

How Low Can We Go? Full-Scale 4-Stage Bardenpho Pilot

Town of Durham, New Hampshire



Presented by:

Dan Peterson, Town of Durham, NH
Tim Vadney, PE, Wright-Pierce

WRIGHT-PIERCE 
Engineering a Better Environment

Presentation Overview

- WWTF Background
- Project Overview
- Dewatering Upgrade
- Implementation of 4-Stage Bardenpho
- Early effluent TN results
- Operation of the 4-Stage Bardenpho
- Challenges of running a WWTF in a University Town

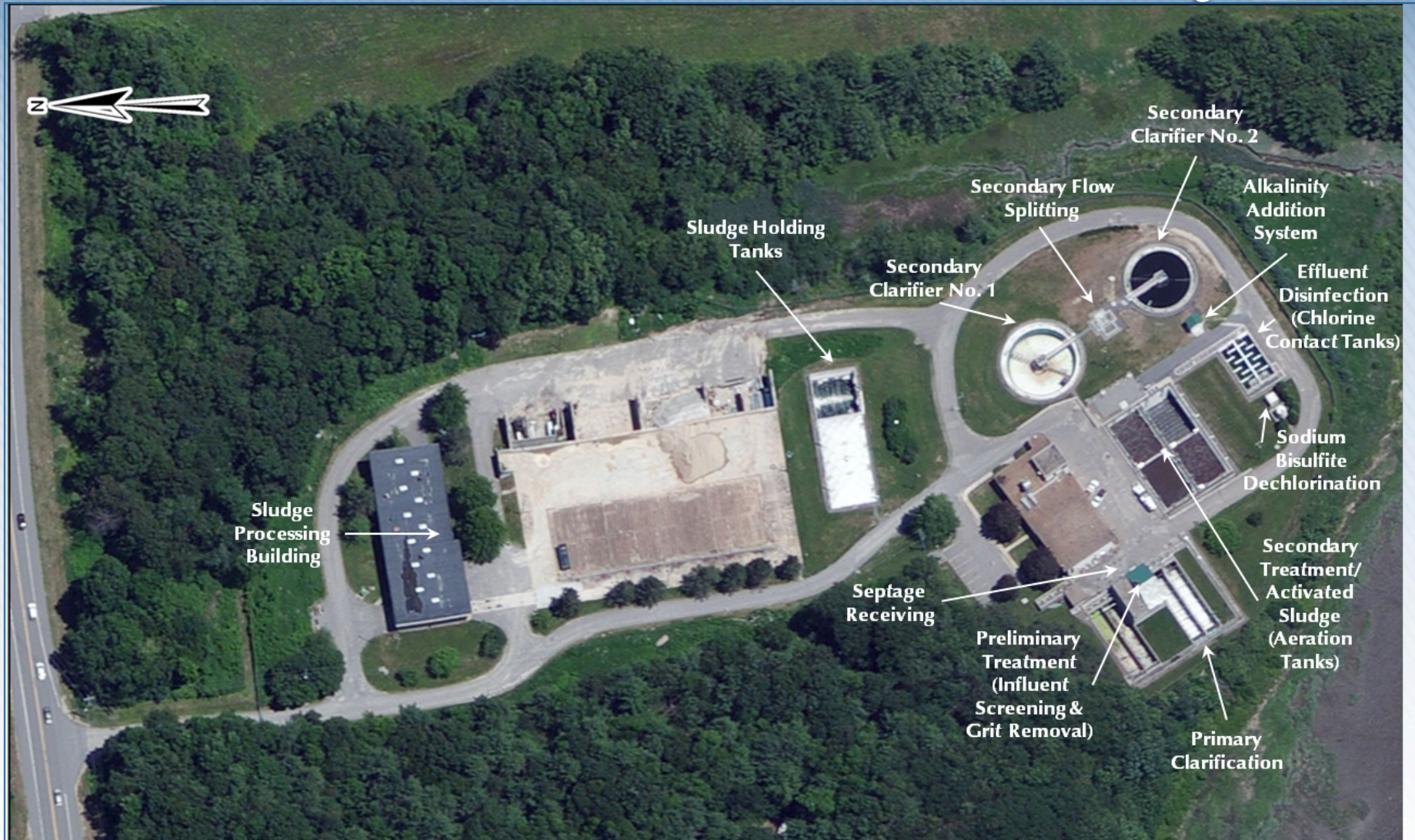


Durham WWTF – A Brief History

- 1932 - the original facility was constructed (primary treatment only).
- 1977 - major upgrades to provide secondary treatment and sludge management (storage/dewatering/compost).
- 1990's - series of upgrades to improve the aeration and sludge management systems
- 2000's – Baseline Improvements and MLE conversion



Durham WWTF – A Brief History



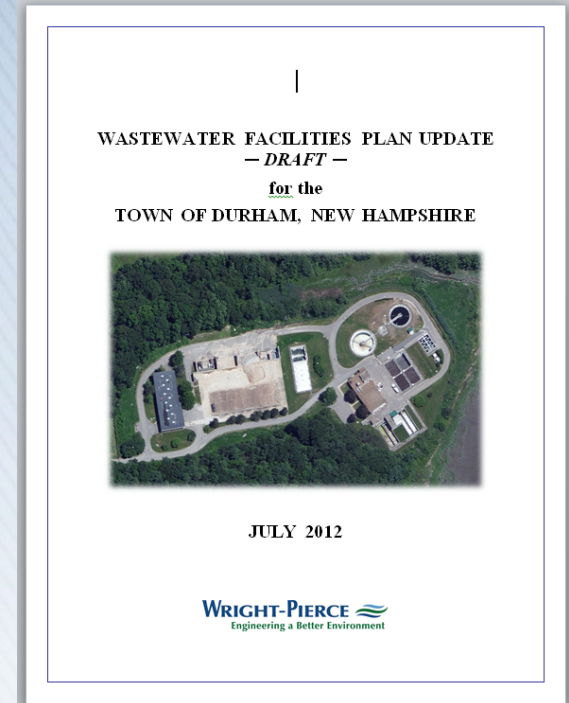
Project Drivers

- Great Bay Issues
- Pending TN Limit
- Facility Planning Efforts



Project Overview

- Wastewater Facilities Plan
 - Equipment Assessment
 - Building System Assessment
 - Alternatives for removing TN
- Prioritized Improvements
 - Dewatering Upgrade
 - Pilot Program to lower effluent TN



