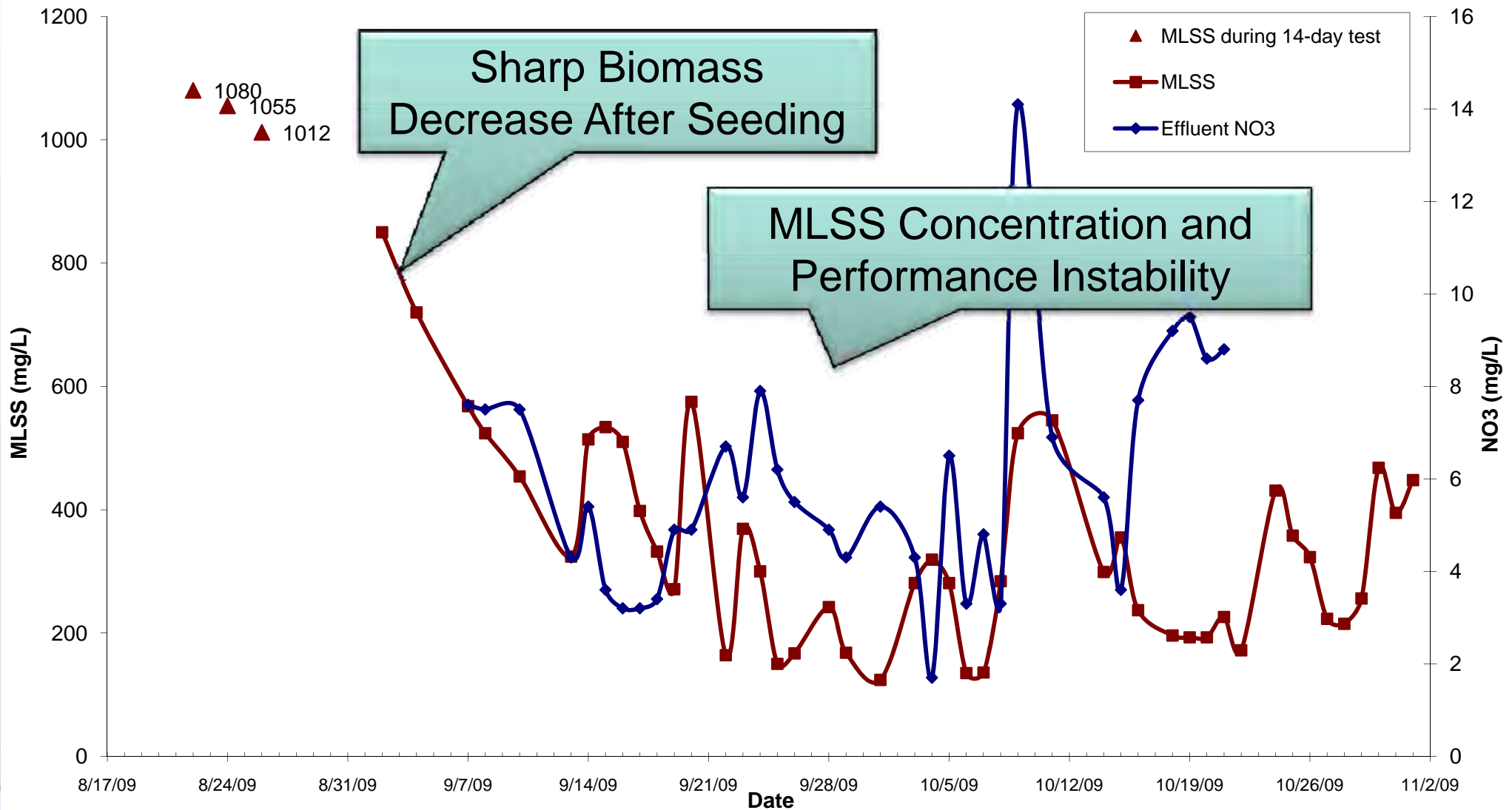
Start-up Process Configuration

1. MLE Configuration
2. RAS and MLR at Maximum Turndown
3. Seed Sludge from Main Facility
 - a. 25,000 gallons TWAS
4. MLSS between 1,010 and 1,080 mg/L



