



INNOVATIVE BIOSOLIDS MANAGEMENT

LITTLE PATUXENT WATER RECLAMATION PLANT
HOWARD COUNTY, MD

County Engineers Association of Maryland – Spring 2022 Conference
Joshua Gliptis - April 14, 2022



BIOGRAPHY – JOSHUA GLIPTIS, P.E.

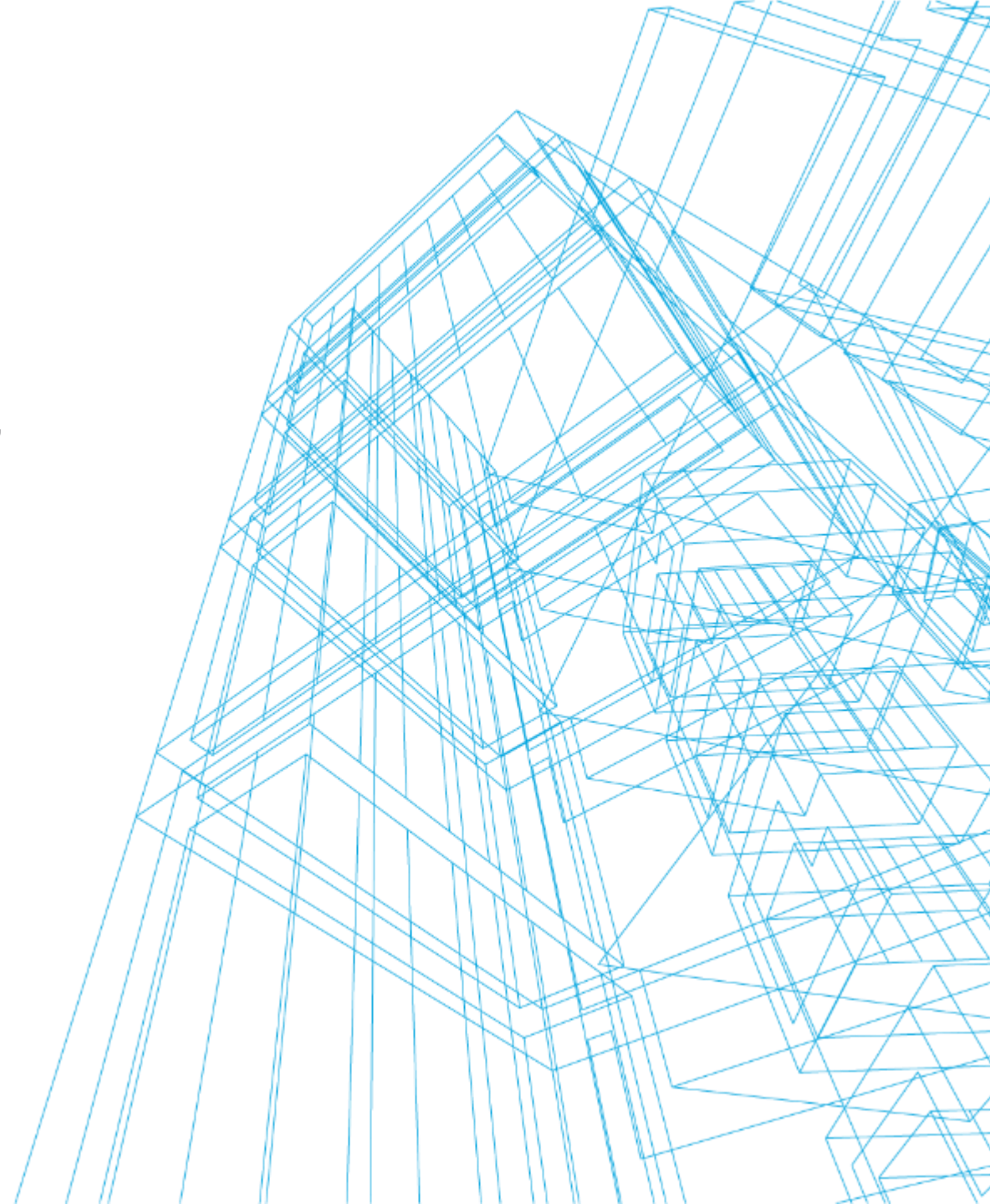
- License Maryland Professional Engineer, #36570
- Licensed Water/Wastewater Operator, #1413
- Over 22 years of experience in the water sector
 - 8.5 years with equipment manufacturer and manufacturer's representative
 - 5.5 years with design consultants
- Bachelor of Science in Geo-Environmental Engineering, Penn State University
- Employed at Howard County Department of Public Works, Bureau of Utilities, Technical Services Division since May 2013
- Principal responsibilities are capital project management and technical support for the Operations and Maintenance Divisions overseeing the water distribution system, sewer collection system and water reclamation facilities.

AGENDA



PDH Value – 1.0 Hour

- Introduction
- Planning
 - Intentional, proactive, focused approach to “The Mission”
 - “Starting with the end in mind”
- Preconstruction and Design
 - CMAR delivery approach and procurement of services
 - Innovative design and process selection
- Construction Progress and Challenges
 - Adaptive, nimble, expedient, collaborative
- Commissioning and Start-up
 - Systematic, performance-based QA/QC
 - COVID impacts
- Closing
 - Lessons Learned and Summary



