PA Water and Wastewater Technology Summit – November 2, 2018

Penn State University Park WRF Upgrade: Innovative Approaches to Common Challenges

PennState Physical Plant

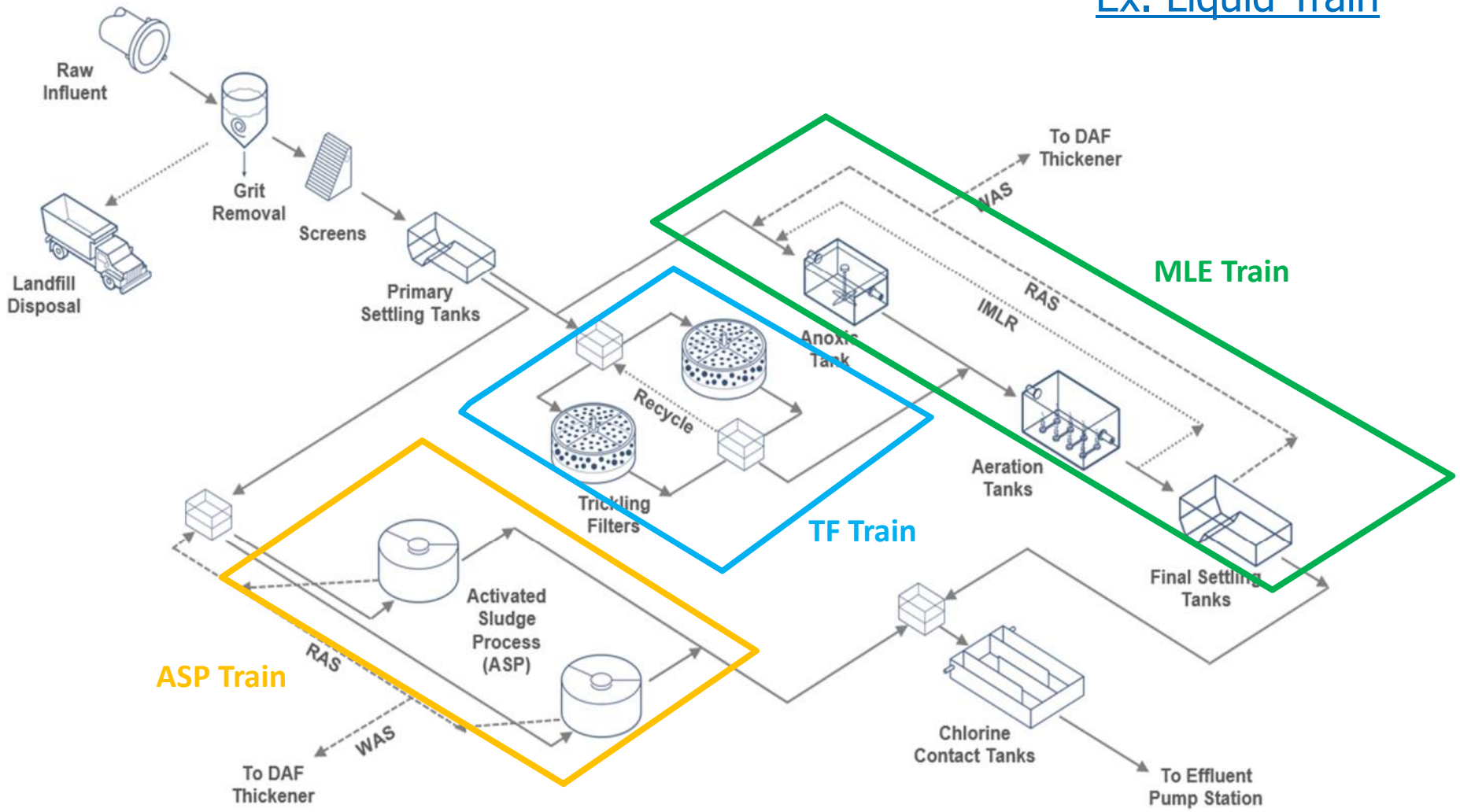
HASKELL | Hazen

Penn State WWTP

- Plant site has been used for sewage treatment since 1913.
- PSU WWTP treats an average of 1.6 million gallons of waste water per day.
- Current permitted capacity is 4.0 MGD.
- Majority of processes constructed in 1950's and 1960's.

Existing Process Flow Diagram

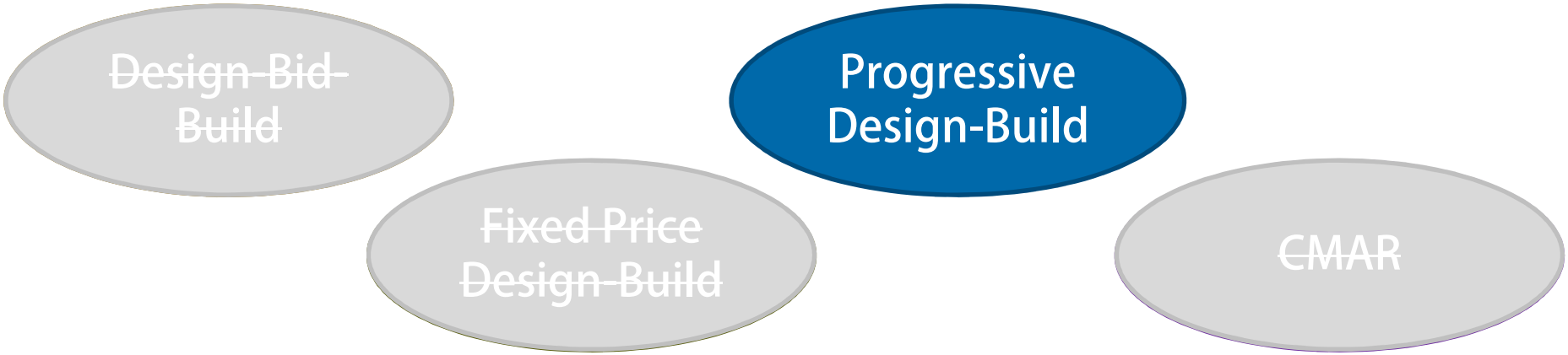
Ex. Liquid Train



Project Objectives

1. Renovate or replace aged infrastructure
2. Improve safety
3. Minimize operational risks from variable flows
4. Improve treatment and energy efficiency
5. Ensure compatibility with future reclaimed water goals
6. Maintain flexibility for future campus growth
7. Improve educational and research opportunities

Project Delivery Method Selection



Benefits:

1. One contract – single point of responsibility
2. Compressed schedule
3. Early collaboration with builder
   - Improved constructability, cost estimating, value engineering, budget certainty