Project Overview

- Dewatering Upgrade



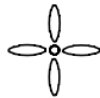
4-Stage Bardenpho Pilot



Primary Sedimentation Basin

BOD, NH_3

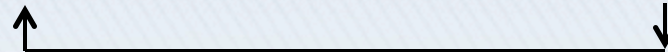
Anoxic Zone [Denitrification]



Oxic Zone [Nitrification]



Secondary Clarifier



internal nitrate recycle

Return Activated Sludge

4-Stage Bardenpho Pilot



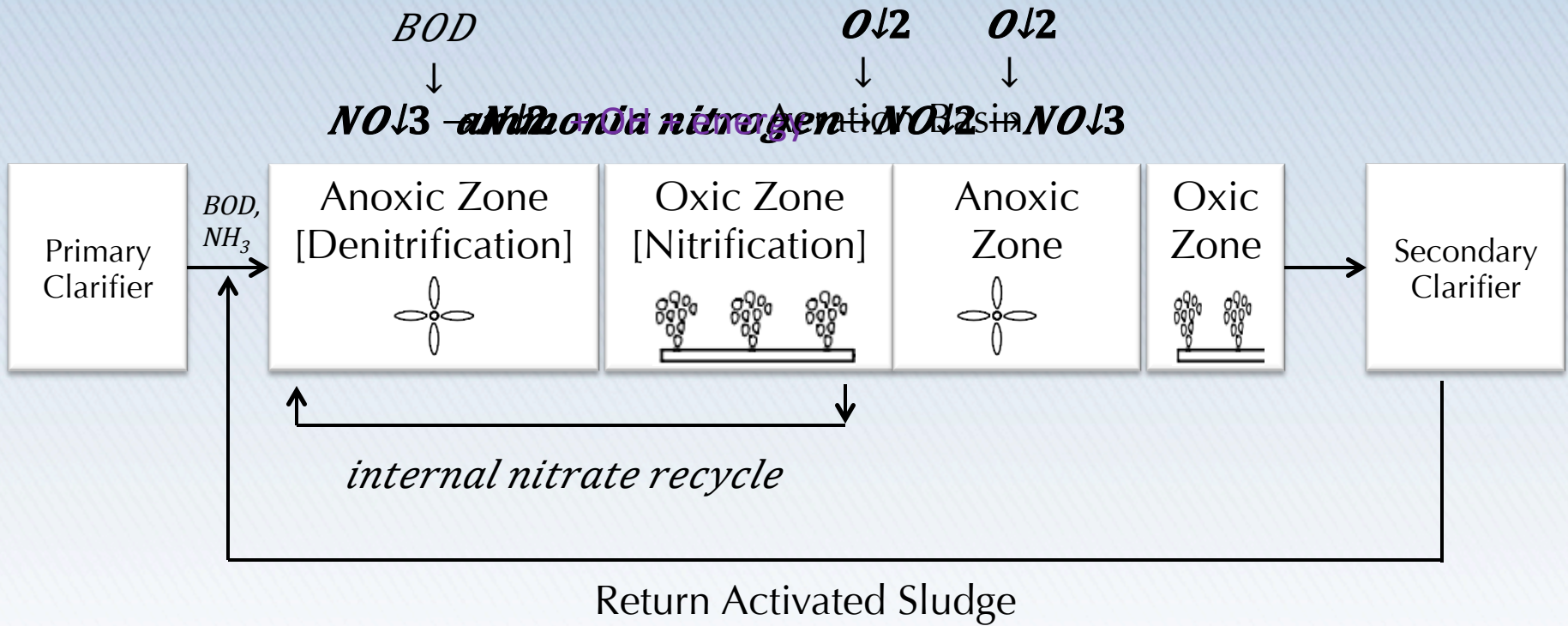
4-Stage Bardenpho Pilot



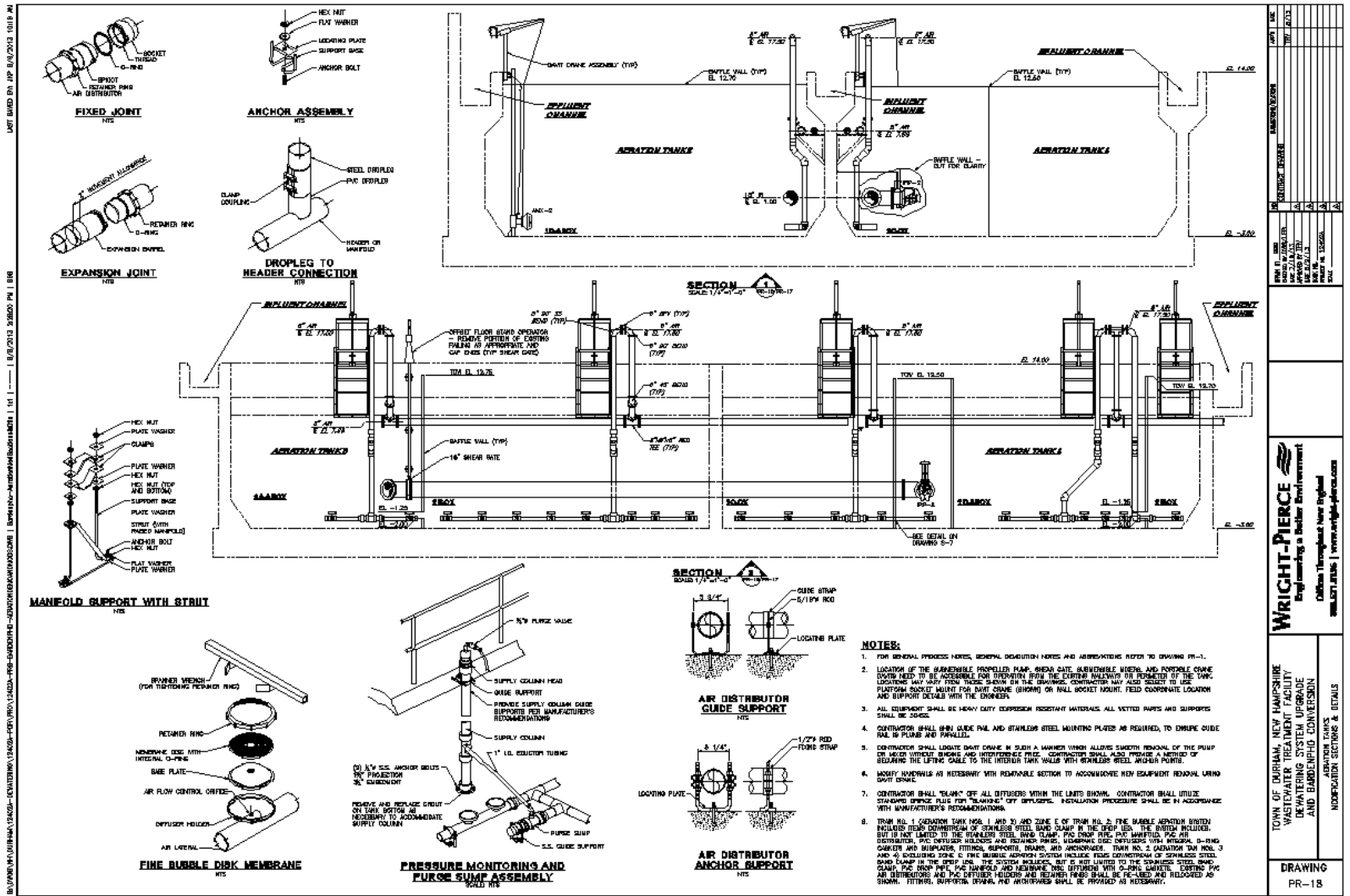
4-Stage Bardenpho Pilot



4-Stage Bardenpho Pilot



Aeration Tanks Demolition and Modification



DATE	NO.	DESCRIPTION
11/15/17	1	ISSUED FOR PERMIT
11/15/17	2	ISSUED FOR PERMIT
11/15/17	3	ISSUED FOR PERMIT
11/15/17	4	ISSUED FOR PERMIT
11/15/17	5	ISSUED FOR PERMIT
11/15/17	6	ISSUED FOR PERMIT
11/15/17	7	ISSUED FOR PERMIT