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INTRODUCTION

INITIAL CONDITIONS AT START OF PROJECT

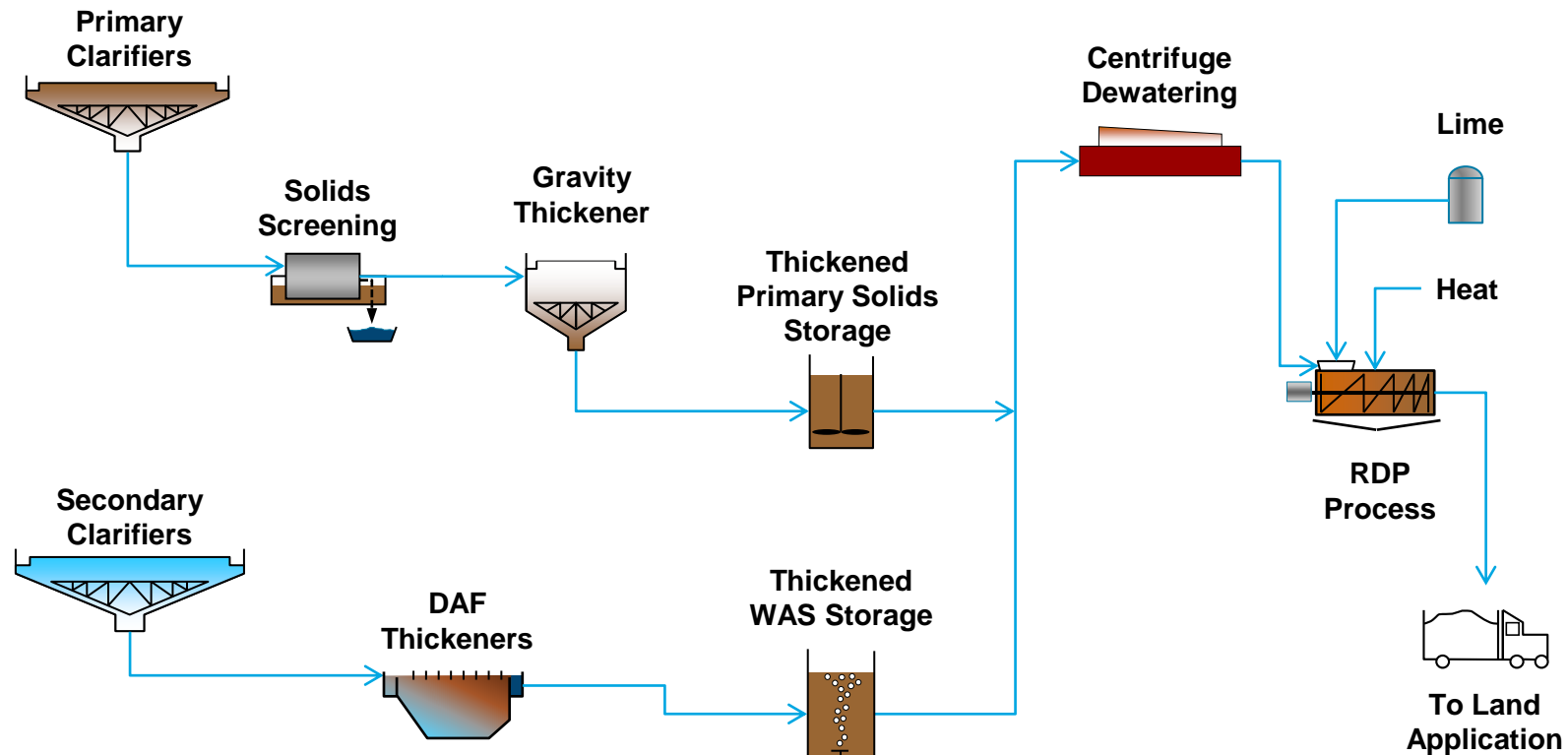
- Name: Little Patuxent Water Reclamation Plant (LPWRP)
- Location: Howard County, Savage, Maryland
- Average Daily Flow of 20 mgd and Permitted Capacity of 29 mgd
- Enhanced Nutrient Removal (ENR) process via Modified Bardenpho Process with Denitrification Filters and Biological Phosphorous Removal
- RDP EnVessel Pasteurization for Class A, EQ Solids
- Biosolids production: 50,000 wet tons/year; 7 trucks per day
- Backup Class B Lime Stabilization or Landfill
- Synagro provides contract operations of RDP, distribution and land application



Existing Little Patuxent WRP

EXISTING LPWRP SOLIDS PROCESS

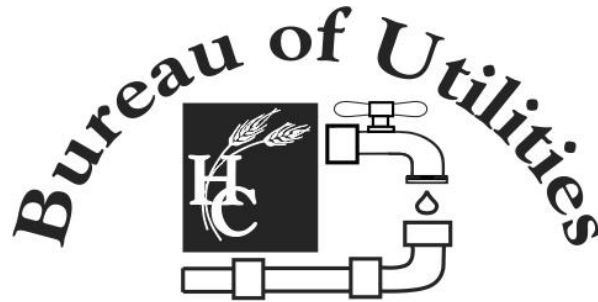
- RDP advanced alkaline stabilization process for Class A EQ biosolids (dewatered cake)





Project Objective:

Design and construct a reliable, cost-effective, and socially responsible treatment facility resulting in beneficial use of LPWRP biosolids in Maryland, for a changing and unpredictable regulatory environment.



Little Patuxent WRP Mission Statement:

Provide environmentally responsible, reliable and cost effective water reclamation services to Howard County.

BUDGET AND TIMELINE

- 2013 Master Plan
 - Approximately \$100,000
 - Used on-call engineer HDR Engineering
- 2014 Preliminary Engineering Report
 - Approximately \$400,000
 - Continued working with HDR Engineering
- 2015 Est. Capital Project and Procure Engineering Services
 - Initially Fund at \$84M: \$12M - Planning & Engineering, \$70M - Construction, \$2M - Administration
 - Qualifications Based Solicitation issued, awarded to HDR Engineering for about \$7M
 - Began Design in July
 - Immediately started drafting QBS for CMAR, advertised in November

BUDGET AND TIMELINE (CONT.)

- 2016 Procure Construction Manager at Risk (CMAR) for Preconstruction Services
 - Award to Clark Construction
 - Develop Dryer Supplier Solicitation, Clark Advertises in July
 - Phase 1 Design Complete in November, HDR transitions to construction phase services (~\$8.5M)
 - Clark solicits for subcontractors and suppliers
- 2017 Begin Construction
 - January Guaranteed Maximum Price (GMP) awarded for approx. \$65.5M including Dryer Package (\$8M)
 - Construction for all Phase 1 facilities starts in February
 - Team progresses Phase 2 design now with Dryer supplier, first dryer design workshop in Dec.
- 2018 Progress Phase 1 Construction – Complete Phase 2 Design, Start Building
 - Design of Phase 2 Complete in January
 - Clark solicits for subcontractors and suppliers, GMP2 early start package issued May 2018
 - Final GMP issued July 2018 – Total now \$92.5M for Construction
 - Anaerobic digesters started in November (major milestone met)

BUDGET AND TIMELINE (CONT.)

- 2019 Finish Phase1 Construction – Progress Phase 2 Construction
 - Punchlist and warranty issues with Phase 1
 - Phase 2 building completion and construction of dryer facilities/processes
- 2020 Phase 2 Commissioning & Startup
 - Progressed despite COVID challenges, but contract was extended due to some delays in commissioning and final construction
 - Dry checkout, wet checkout, and performance testing
- 2021 Phase 2 Completion
 - Final commissioning, punchlist and warranty items
 - Substantial Completion issued December 2020
 - Final Completion issued August 2021

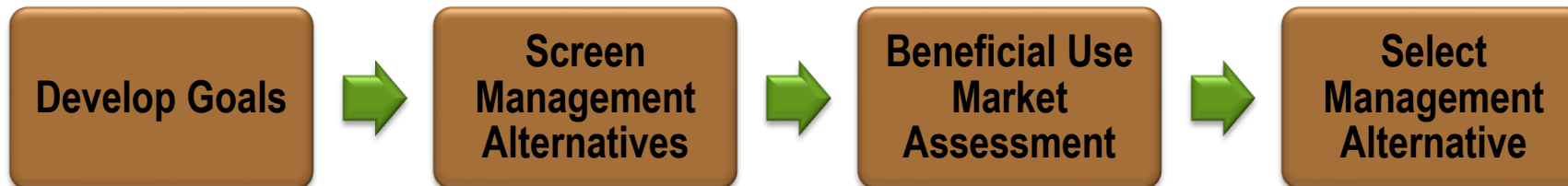
An abstract graphic featuring a complex, multi-layered wireframe structure. The structure is composed of numerous thin, white lines that form a series of overlapping rectangular frames, creating a sense of depth and architectural complexity. The lines are set against a solid, vibrant blue background. The overall effect is reminiscent of a technical drawing or a digital architectural model.