Biomass Accumulation and Process Performance - Start-up

MVWRC Commissioning Phase



Troubleshooting MLSS Instability

Challenge	Possible Cause(s)	Proposed Solution(s)
Solids settling in pipes, splitter structures, and inside the basin	<ul style="list-style-type: none"> • Low influent flow • Power outages • Issues with mixer installation 	<ul style="list-style-type: none"> • Increase RAS and MLR return flow • ML diverted to Headworks for flushing • Recirculate RAS in RAS wetwell • Install temporary coarse-bubble system in splitter boxes • Verify correct mixer installation
Wasting solids	<ul style="list-style-type: none"> • WAS pump testing • Discharge to existing ponds 	<ul style="list-style-type: none"> • Stop wasting
Biofilm layer at AB and SC	<ul style="list-style-type: none"> • Not determined 	<ul style="list-style-type: none"> • Occasionally wash down walls and submerged equipment with plant water
Midge fly proliferation (Bloodworms potentially feeding on activated sludge bacteria depleting activated sludge biomass)	<ul style="list-style-type: none"> • Addition of pond water 	<ul style="list-style-type: none"> • Stop transfer of pond water to plant

Troubleshooting Process Instability

Challenge	Possible Cause(s)	Proposed Solution(s)
High nitrate concentration in effluent	<ul style="list-style-type: none">• Excessive aeration• Low MLSS concentration• Lack of readily available carbon source for denitrification• High DO concentrations in the RAS	<ul style="list-style-type: none">• Reduce process air flow• On-off operation for air diffuser grid• Modify process configuration• Adjust RAS and MLR to increase detention time in anoxic zones• Consider supplemental carbon source

Process Modeling Performed to Address Start-up Challenges

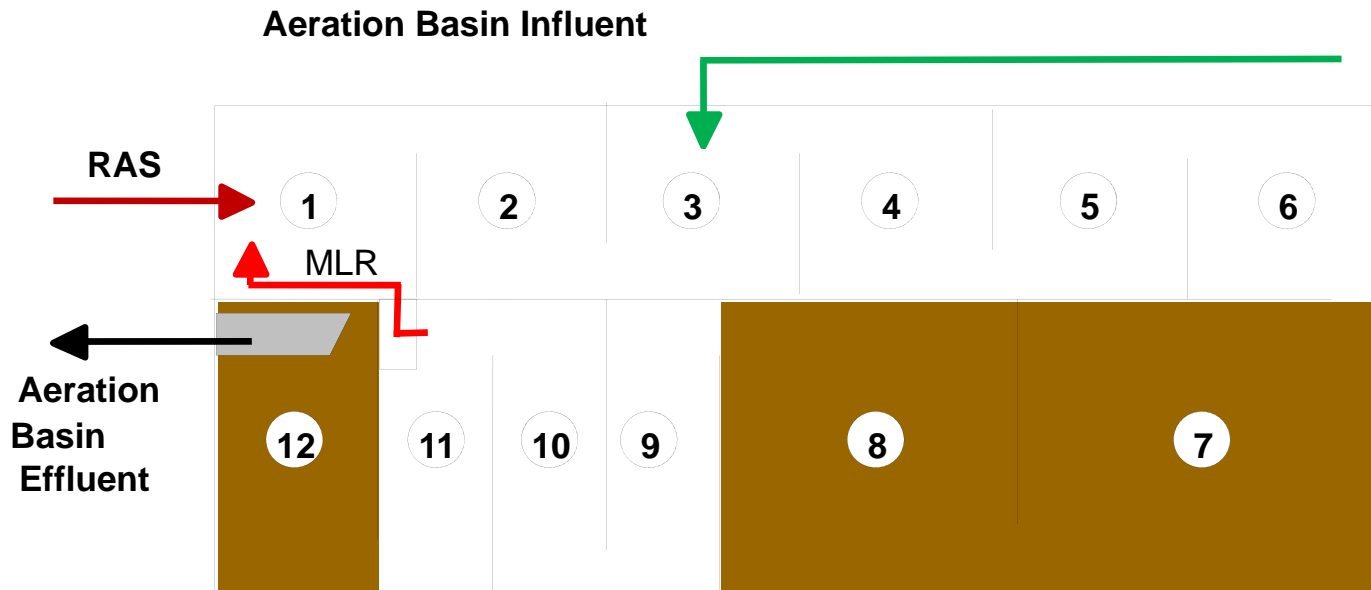
1. Objective

- a. Evaluate Effects of High DO Concentrations
- b. Evaluate Alternative Process Configuration