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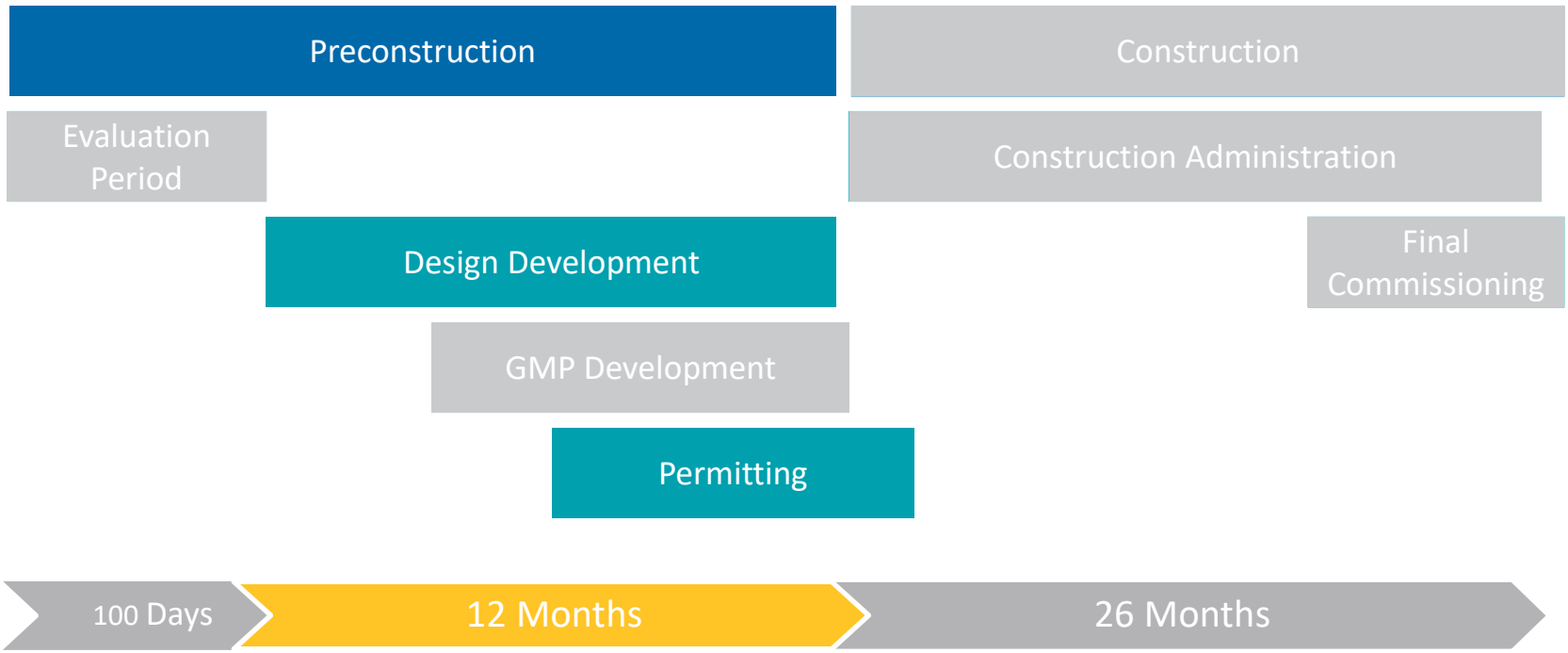
Progressive Design Build



Project Challenges

- Schedule Constraints
- Maintenance of Plant Operations (MOPO)
- Watershed Protection
- Stakeholder Involvement

Project Challenge: Schedule

PennState
Physical Plant

Schedule Review and Key Dates

Milestone	Date
Project Award	August 2017
30% Design Submittal	March 2018
Submit 60% Design	June 12, 2018
Early Package Mobilization	September 2018
Submit 90% Design	October 2018
Bidding	November 2018
GMP to PSU	December/January 2019
GMP Approval	February 22/23, 2019
GMP Notice to Proceed	March 2019
Substantial Completion	December 2021

First 100 Days

10 Haskell-Hazen Team Members

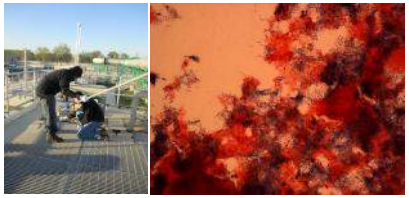
1 Week

Intensive On-Site Investigation

ZERO

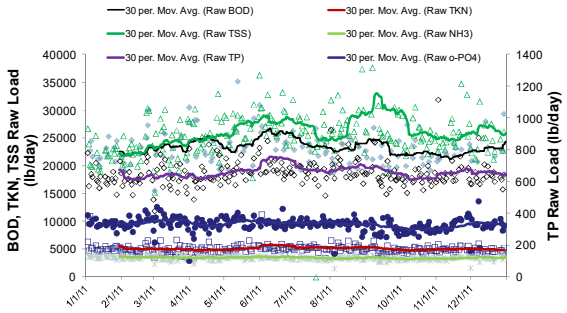
Learning Curve

On-site Sampling and Interviews

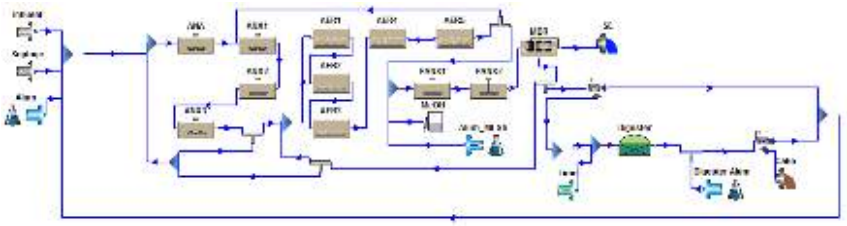


Structural Evaluation

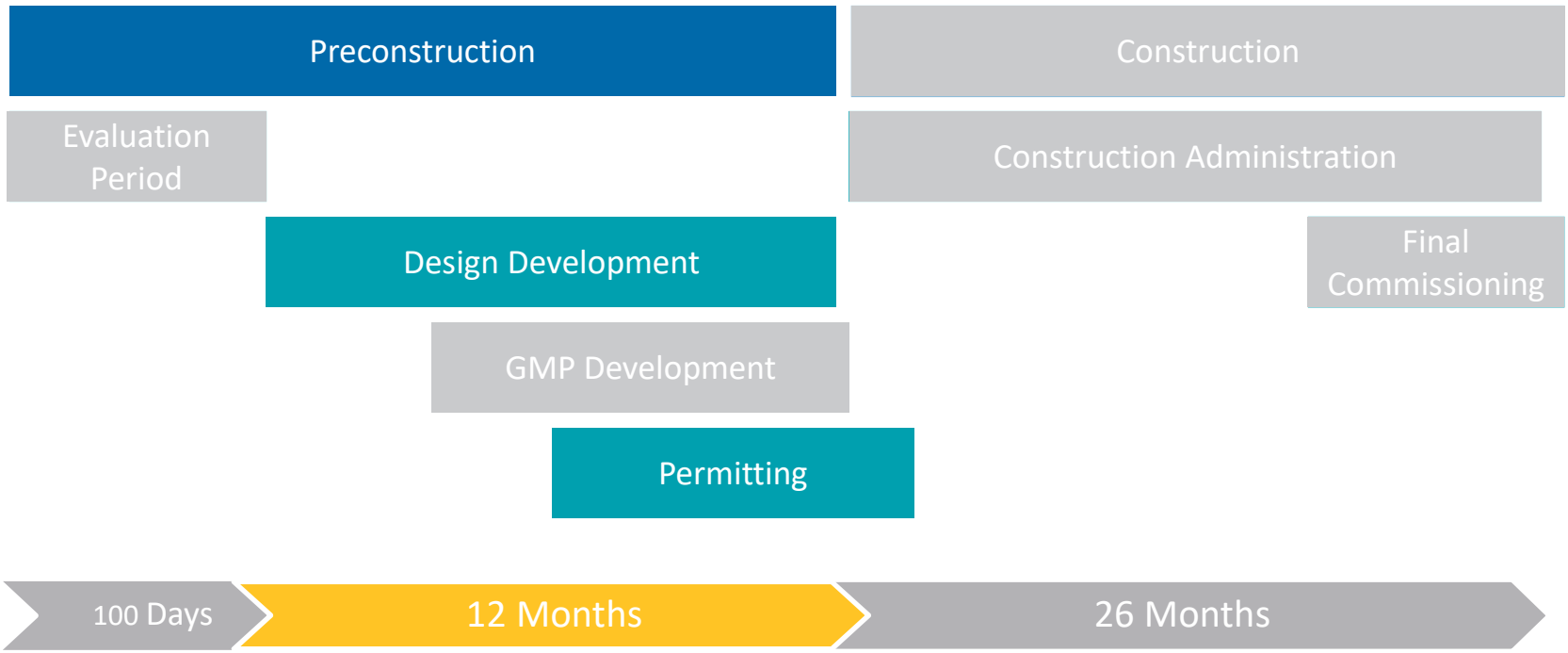
Data Analyses



Process Modeling



Progressive Design Build



Early Procurement Packages

- MBR design advancement
- Temporary thickening
- Utility relocation
- Demolition