PLANNING

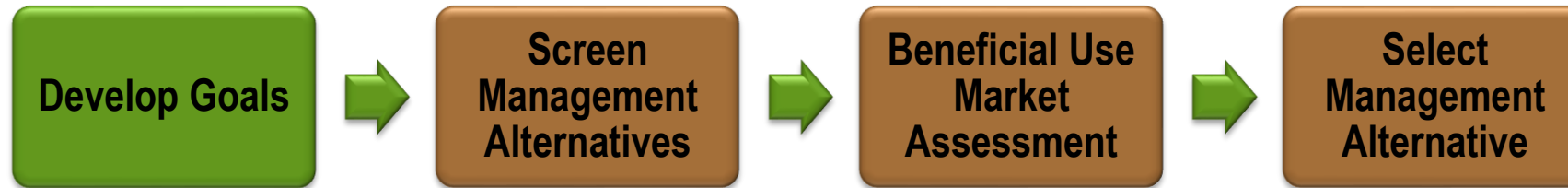
2013 Biosolids Master Planning

Develop a Biosolids Master Plan that provides a framework for reliable, cost-effective, and socially responsible treatment and beneficial use of LPWRP biosolids in a changing and unpredictable regulatory environment.

- Drivers:
 - Evolving regulations for agricultural land application
 - Winter land application ban
 - Phosphorus Management Tool
- Poor workplace environment with lime dust
- High operating cost
- Poor system reliability

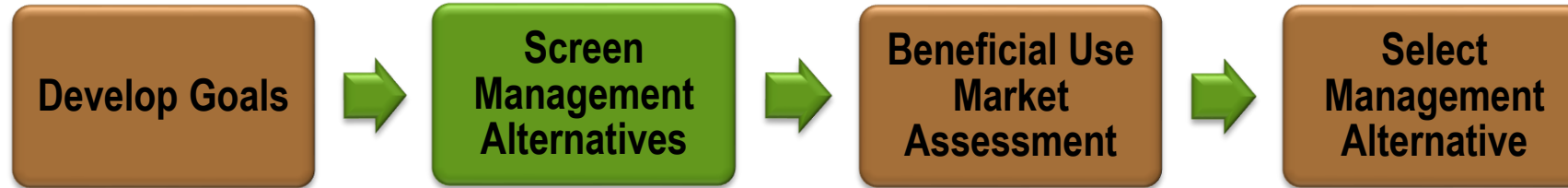


2013 Biosolids Master Planning



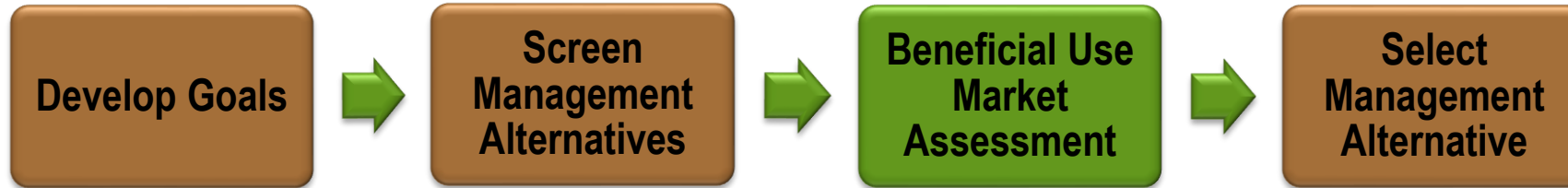
- Goals:
 - More versatile biosolids product (i.e., useable in various markets)
 - Biosolids volume reduction
 - Improved workplace environment (i.e., no corrosive lime dust)
 - Improved ease of operations and system reliability
 - Reduced operating cost and chemical demands

2013 Biosolids Master Planning

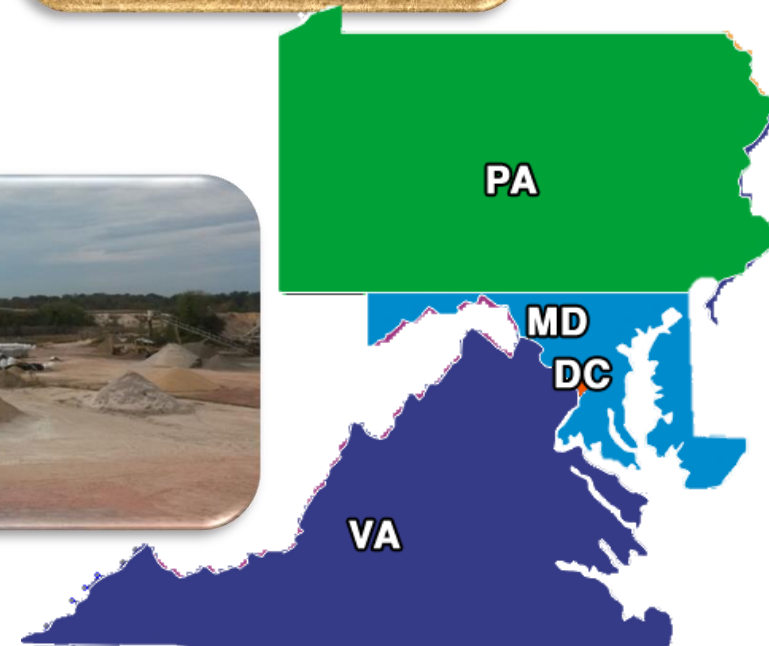


No.	Anaerobic Digestion	Dewatering	Added Stabilization	Energy Recovery	Product	Beneficial Use
1	None	Centrifuge	RDP	NA	EQ cake	Bulk agricultural
2	None	Centrifuge	Drying	NA	EQ granule	Bulk agricultural
5	Mesophilic	Centrifuge	RDP	CHP	EQ cake	Bulk agricultural
7	Mesophilic	Centrifuge	Drying	Dryer fuel	EQ granule	Specialty fertilizer, turf, soil blending
10	THP/ Mesophilic	Centrifuge /BFP	None	THP, CHP	EQ cake	Bulk agricultural
13	THP/ Mesophilic	Centrifuge	Drying/ Screening	THP, Dryer	EQ granule	Specialty fertilizer, turf, soil blending

2013 Biosolids Master Planning



- Understand local markets available
- Preferred/required customer product characteristics
- Market capacity
- Storage needed
- Seasonality



2013 Biosolids Master Planning

Develop Goals

Screen
Management
Alternatives

Beneficial Use
Market
Assessment

Select
Management
Alternative

- Define target markets
- Assess product
- Assess regulatory environment

- Identify local customers
- Phone surveys/site visits

Thermally Dried Exceptional Quality BIOSOLIDS Natural Soil Amendment

Soil Blenders
Fertilizer Blenders
Sod Producers
Product Utilization Sheet

What are Exceptional Quality (EQ) Biosolids?