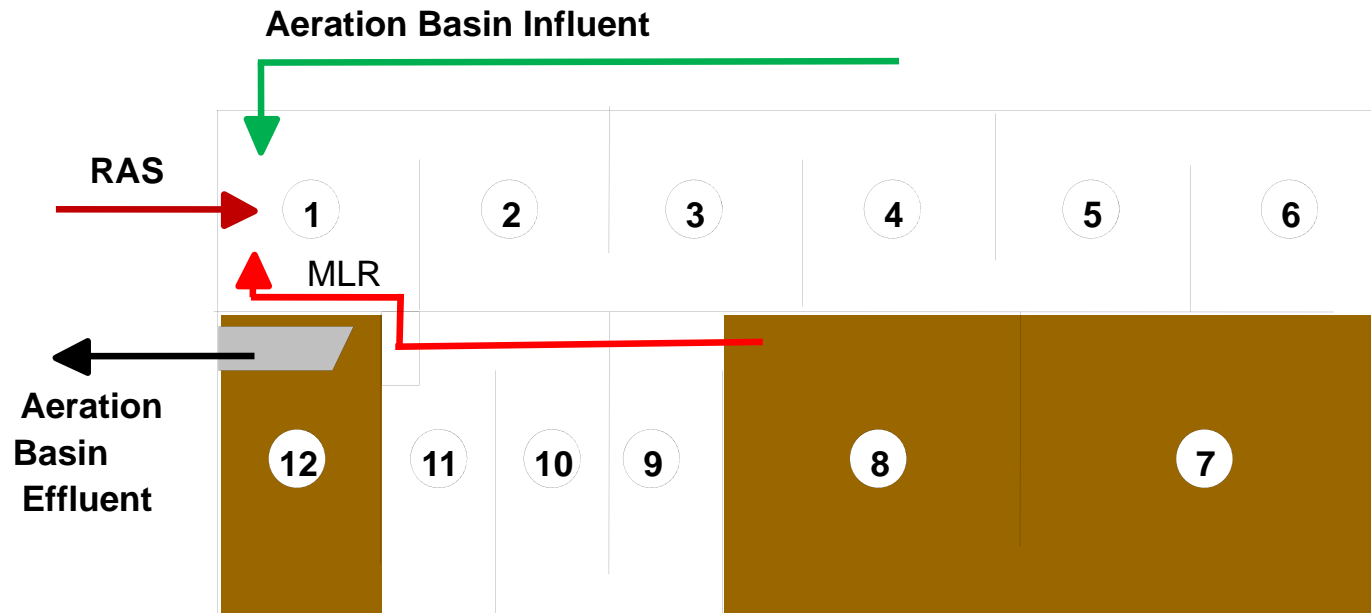
2. Modeling Tools

- a. Biotran™, Carollo Engineers
- b. Biowin™, EnviroSim