Project Challenge: MOPO

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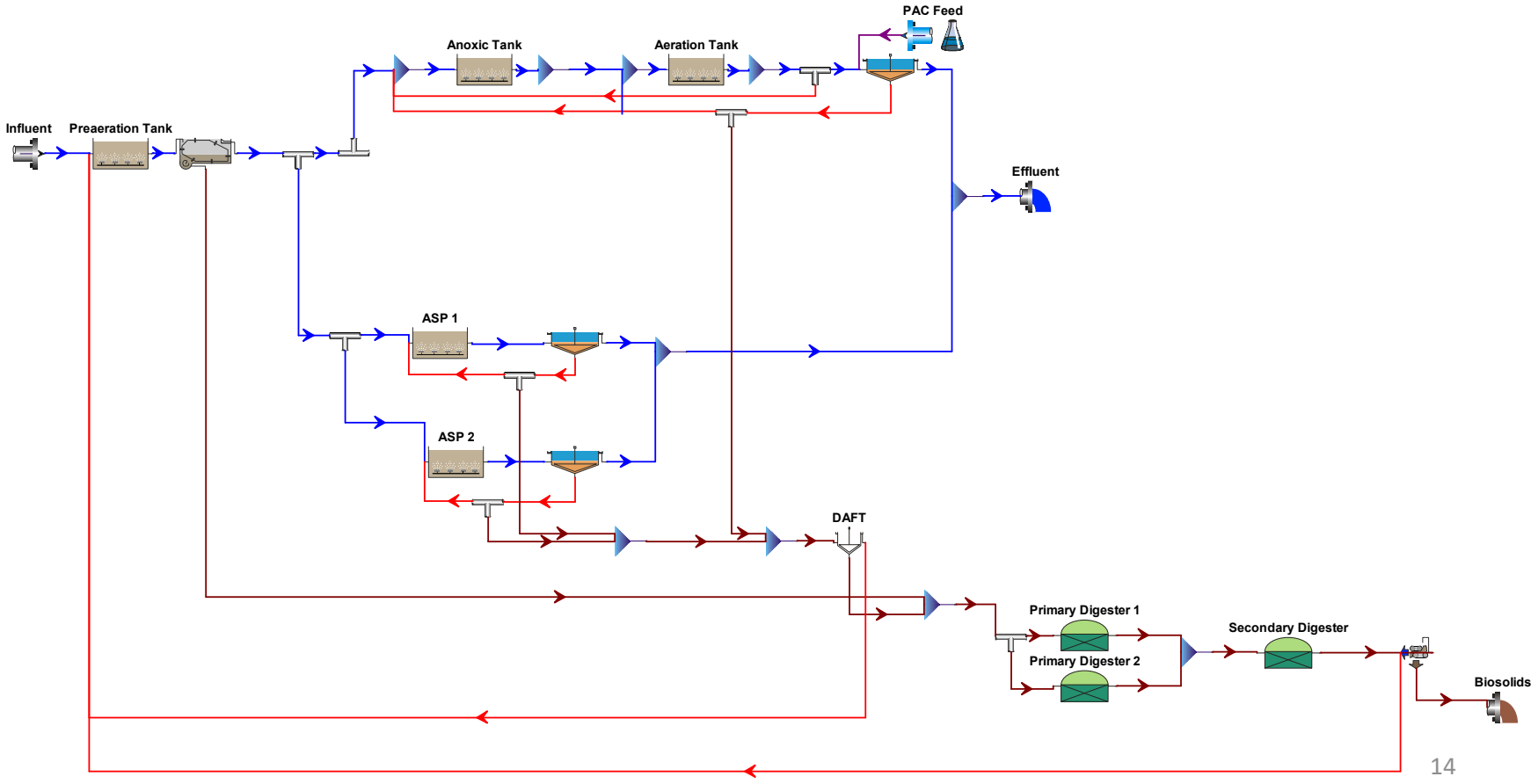
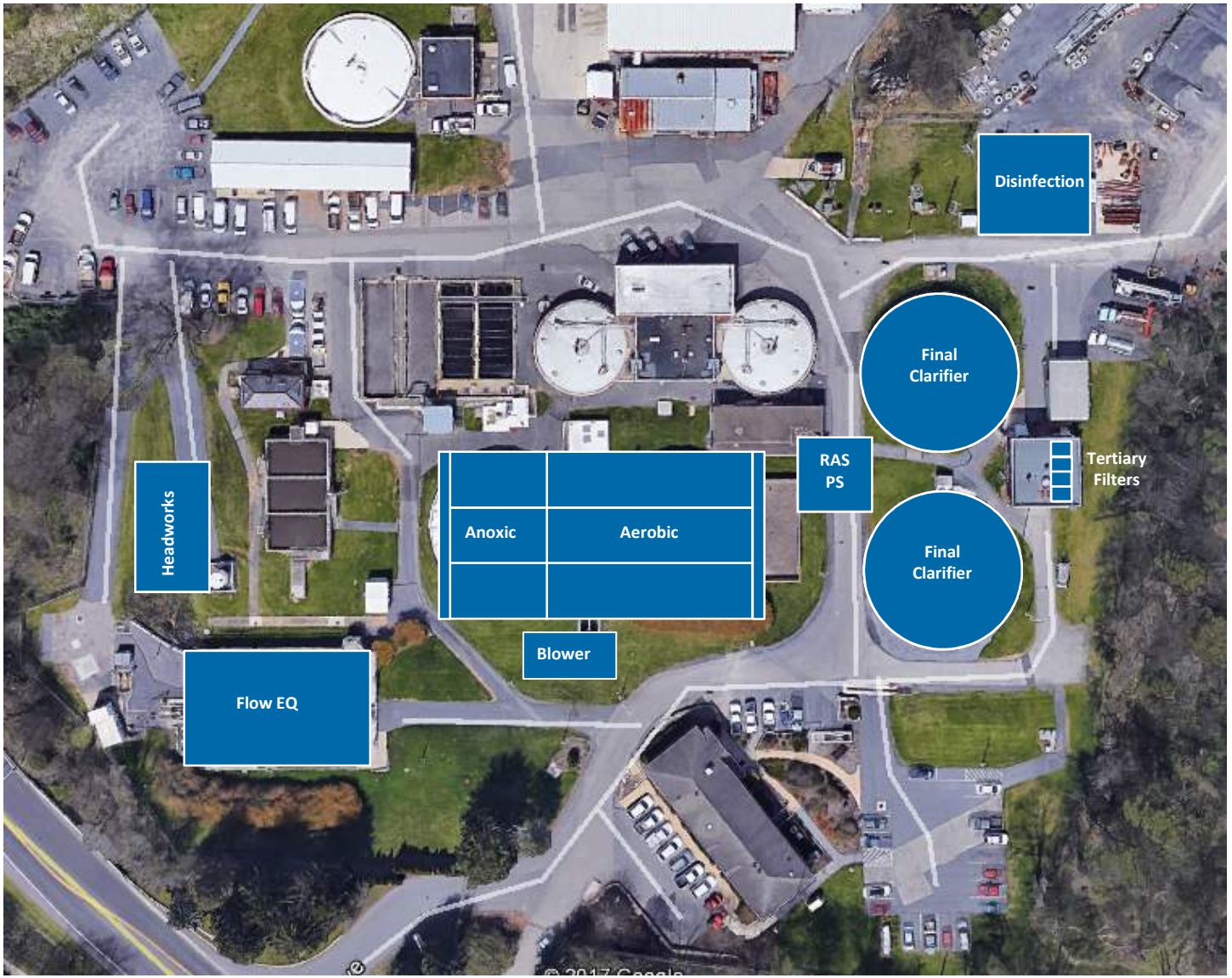
Physical Plant