Exceptional Quality (EQ) biosolids are an organic-based, slow-release soil enhancement and fertilizing product. They are produced from treated, processed, and stabilized residuals from the Little Patuxent Water Reclamation Plant in Howard County, MD. Little Patuxent EQ Biosolids provide a valuable source of organic matter and also serve as a natural nitrogen fertilizer. As a natural nitrogen source, EQ Biosolids provide a consistent, long lasting flow of nitrogen, while also avoiding nitrogen burn symptoms commonly seen with conventional chemical fertilizers.

How are EQ Biosolids Produced?

The Little Patuxent Water Reclamation Plant is an advanced treatment plant that utilizes anaerobic digestion and thermal drying for EQ biosolids stabilization. These EQ biosolids have been treated to such a high degree that the most rigorous standards imposed by state and federal regulations are satisfied. Such residuals meet stringent quality criteria relative to trace elements (heavy metals), pathogen destruction, and vector attraction reduction (volatility).

Plant Growth and Soil Quality

Little Patuxent EQ Biosolids are an excellent moderate-grade fertilizing material and a valuable source of organic matter. In addition to primary nutrients, EQ Biosolids contain secondary and micronutrients that are essential to plant health and vigor, and crucial for superior turf.

Primary Nutrient	AsG	Max/Typ	Min/Typ
% Organic N	4.85%	82.4	16.5
% Ammonium N	0.07%	1.2	0.6
% Phosphate (P ₂ O ₅)	0.06%		
% Soluble potash (K ₂ O)	0.53%		
If a new turf will apply soil by hand			
Micronutrients	AsG		
% Calcium (Ca)	1.03%		
% Iron (Fe)	0.42%		
% Magnesium (Mg)	0.34%		

Benefits Include:

- increased soil water holding capacity
- increased water infiltration
- increased soil aeration
- increased mineral fertilizer plant uptake efficiency
- slow-release nutrients provided for plant growth
- reduced soil surface crusting
- reduced soil compaction from excessive traffic
- improved soil pH (acidic, neutral, alkaline)

Recommendations for Use

EQ Biosolids may be used as a fertilizer for flower and vegetable gardens, shrubbery, ornamentals, and as a potting mix component (Table 2). It is an excellent fertilizer for use in the establishment and/or maintenance (topdress) of turf, golf courses, and home lawns (Table 3). Little Patuxent EQ Biosolids may be used as an agent for soil blending with other approved residuals or as an agent for compost.

Table 2 Container/Garden Typical Application Rates

Garden Plant	Application Rate
Oil-Rose Bedding Plants	1 cup per 10'
Quarantined Transplants	1 cup per 10'
Established Plants	1 cup per 10' around root zone
Flower Beds	3.5 cups (per 8' x 16' per 20' sq ft)
Little Patuxent EQ Biosolids should be incorporated into the top 1-2" of soil in established perennial and annual gardens in spring. Perennial plantings mix with the soil and EQ around the plant.	
Potted Plants*	Indoor: 4" Diameter: 4 cup, 8" Diameter: 1 cup, 12" Diameter: 1 cup, 14" Diameter: 1 cup
*For container gardens, mix evenly into the potting soil in spring.	

Little Patuxent EQ Biosolids Application Rates

The plant available nitrogen (PAN) contributed by biosolids as a fertilizer should be credited along with other N sources (e.g. chemical fertilizers, manure, etc.) towards satisfying the plant N need. The biosolids N content determines the amount of biosolids that may be applied for a particular use such as turf,

nursery, or sod. Additionally, EQ biosolids have a lower P availability and less impact on the environment than fertilizers with highly available P. Recommended application rates will build the soil's organic content and improve soil quality (Table 3).

Planned Vegetation	EQ Biosolids Application Rate (per appl. event)	Recommended Application Rate (per appl. event)
Sod Establishment	180 lb/1,000sq ft	1 application (bi-monthly during growing season)
Turf/Turf Seasonal Topdress, Landscaping	88 lb/1,000sq ft	2 applications (Spring and Fall)
Turf/Turf Feed (Golf Courses)	134 lb/1,000sq ft	1 application (Early winter)

The natural slow release granules have a guaranteed fertilizer analysis of 4-4-0 (% nitrogen, phosphate, and potash). Approximately 100 lb will slowly release a minimum of 4 lb of total nitrogen over an extended period. The nutrients are highly available in an organic, water insoluble form, releasing at a rate similar to which roots absorb them, so feeding a little more or less won't harm plants.

Table 3 Turf and General Use Guidelines

Because Little Patuxent EQ Biosolids meet the EPA most stringent trace element limits, Class A pathogen, and vector reduction standards, they can be applied anywhere that fertilizer is applied. Like all commercial fertilizer products, EQ biosolids should be used in a way to avoid potential environmental impacts. Therefore, standard application practices used with any commercial fertilizer are recommended for application of EQ biosolids.

- During or immediately prior to a rain event
- When ground is saturated, once covered, or frozen (deeper than 2 inches)

As with any fertilizer, applications of EQ biosolids should be kept away from surface waters and streams.

Transport and Beneficial Use

EQ Biosolids produced at the Little Patuxent Water Reclamation Plant are certified by analysis to meet USEPA Class A requirements. This fertilizer can then be applied, stored and later applied onto lawns, flower gardens, residential areas, athletic fields, golf courses, and numerous other applications. Generally, it is suggested that EQ Biosolids be covered and stored until conditions are suitable for application (within one year). EQ Biosolids application rates should be based on the N-need of the

established or planned vegetation.

The chemical and physical properties of Little Patuxent EQ Biosolids are shown in Table 4. Note that they contain very low levels of trace elements.

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Table 4 Typical Characteristics & Accepted Levels for Trace Elements

Element/PCB	Accepted % Concentration (mg/kg)	Little Patuxent EQ Biosolids Concentration (mg/kg)
As	41	4.8
Ca	99	4.9
Cu	1,500	201
Fe	300	1.8
Mn	17	0.5
Ni	420	0.6
Pb	200	0.8
Se	2,800	287

Other Parameters:

pH: 7.5

Total Solids Content: 90% (approx.)