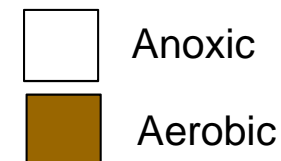
Process Model Configurations



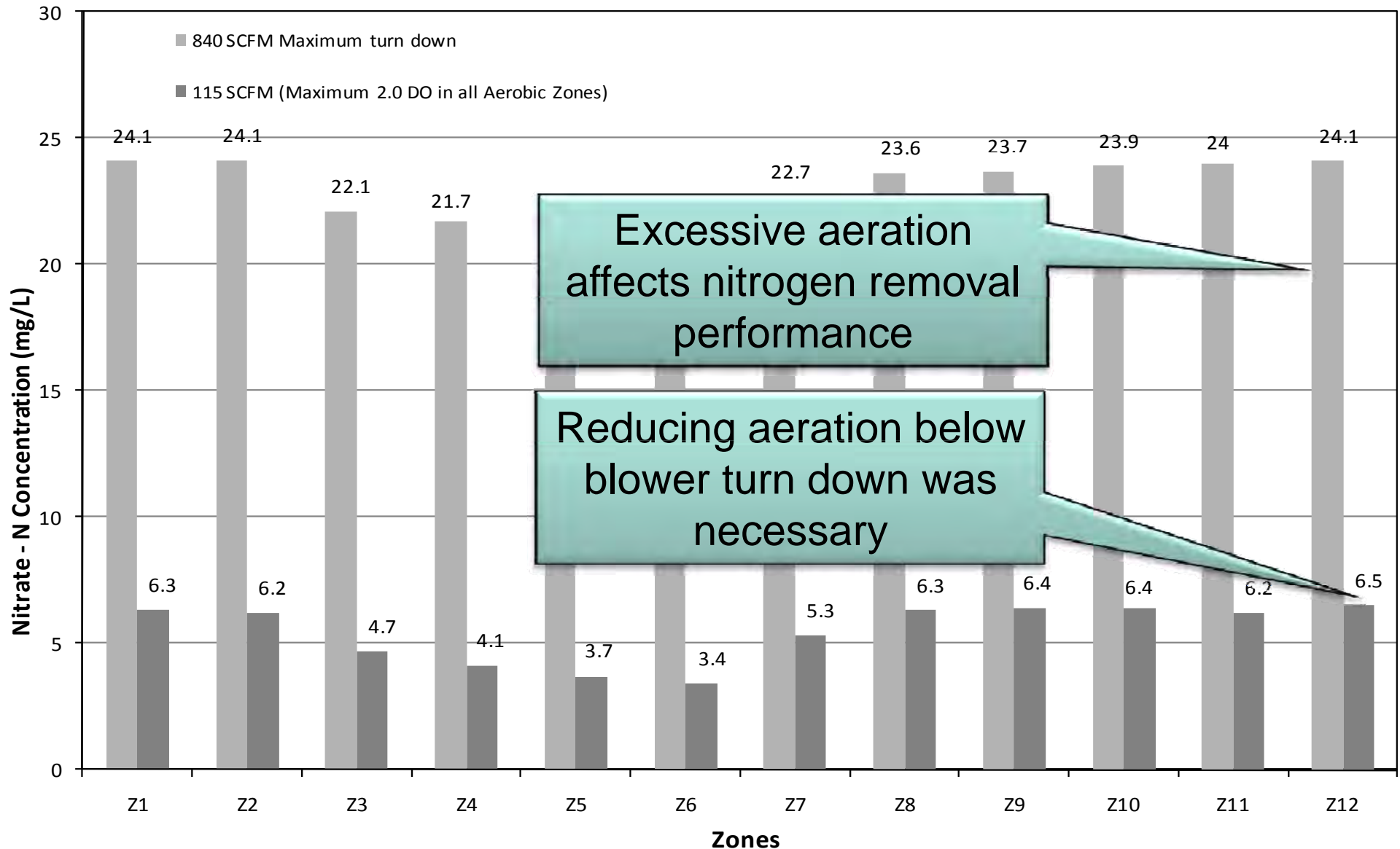
MLE Variation
Proposed by Plant Operators