BioWin Model Calibration

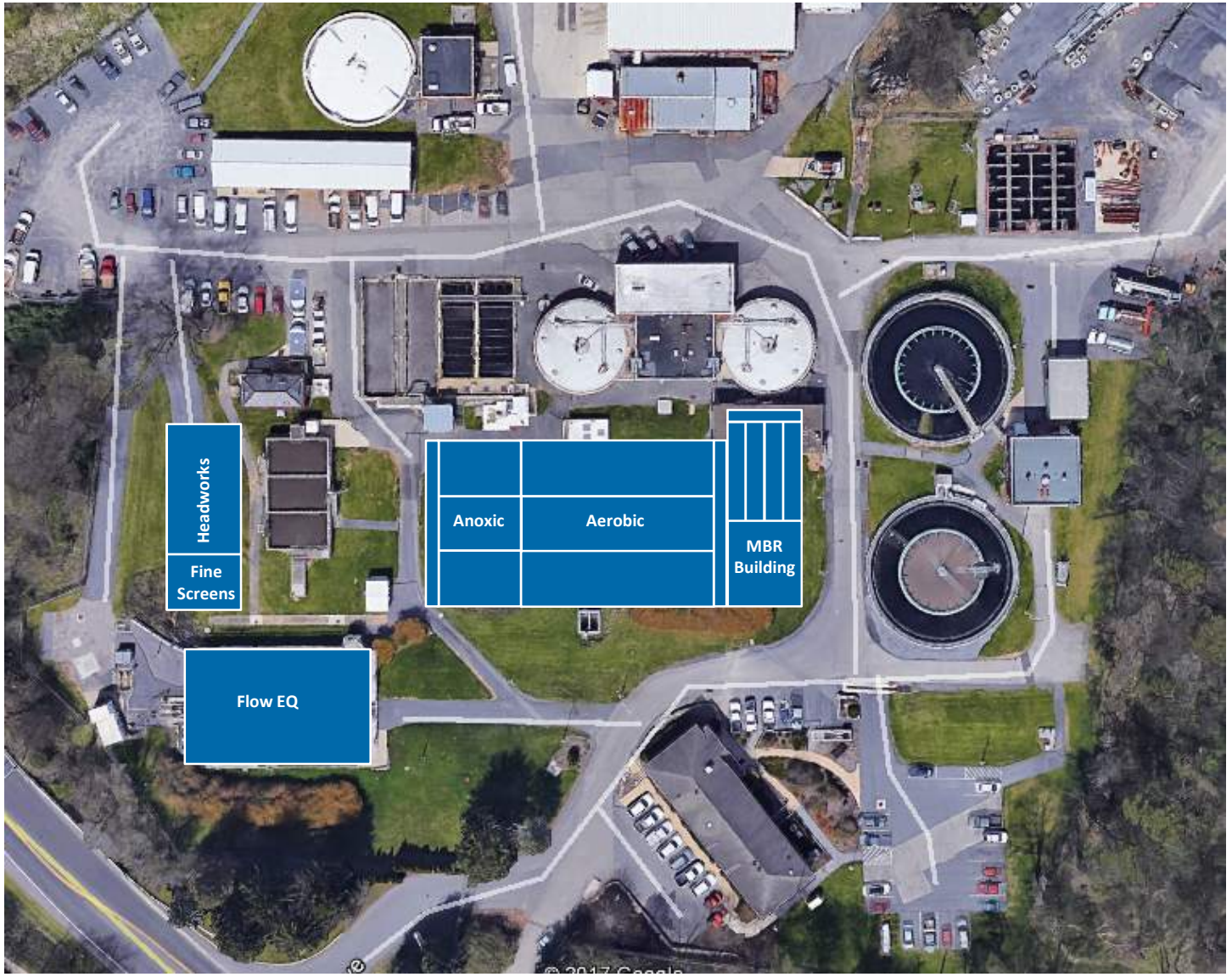
- Model calibrated to September 2017
  - Treatment
  - Mass balance