(*) All values expressed on dry weight basis

Environmental Considerations

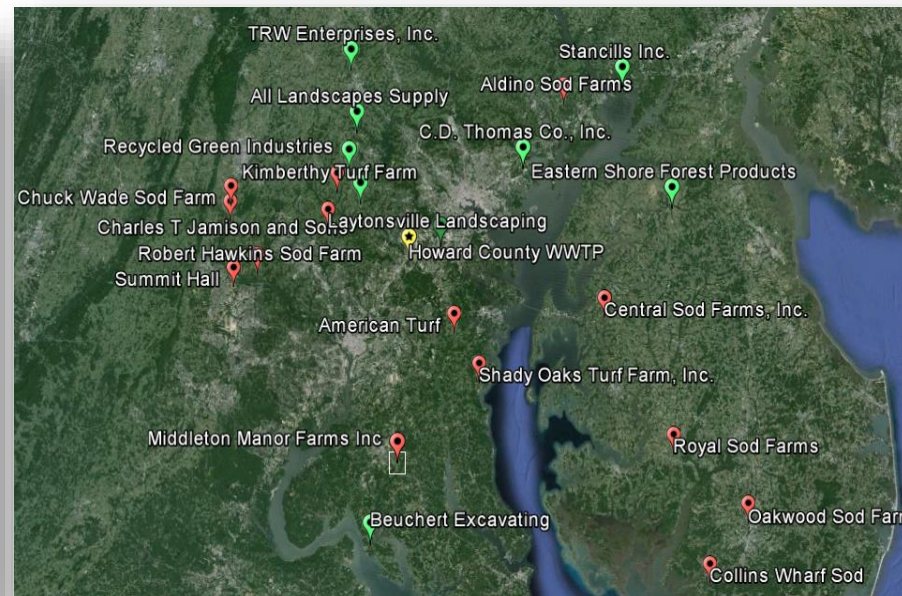
Beneficial use of biosolids has an excellent track record, over a period of more than 40 years. Hundreds of academic and actual field studies, along with the experience of thousands of beneficial users show that biosolids use provides greater crop yields, improved soil structure, and sufficient nutrients for plants to thrive.

For Additional Information Contact:

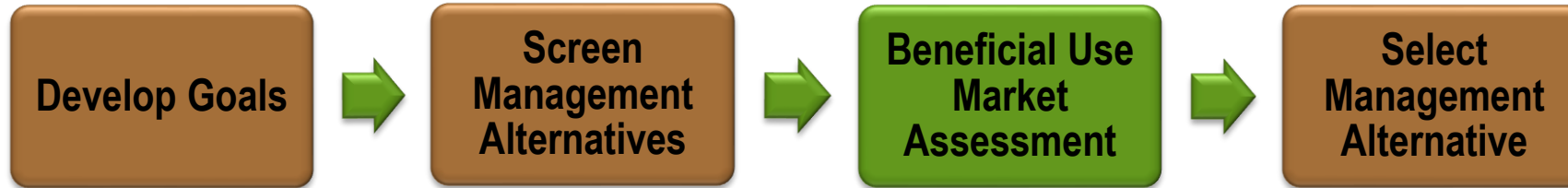
Little Patuxent Water Reclamation Plant
8900 Greenwood Place
Savage, Maryland 20783
(410) 880-5510 (phone)

Material Matters, Inc.
P.O. Box 224
Elizabethtown, PA 17022
(717) 357-9697 (phone)

Email: info@materialmatters.com
Web: <http://www.materialmatters.com>



2013 Biosolids Master Planning

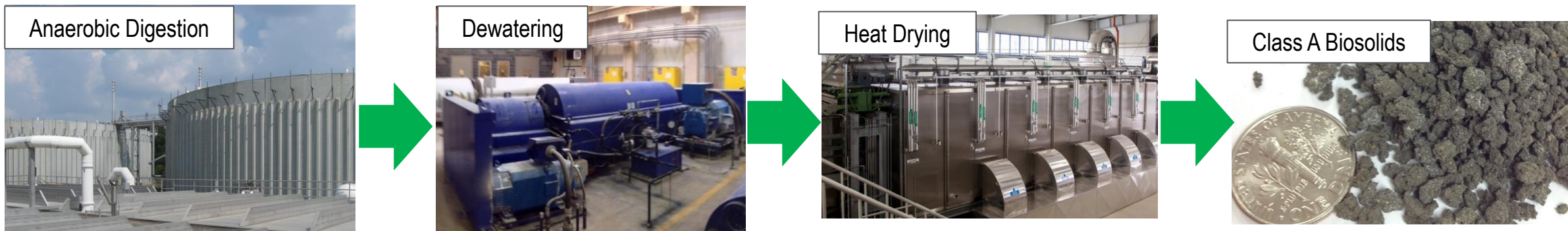


- Survey Results

Bulk Agriculture	Specialty Markets (turf, soil blending, fertilizer blending)
Established market	Novel market
Low marketing effort required	Marketing effort required
Low value	Higher Value
MD options likely limited in long term	Local markets available in long term
One market option	Multiple markets
Wide range of characteristics accepted	Narrow range of characteristics

Master Planning Recommendation

- Replace RDP with anaerobic digestion and heat drying



- Versatile Class A EQ product, multiple end-use potentials
- Volume reduction – from 7 trucks/day to just one
- Local beneficial use outlets exist
- Improved reliability
- Manageable process complexity
- Greatly improved work environment
- Reduced chemical costs (no lime!)

Management Alternative	Biosolids Product tons/year	Project Cost \$million	Annual O&M \$million	Present Worth ¹ \$million
Alt 1: RDP Lime Stabilization	48,800	\$7.1	\$4.3	\$77.3
Alt 2: Heat Drying	11,800	\$31.5	\$3.1	\$82.6
Alt 5: Anaerobic Digestion + RDP Lime Stabilization	33,100	\$31.1	\$3.0	\$81.1
Alt 7: Anaerobic Digestion + Heat Drying	6,800	\$49.3	\$2.5	\$89.8
Alt 10: THP + Anaerobic Digestion	16,900	\$40.2	\$1.9	\$71.7
Alt 13: THP + Anaerobic Digestion + Heat Drying	5,600	\$58.7	\$2.3	\$95.8
¹ Project Cost + Present Worth of 20 years O&M cost at 1.5% annual escalation and 3% discount rate.				

The background of the entire image is a solid blue color. Overlaid on this background is a complex, white wireframe architectural drawing. The drawing consists of numerous thin white lines that form a series of interconnected rectangular and cubic shapes, creating a sense of depth and perspective. These shapes are arranged in a way that suggests a multi-level building or a series of stacked volumes. The lines are most dense in the lower-left and upper-left areas, where they form more complex, multi-layered structures. In the center and towards the right, the lines become more sparse, revealing the blue background. The overall effect is one of technical precision and modern design.

PRECONSTRUCTION AND DESIGN



Preliminary Engineering Report

2014 Preliminary Engineering Report

- Summarize Master Plan Finding and Objectives of Project
- Assess Similar Facilities and Market Evaluation
 - Visit other dryer sites
 - Refine biosolids market analysis
- Further define necessary process improvements
 - Thickening, Storage, and Screening
 - Anaerobic digestion and gas handling
 - Nutrient management (P & N)
 - Heat Drying and Building Requirements
 - Odor control
 - Electrical Distribution
- Outline Project Implementation and Path Forward
 - Schedule, Budget, and Permitting Requirements
 - Bridging document for CMAR delivery method



PER - Visit Sites Using Selected Management Alternatives

- Interviewed plant operators
 - Dryer benefits/challenges
 - Manufacturer relations
- Obtained product samples
- Noted dryer configurations, layout, and ancillary processes



Drum Dryer



Belt Dryer



Drum Dryers in Philadelphia and New Jersey



PER – Refine Beneficial Use Markets

- Revisited interviewed customers
- Conducted additional market interviews
 - Detailed and confirmed product preferences



Granule Size?
Dustiness?
Nutrient content?
Consistency?
Odors?