11/15/17	8	ISSUED FOR PERMIT
11/15/17	9	ISSUED FOR PERMIT
11/15/17	10	ISSUED FOR PERMIT
11/15/17	11	ISSUED FOR PERMIT
11/15/17	12	ISSUED FOR PERMIT

DATE	NO.	DESCRIPTION
11/15/17	13	ISSUED FOR PERMIT
11/15/17	14	ISSUED FOR PERMIT
11/15/17	15	ISSUED FOR PERMIT
11/15/17	16	ISSUED FOR PERMIT
11/15/17	17	ISSUED FOR PERMIT
11/15/17	18	ISSUED FOR PERMIT
11/15/17	19	ISSUED FOR PERMIT
11/15/17	20	ISSUED FOR PERMIT
11/15/17	21	ISSUED FOR PERMIT
11/15/17	22	ISSUED FOR PERMIT

WRIGHT-PERCE
 Engineering & Construction
 1000 South Lakeshore Drive, Suite 100
 Durham, NC 27701
 (919) 470-7000 | www.wright-perce.com

TOWN OF DURHAM, NEW HAMPSHIRE
 WASTEWATER TREATMENT FACILITY
 DRAWING NO. 17-0000-00000
 AIR DISTRIBUTOR AND BRIDGE PLUMBS
 DEMOLITION AND MODIFICATION
 DRAWING PR-18