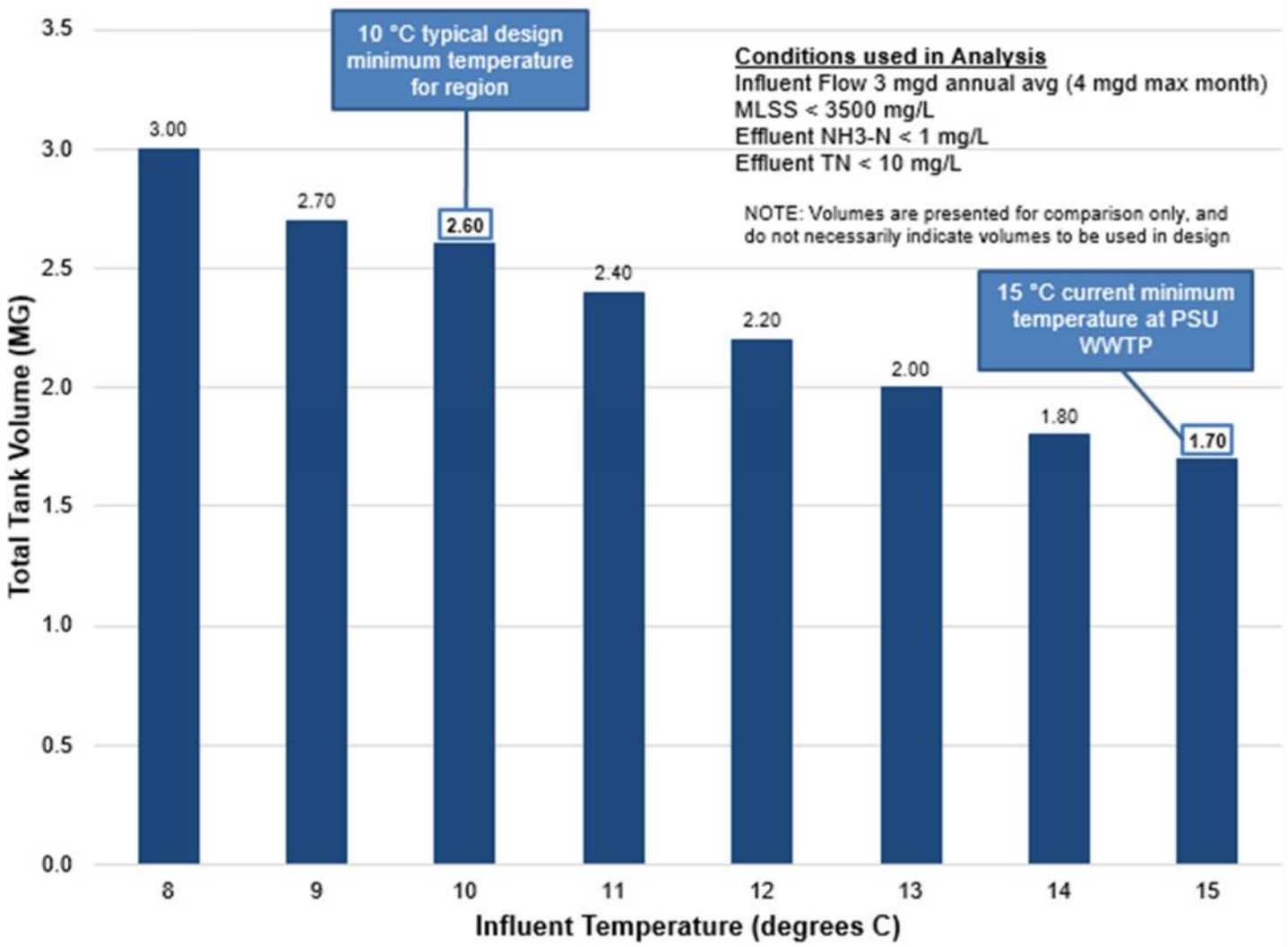
Conventional Activated Sludge Layout



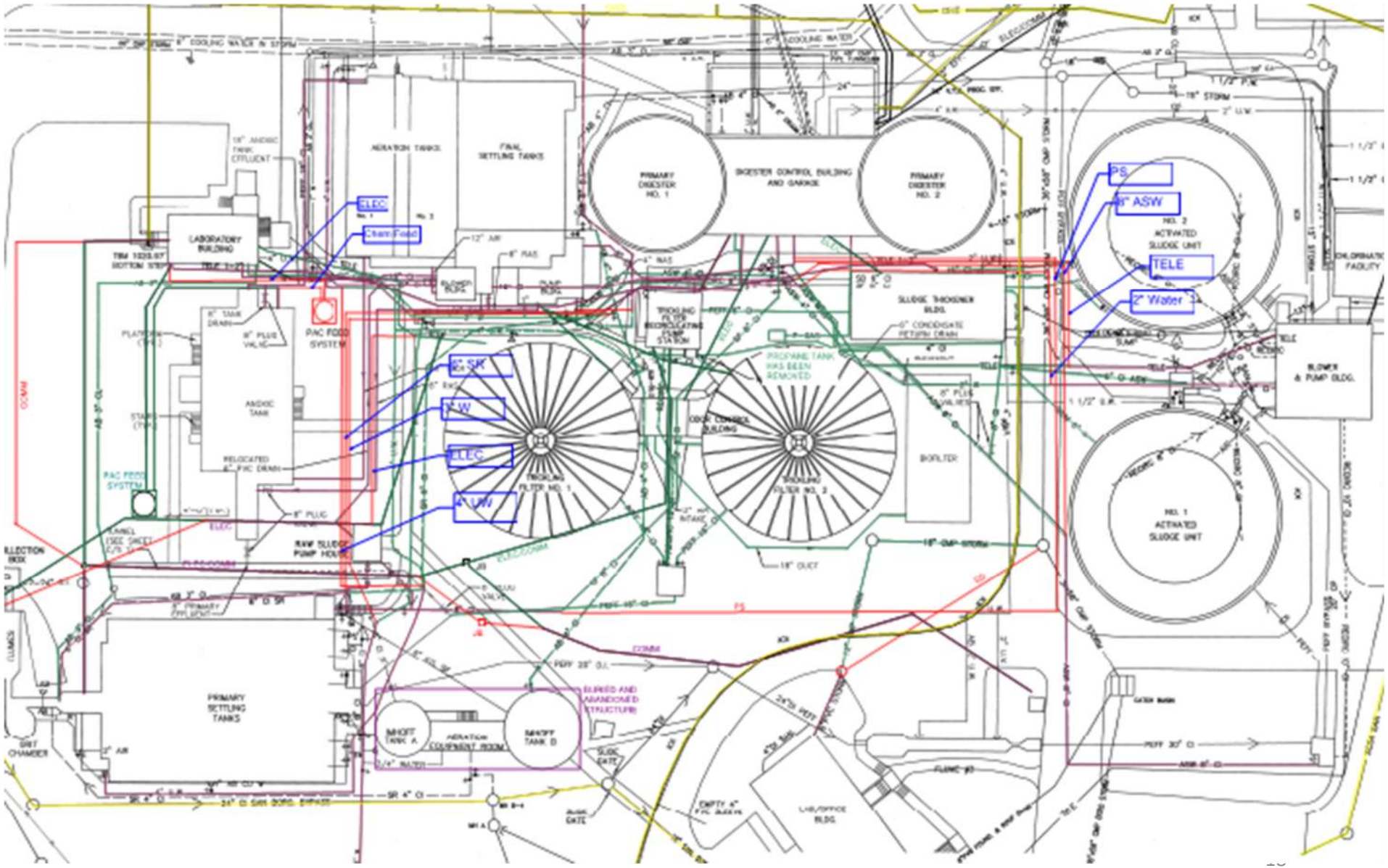
MBR Layout


Headworks
Fine Screens
Anoxic
Aerobic
MBR Building
Flow EQ

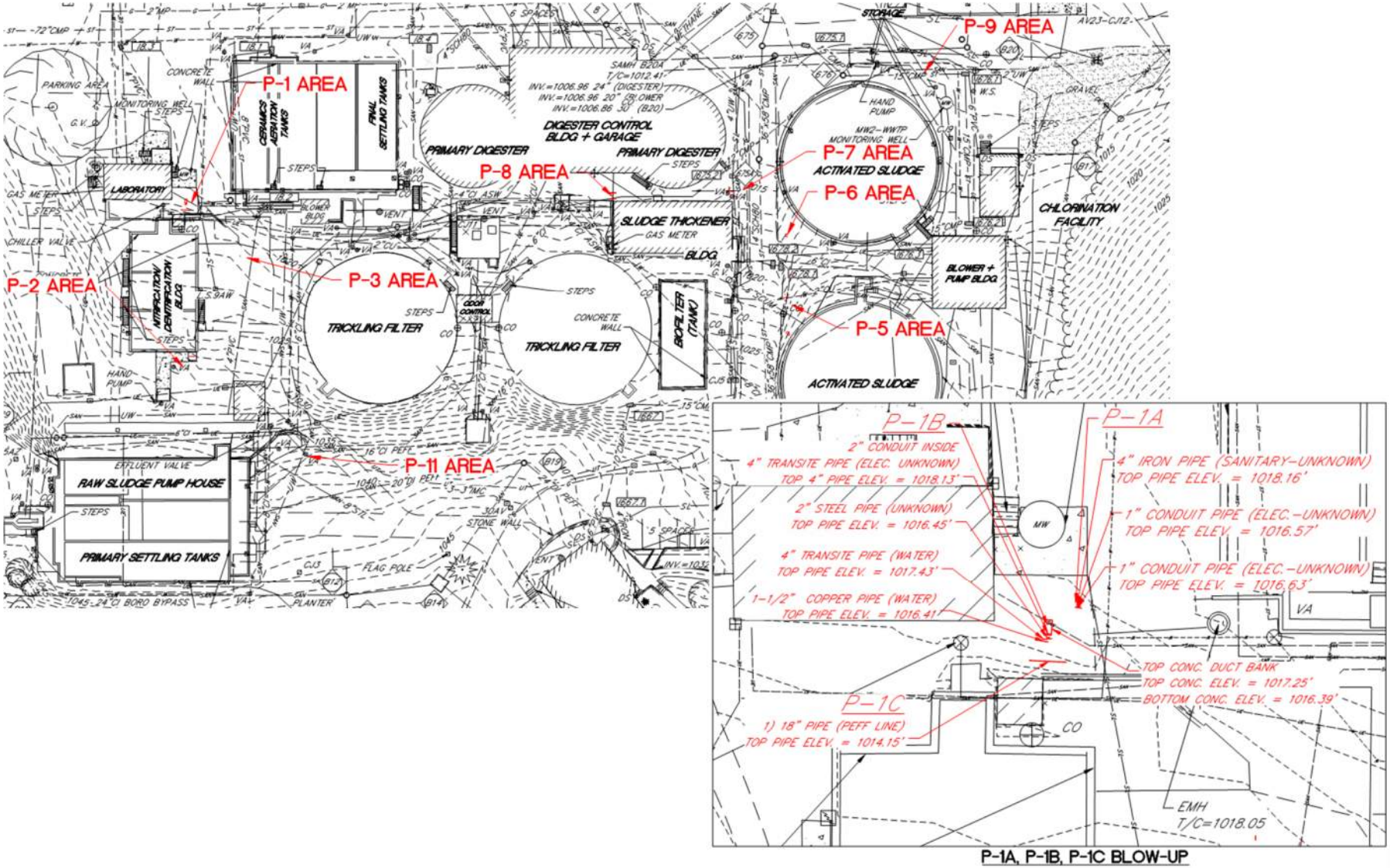
Temperature Sensitivity Analysis



Utilities Plan

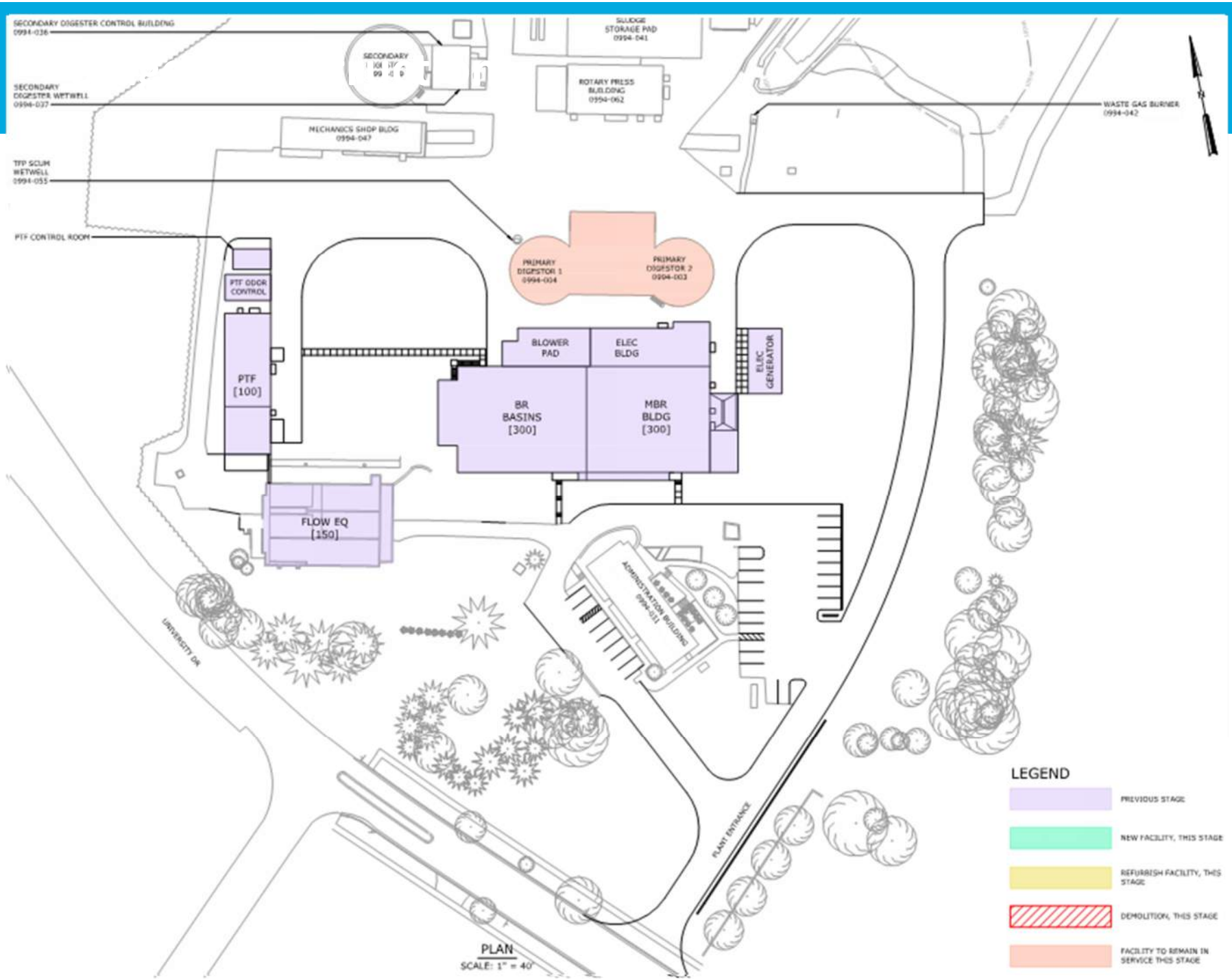


Utility Locations: Potholing



P-1A, P-1B, P-1C BLOW-UP

Project Staging


SECONDARY DIGESTER CONTROL BUILDING
0994-036
SECONDARY DIGESTER WETWELL
0994-037
MECHANICS SHOP BLDG
0994-047
SLUDGE STORAGE PAD
0994-041
ROTARY PRESS BUILDING
0994-062
WASTE GAS BURNER
0994-042
TFP SCUM WETWELL
0994-055
PTF CONTROL ROOM
PTF ODOR CONTROL
PRIMARY DIGESTOR 1
0994-004
PRIMARY DIGESTOR 2
0994-003
BLOWER PAD
ELEC BLDG
ELEC GENERATOR
PTF
[100]
BR
BASINS
[300]
MBR
BLDG
[300]
FLOW EQ
[150]
ADMINISTRATION BUILDING
0994-031
UNIVERSITY DR
PLANT ENTRANCE
LEGEND
PREVIOUS STAGE
NEW FACILITY, THIS STAGE
REFURBISH FACILITY, THIS STAGE
DEMOLITION, THIS STAGE
FACILITY TO REMAIN IN SERVICE THIS STAGE
PLAN
SCALE: 1" = 40'

Project Challenge: Watershed Protection

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Protection of Thompson Spring

- Early meetings with PA DEP
- Building in previously disturbed areas
- Emphasis on reducing impervious areas
- Turbidity monitoring prior to construction