PER – Define necessary process improvements and equipment

- Thickening, Storage, and Screening
- Anaerobic digestion and gas handling
- Nutrient management (P & N)
 - P: Struvite control with chemical addition
 - N: Centrate treatment - Deammonification
 - Risk: relatively new technologies and limited vendors
- Odor control
- Electrical Distribution
- Dryer options – rotary drum or belt
 - Belt dryers selected – less complex, lower operations and maintenance demands
 - Risk: relatively new and nearly unprecedented size of units; Site constraints



PER - Outline Project Implementation and Path Forward

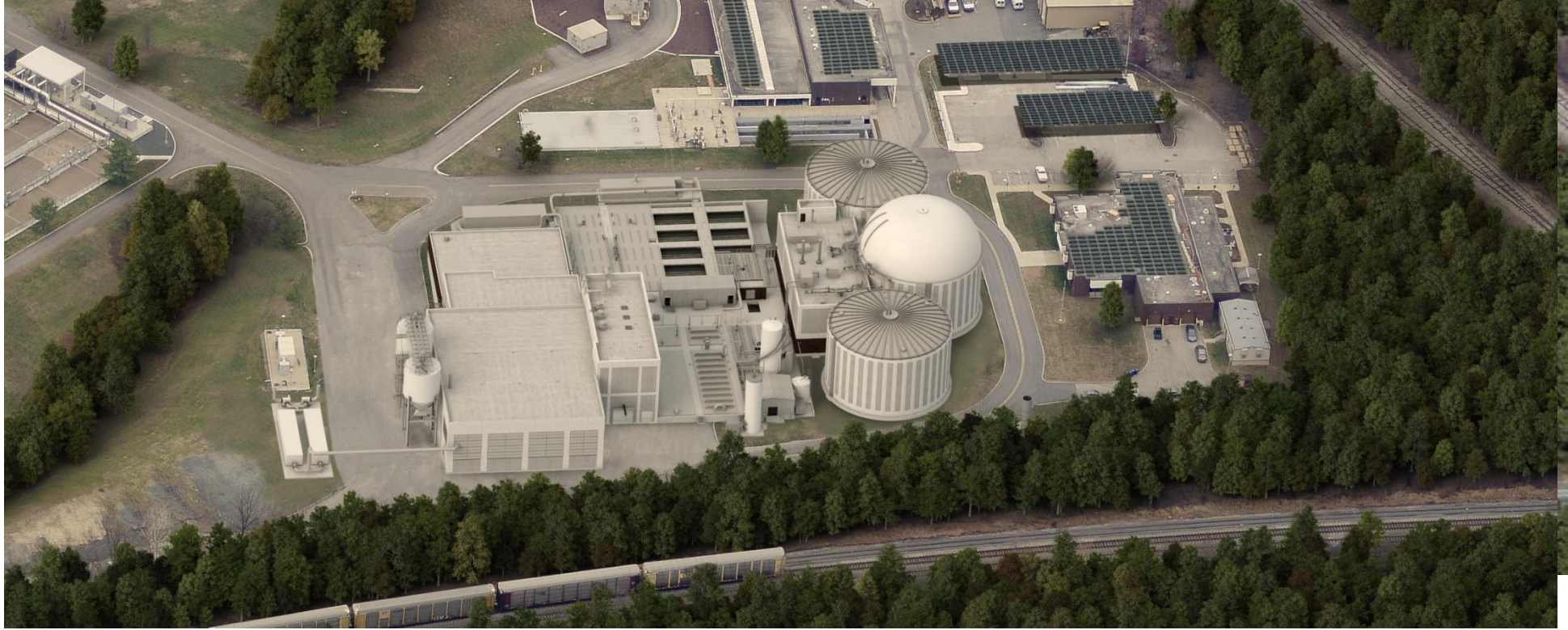
- Present draft schedule and “Opinion of Probable Construction Cost”
- Identify permitting and procurement constraints

Phase 1

- WAS thickening (GBTs)
- Gravity Thickener No 1 & 2 rehabilitation
- Solids storage tank modifications
- Solids screening facilities
- Anaerobic digestion facilities
- Digester gas equipment and treatment facilities
- Centrate treatment process
- Odor control for Phase 1 facilities
- Primary Substation No. 2 replacement
- Phase 1 electrical and instrumentation
- Phase 1 stormwater management
- Plant Control System

Phase 2

- Belt dryer facilities – building and equipment
- Dried biosolids storage
- Dryer odor control
- Centrifuge relocation and feed pump replacement
- Phase 2 electrical and instrumentation
- Phase 2 stormwater management
- Existing biosolids and lime equipment demolition
- Existing biosolids building modifications



Choosing Delivery by Construction Manager at Risk (CMAR)

CMAR Delivery – Why Do It? What are the Benefits?

- Complexity of Project
 - Maintenance of Plant Operations
 - Site Constraints
 - Innovative technology selection and procurement
- Speed in delivery
- Manage Risk
- Eliminate Exhaustive/Defensive Engineering
- Collaboration
 - Selection of most qualified team
 - Selection of equipment and vendors
- Price Certainty
 - Estimates done by Contractor at each milestone
 - Guaranteed Maximum Price established (GMP)
- Schedule Certainty



Engineer and CMAR Solicitations

- Both follow Howard County's Quality Based Selection process

- Expressions of Interest
- Technical Proposals (Top 3-4)
- Interviews
- Consider Compensation for Proposals and Interviews

- County develops solicitation for Engineer

- Issued summer 2015
- Under contract October, 2015

- County and Engineer (acting as Owner's Rep) Develop Solicitation for CMAR

- Issued late 2015
- Under contract March 2016

- CMAR Contracts

- Pre-construction – modeled after County's professional services agreement
- Construction – modeled after County's construction agreements
- Incorporated lessons learned from previous CMAR and DB agreements
- EJCDC and DBIA reference documents as resources



CMAR Involvement and Responsibilities

- Review and comment on Preliminary (30%), Intermediate (60%) , and Final (90%) design submittals
- Other CMAR responsibilities
 - Early procurement of dryer systems and other major equipment items
 - Visited dryer sites together
 - Increased pre-selection list
 - Drafted EOI Solicitation and RFP
 - Value engineering proposals
 - Constructability reviews
 - Development of formal Plans: Site Utilization, Maintenance of Plant Operations (MOPO), Procurement, and Site Specific Safety Plans
 - Schedule
 - Key Milestones
 - » October 2018 Start of Phase I Processes
 - » Working backwards leads to Early and On-Time Delivery of Final Design and GMP1 NTP



GMP Development

- Estimates completed on each design submittal
 - Final GMP consistent with original 30% estimate
- Competitive bids for each of the major bid packages
- Joint interview and review of bidding companies (Owner, Engineer, CMAR)
 - Risk assessment
 - Scope verification
 - Quality
 - Understanding of delivery process
- Meet to review Owner Allowances and CMAR Contingencies
 - Place risk where it is best controlled
- Negotiated GMP within three weeks of receiving bids
- NTP for Phase 1 – February, 2017