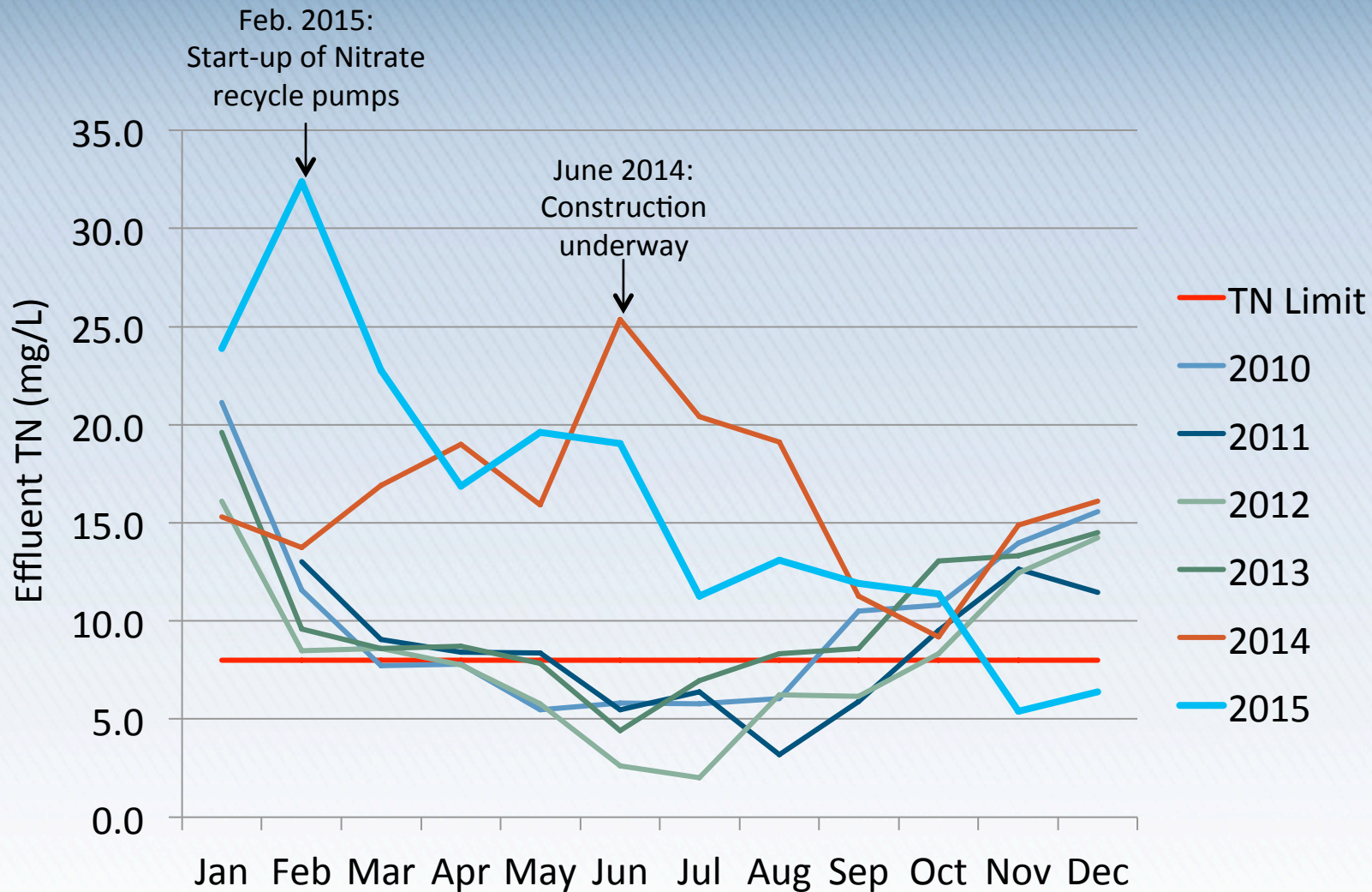
Construction Phase (2014-2015)