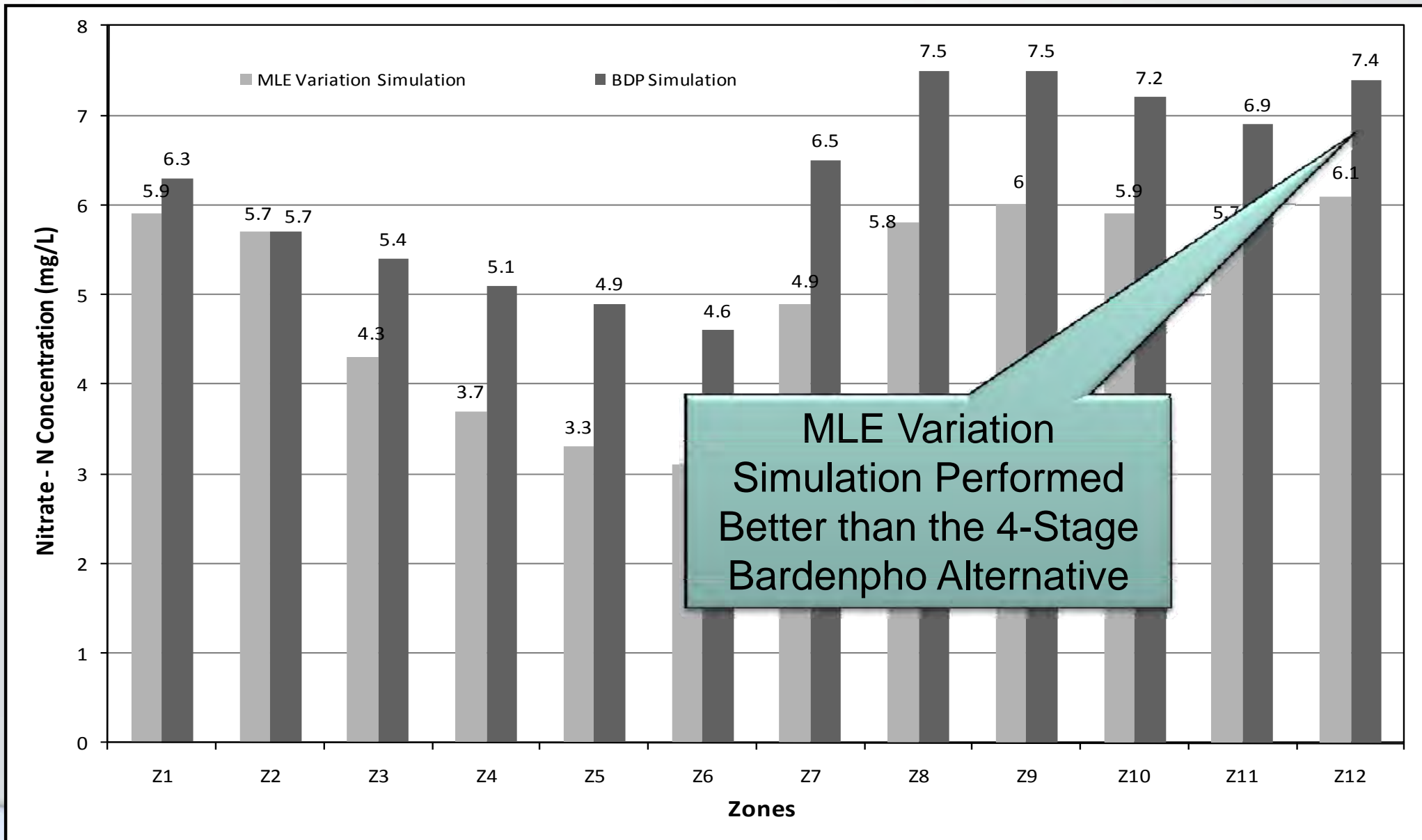
4-Stage Bardenpho
Best Configuration
for Nitrogen Removal under
Design Conditions