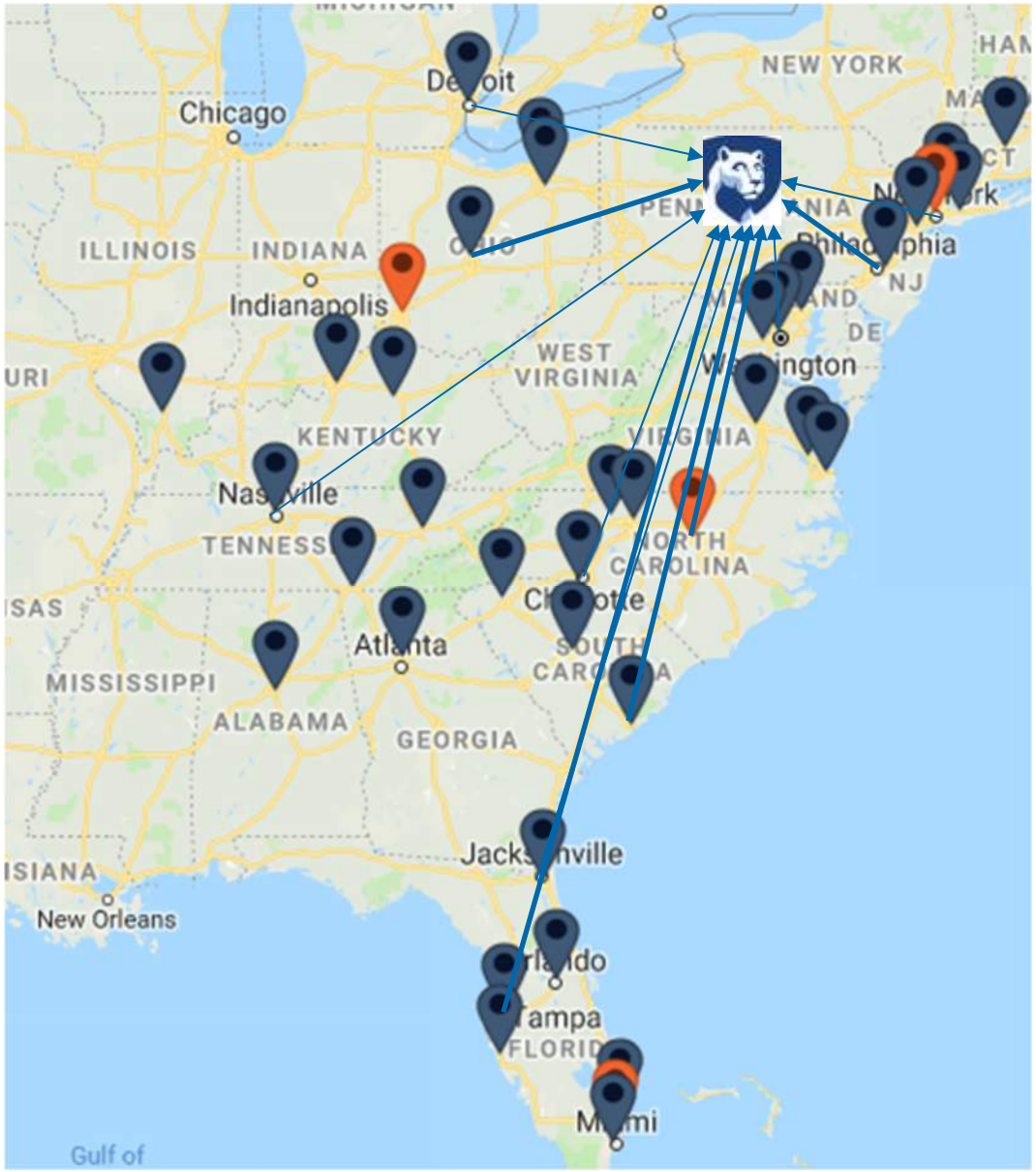
Existing Land Use

Proposed Land Use

Project Challenge: Stakeholder Involvement

PennState
Physical Plant

Virtual Meetings



Not shown:

- San Diego, CA
- Tempe, AZ
- San Francisco, CA
- El Paso, TX
- Multiple offices and stakeholders within PSU

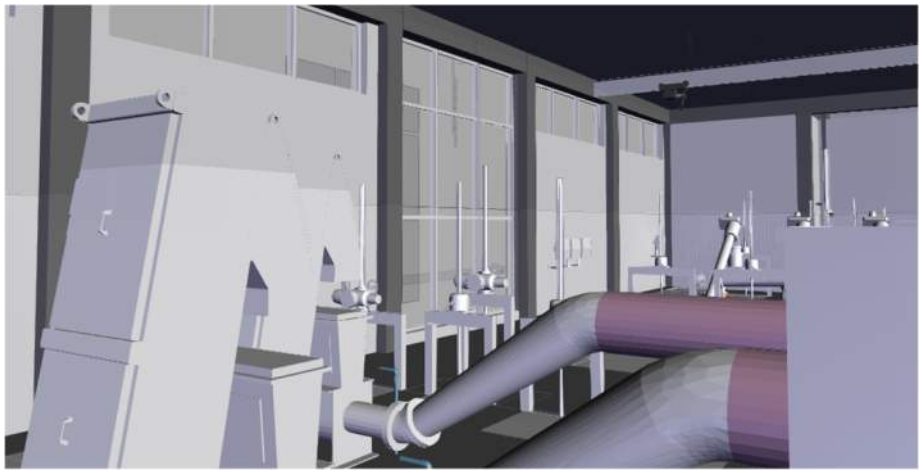
Solution:

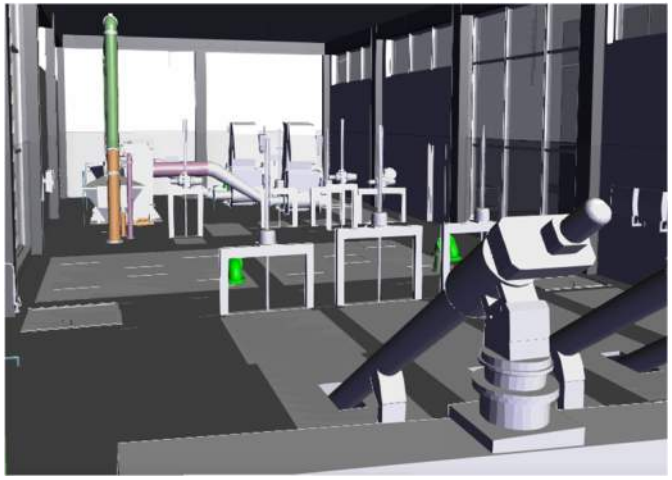
GlobalMeet™

Envision Sustainable Infrastructure Rating System

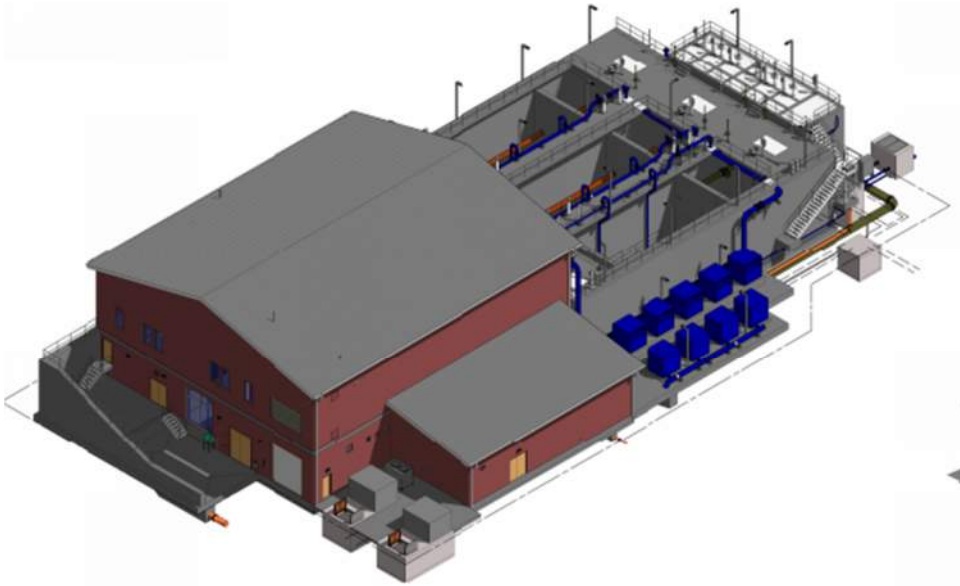
- Authored by APWA, ASCE, ACEC, and Harvard University in 2012
- What makes it different?
  - Applies to civil infrastructure
  - Addresses full spectrum of triple bottom line
  - Applicable in any project phase
- Credible and transparent platform for quantifying non-monetary attributes