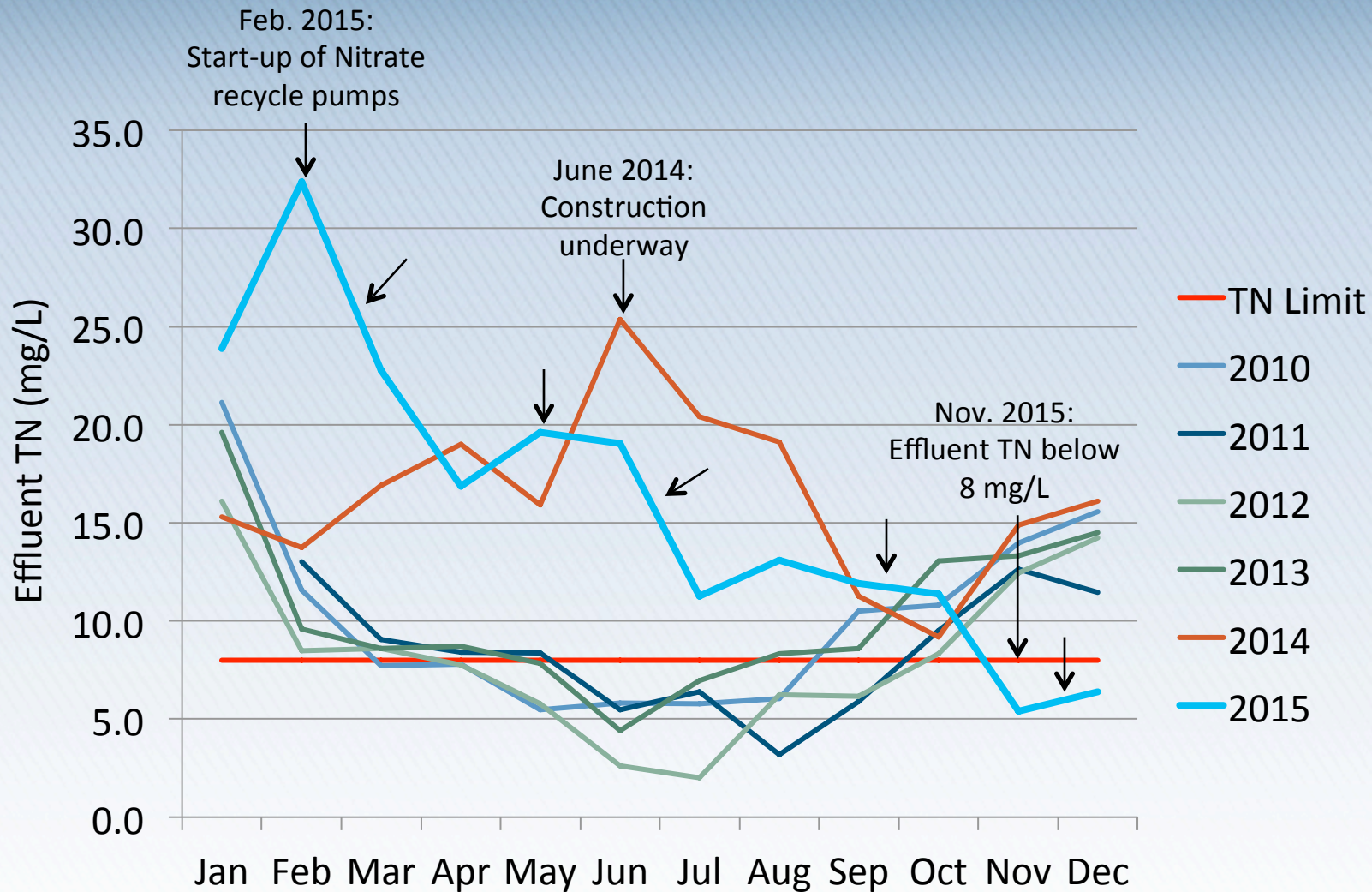
Effluent TN – 2010 thru 2015



Effluent TN – 2010 thru 2015



Effluent TN – 2010 thru 2015



Presentation Overview

- WWTF Background
- Project Overview
- Dewatering Upgrade
- Implementation of 4-Stage Bardenpho
- Early effluent TN results
- **Operation of the 4-Stage Bardenpho**
- **Challenges of running a WWTF in a University Town**



IN 2004 Wright-Pierce Engineers Designed an MLE system to recoup alkalinity for ongoing pH issues.

At the Time, Nitrogen was still a non issue for the Great Bay, but within time we new we had the best of both worlds.

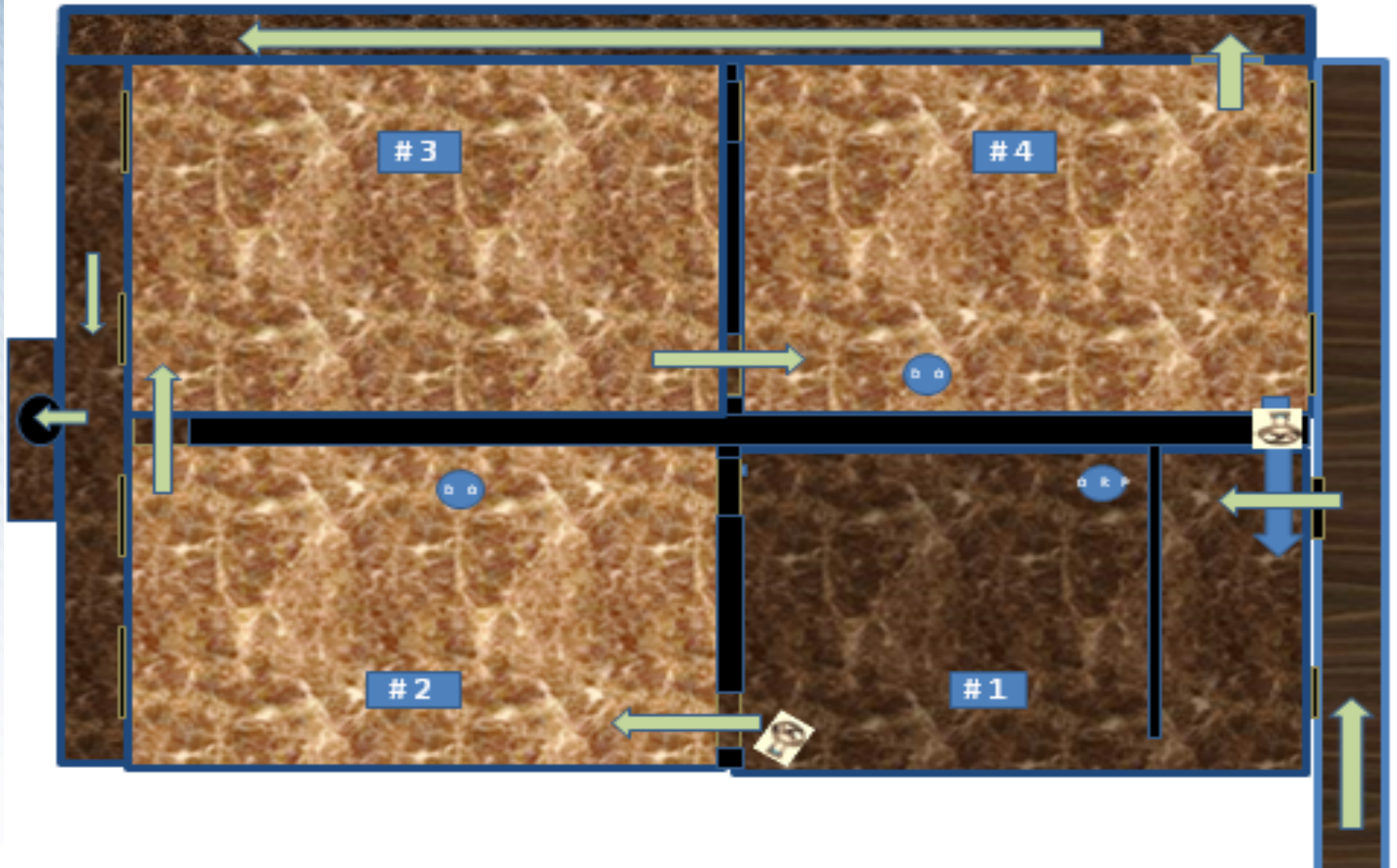
Aeration Tanks



Aeration Tanks



Making an MLE system work, not so easy.