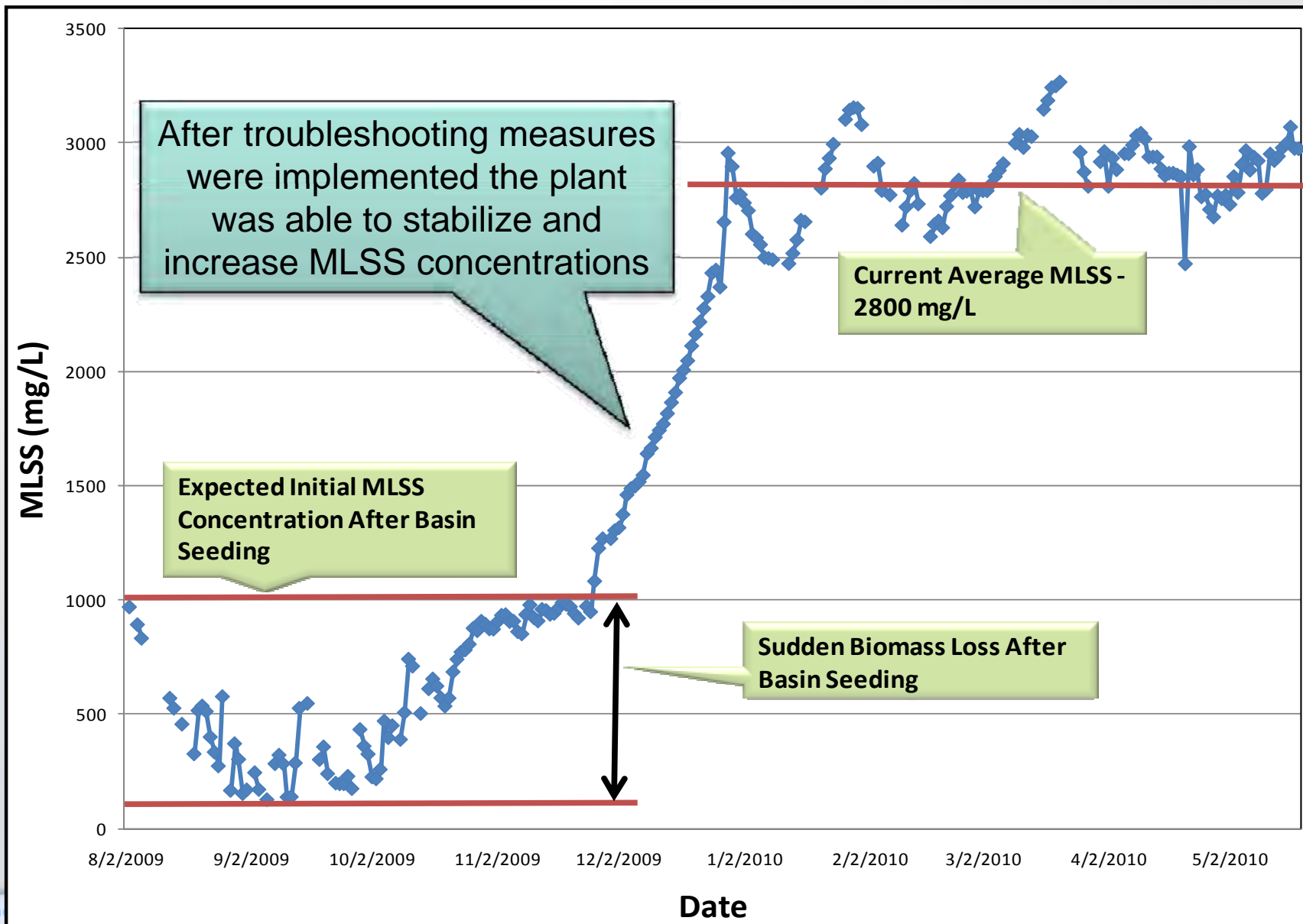
Simulated Nitrate Profiles for the MLE Variation Configuration