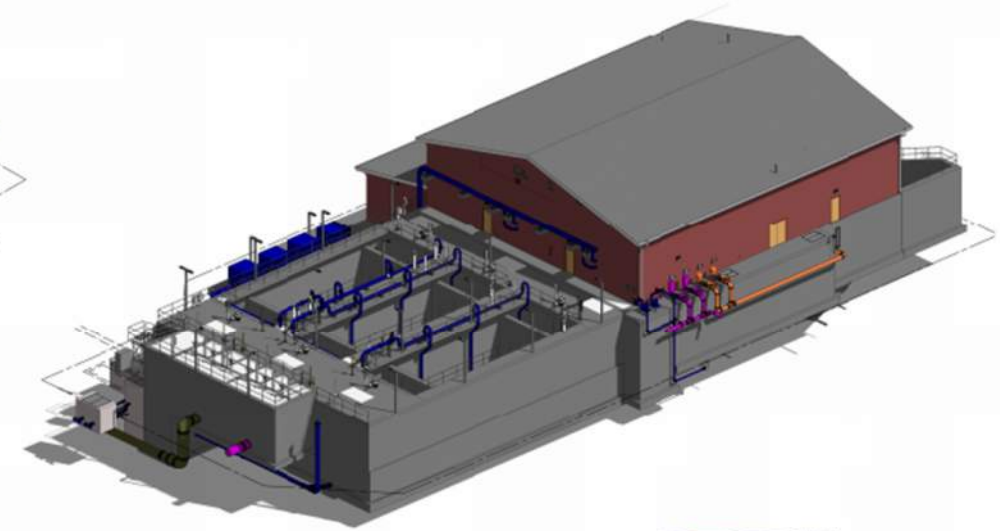
BIM Visualization: PTF

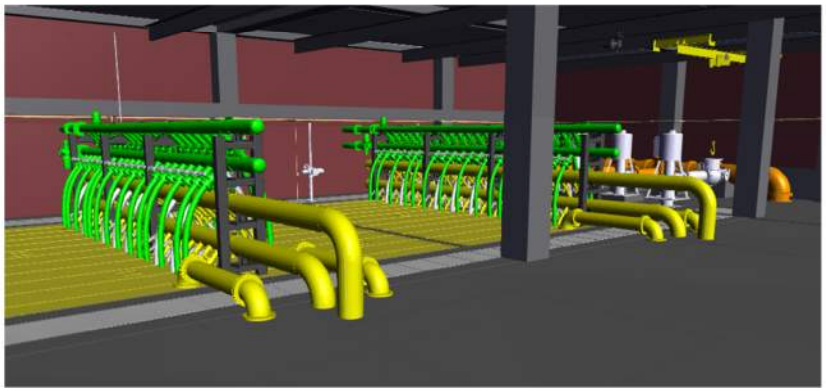


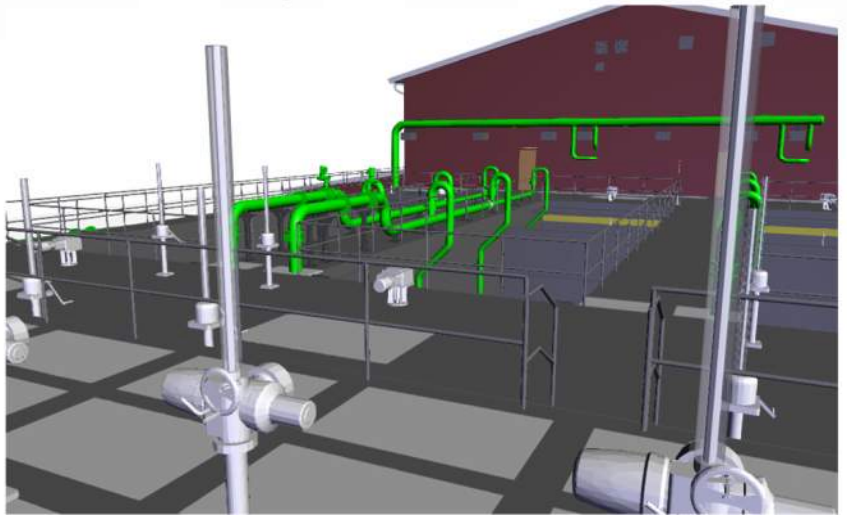


BIM Visualization: BRBs and MBR

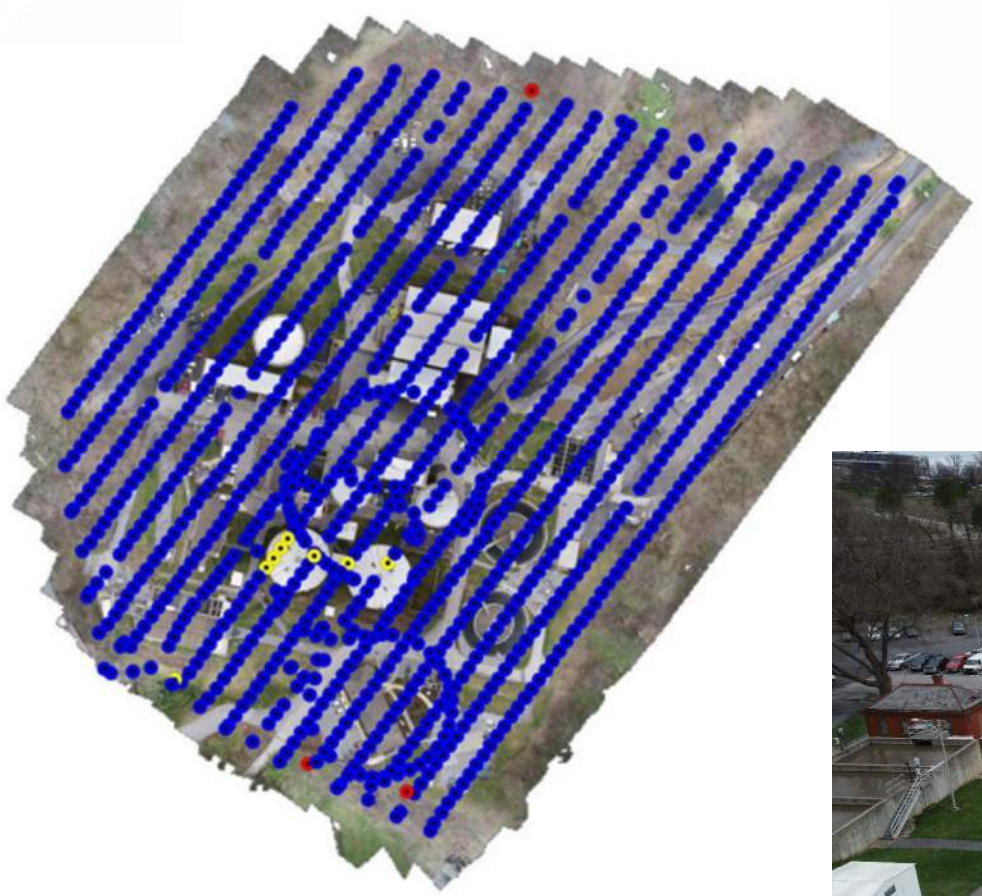








Drone Flyover



Sequencing and Coordination with Operations

THE PENNSYLVANIA STATE UNIVERSITY
UNIVERSITY PARK WATER RECLAMATION FACILITY

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