Why not so easy
you ask?

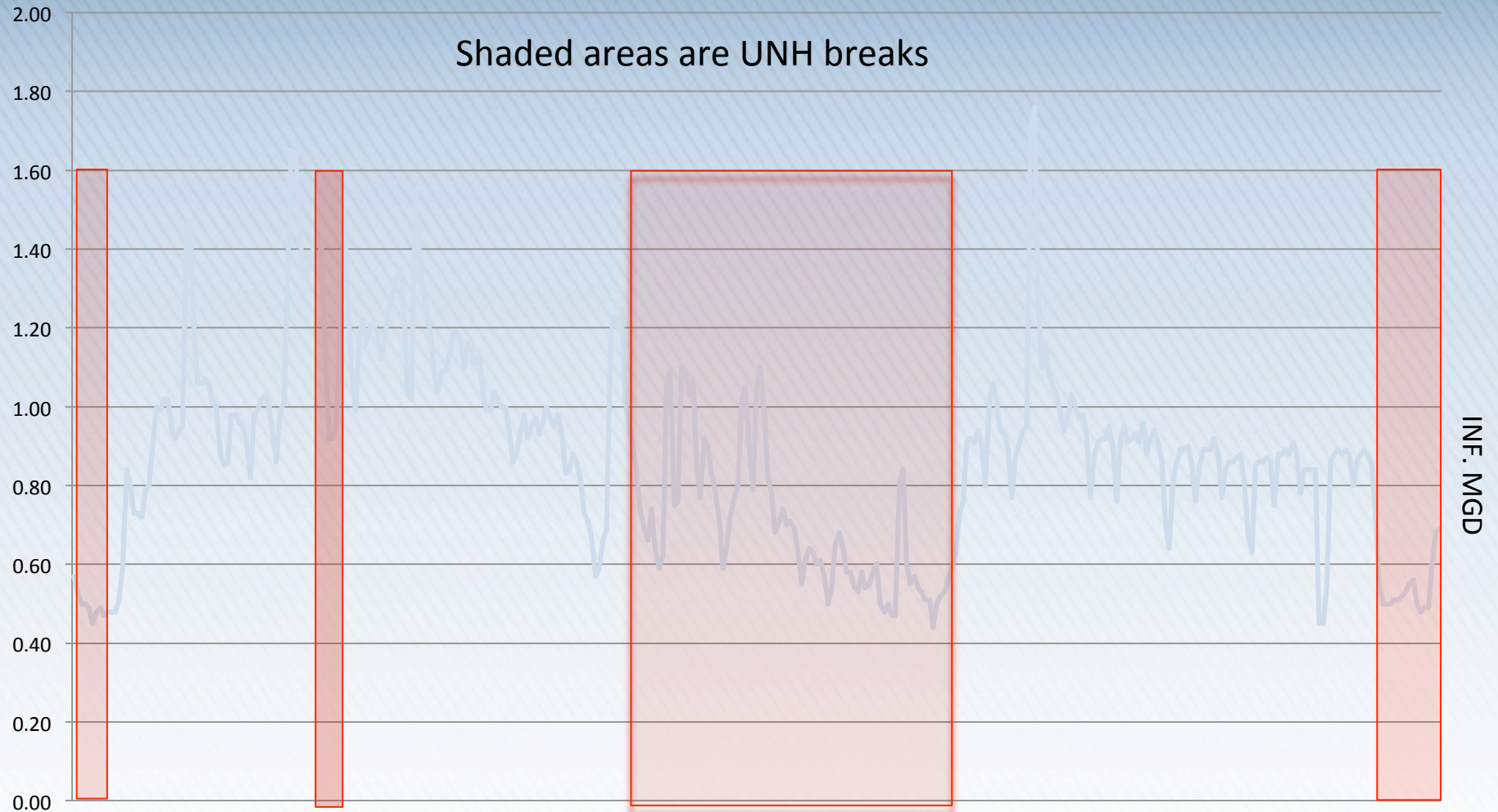
Durham Resident Population –
15,000

**UNH Student and Faculty
Population – 17,000**

**That's More Than
Double the Population
of Partying Students.**

Sooooo,
just imagine what happens
to the Treatment Plant
when the students come and go
on breaks.