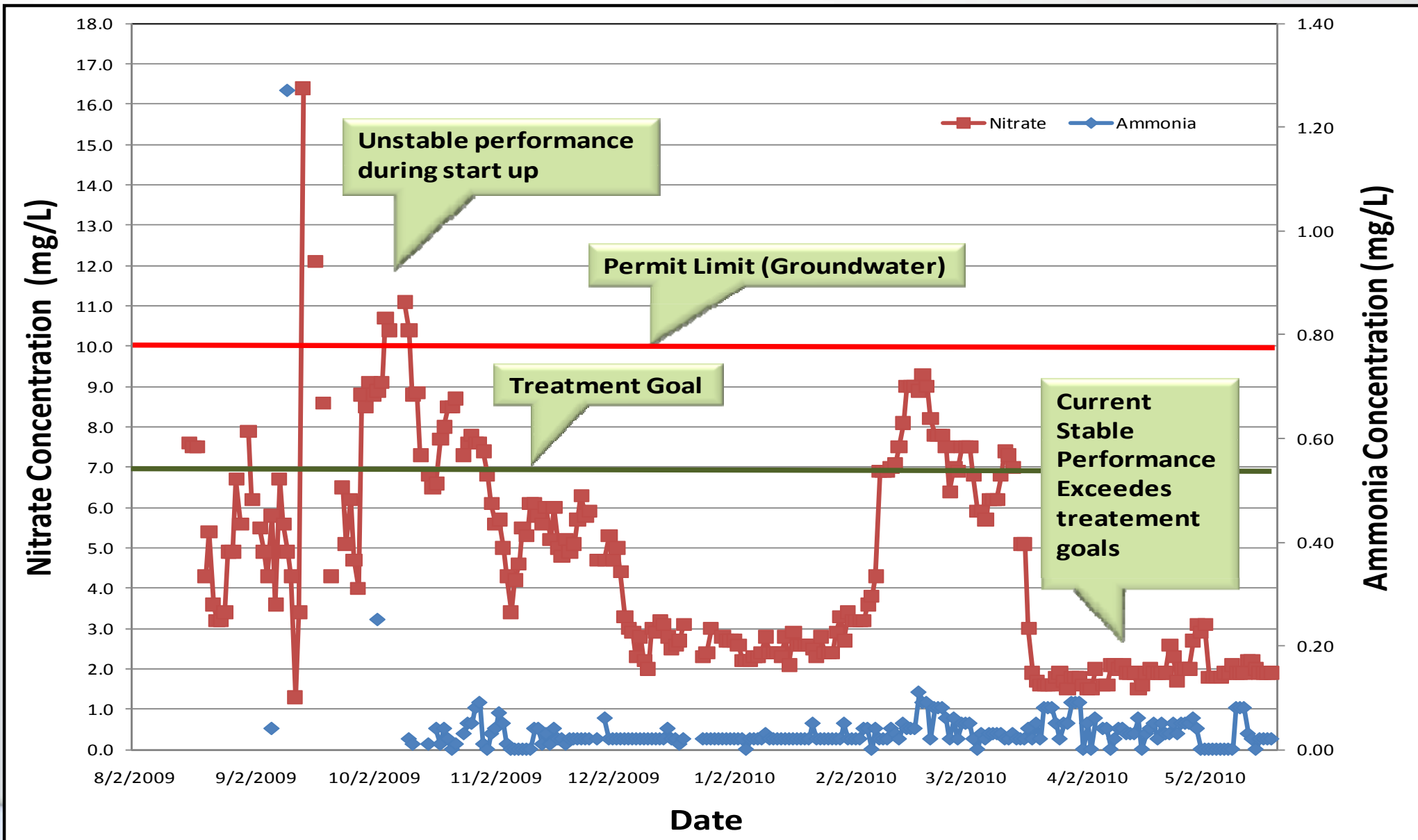
MLE Variation & 4-stage Bardenpho Simulated Nitrate Profiles



Stable MLSS Concentration after Troubleshooting



Current Performance Exceeds Treatment Goals



Conclusions

1. External Factors Outside the Design Intent Can Significantly Affect Plant Performance
2. Having a Dedicated Team of Engineers and Operations Staff Can Enhance Identification and Implementation of Optimization Actions
3. Providing a Flexible Design to Accommodate Various Process Configurations Enhances Success
4. Initially It's a Slow Road to Recovery But the End Results Can Be Rewarding

The authors would like to recognize the Clark County Water Reclamation District staff and operations personnel for their cooperation and dedication in obtaining a variety of data and information, offering solid input and advice, and working together as a Team which were valuable components in making this project successful as well as completing and producing this presentation.

References

Carollo Engineers (2007) *Clark County Water Reclamation District Moapa Valley Water Resource Center, Design Information Memorandum*, Clark County Water Reclamation District Project 560B.

Clark County Water Reclamation District, CCWRD (2005) *Moapa Valley Collection System Pre-Design Report*.

Water Environment Federation (2005) *Biological Nutrient Removal (BNR) Operation in Wastewater Treatment Plants*, Manual of Practice No. 29; Alexandria, Virginia.

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Questions?

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