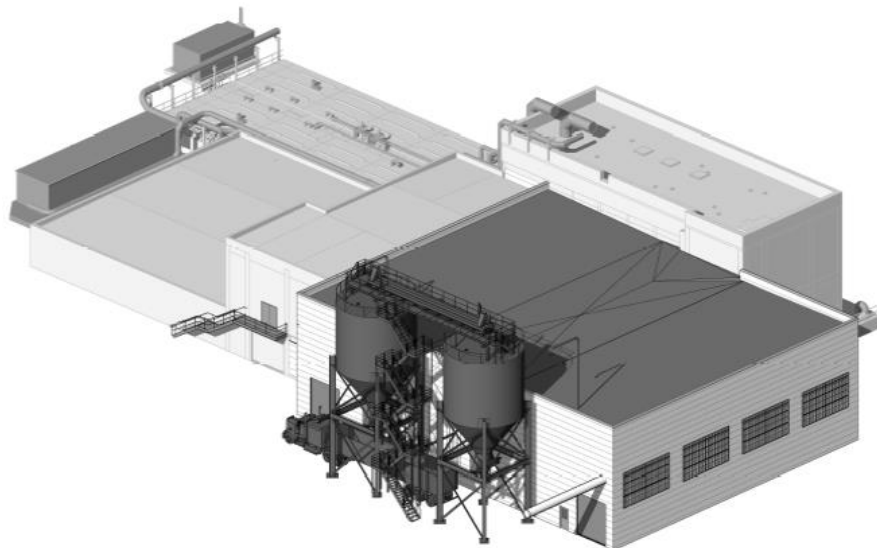
Collaborative Approach...

- Workshops
 - Identifies the key decisions needed
 - Facilitates decisions for the owner
 - Opportunity for top and mid level team members to share ideas
- Partnering
 - Promotes High Level PM Discussions
 - Venue for voicing concerns or highlighting positives
 - Involve key sub-contractors and vendors
- Value Engineering
- BIM
- Outreach
- Envision