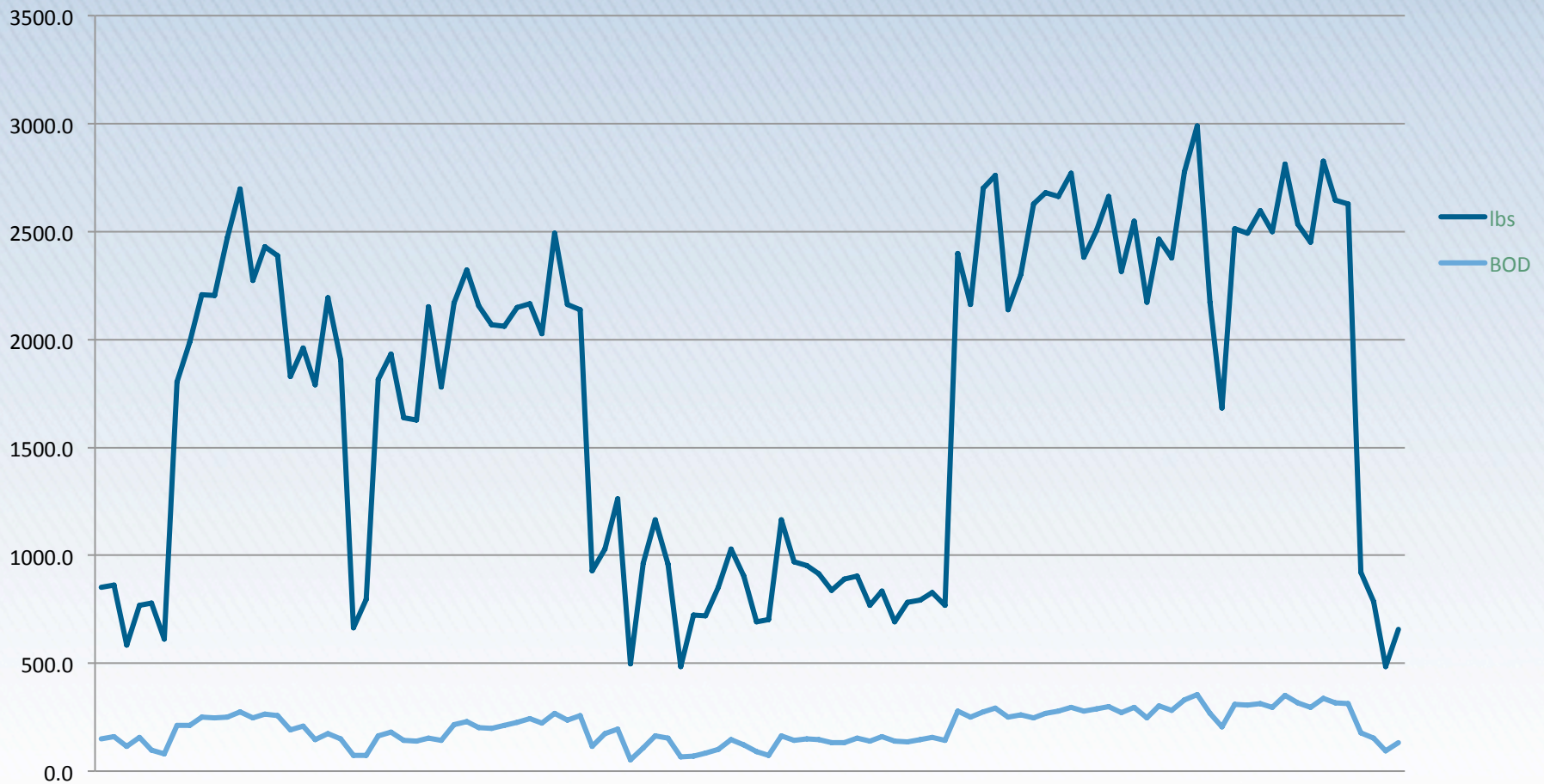
Variation of Flows



If your just looking at just
flows,
your looking at it wrong.

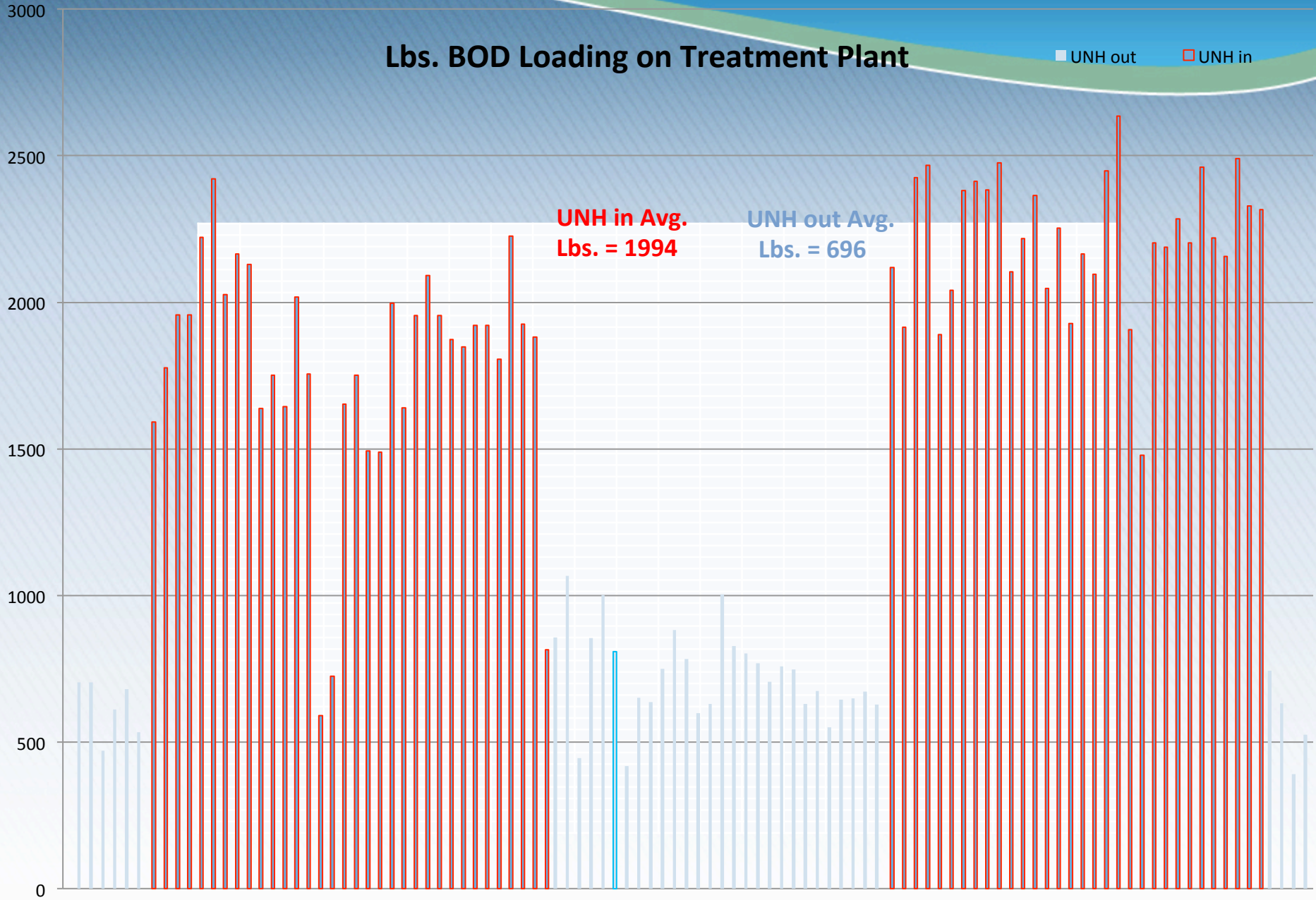
Here's why.

Plant Loading Lbs. BOD



Lbs. BOD Loading on Treatment Plant

UNH out UNH in

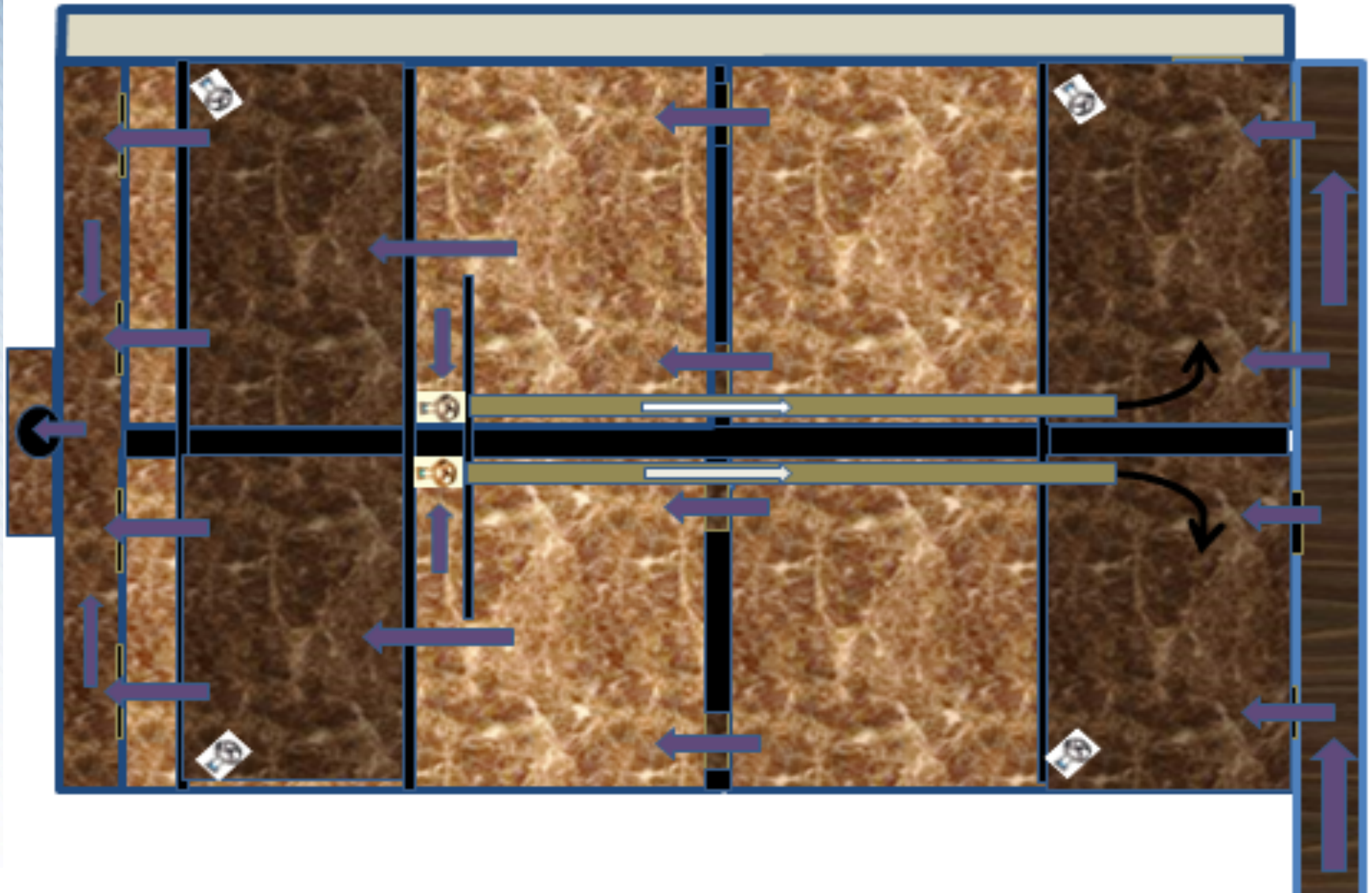


**UNH in Avg.
Lbs. = 1994**

**UNH out Avg.
Lbs. = 696**

Great system, great removal,
but wanted better Nitrogen
removal and more flexibility
with rollercoaster loadings

4 stage Flexibility



Questions / Discussions