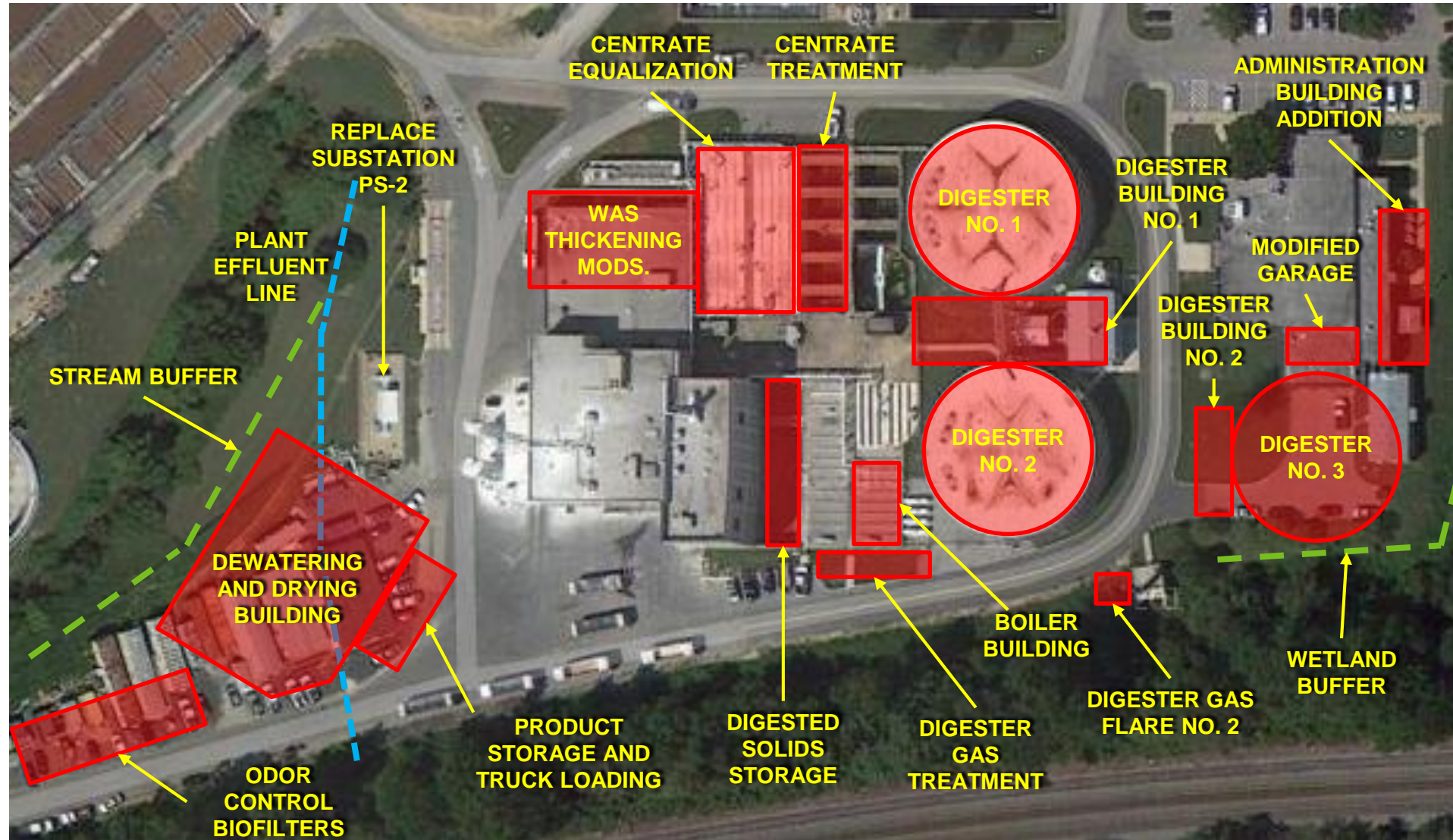


... Leads to Results

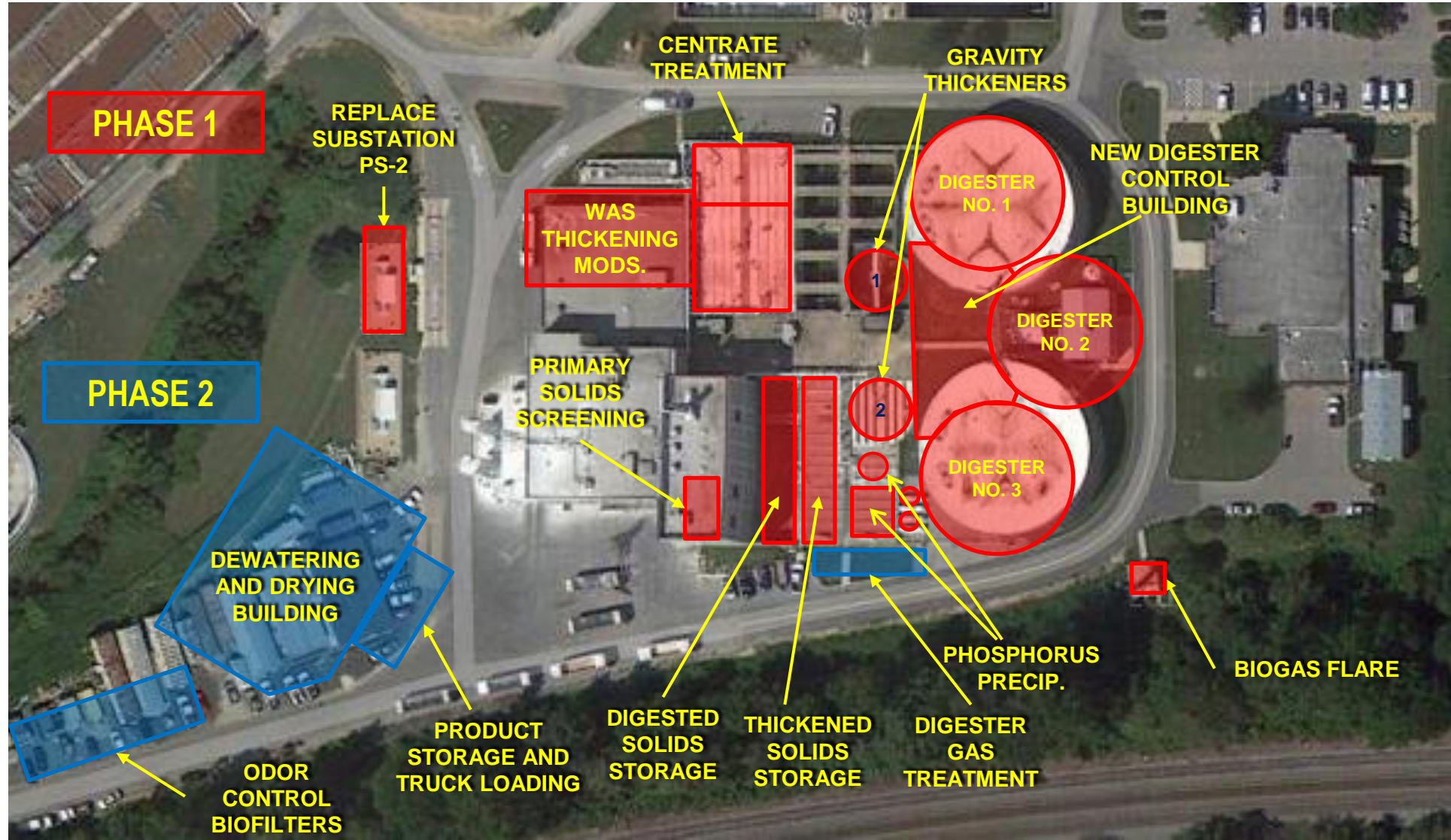
- Major scope revisions...
 - Digester configuration and construction methods
 - Dryer package selection
 - Split Substation and MCC locations (PH1 Design Revision)
 - Relocate dryer building
- ...leads to improved operations, maintenance, and site utilization.



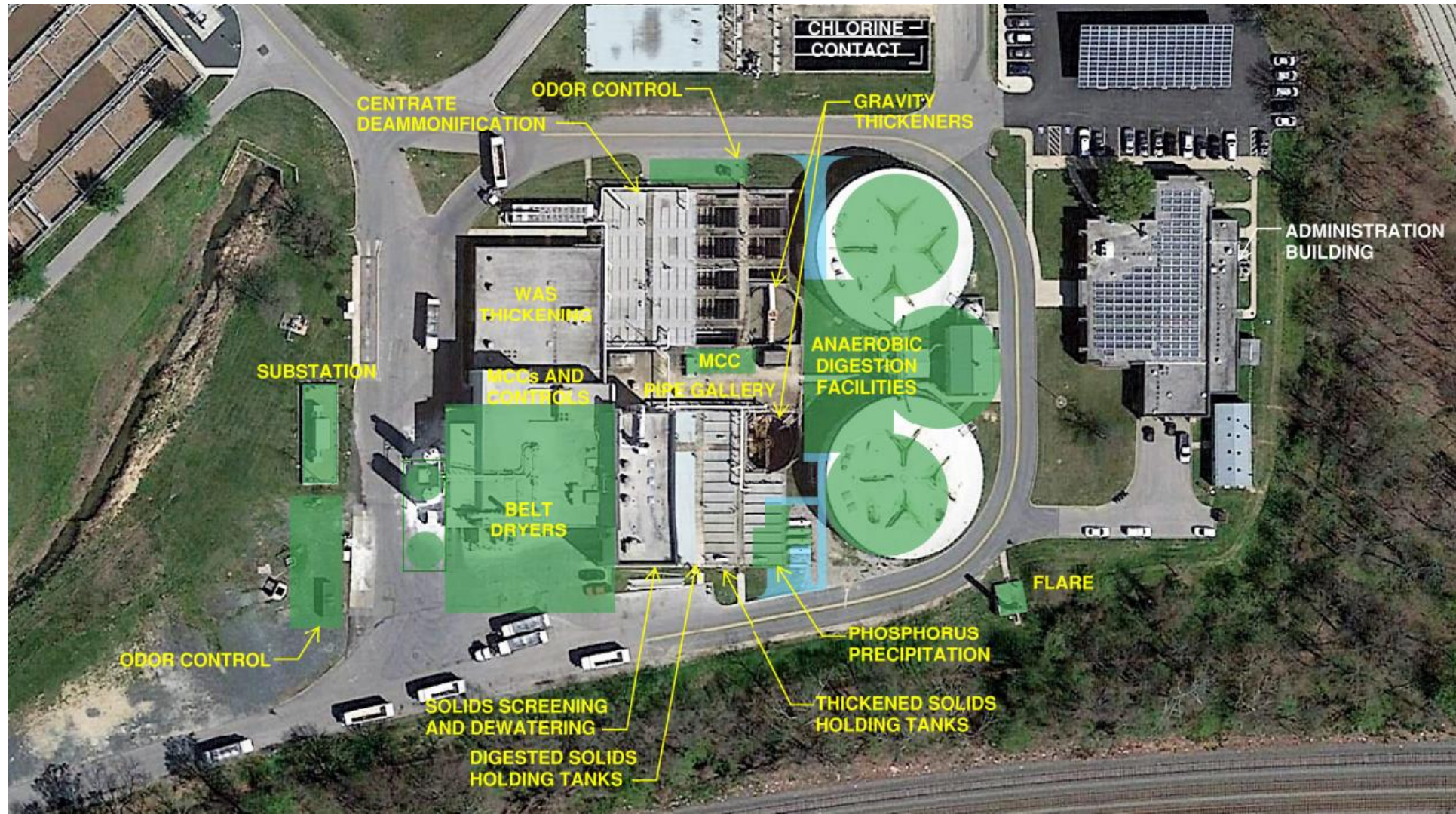
From where we started design...



... through collaboration the process evolved ...



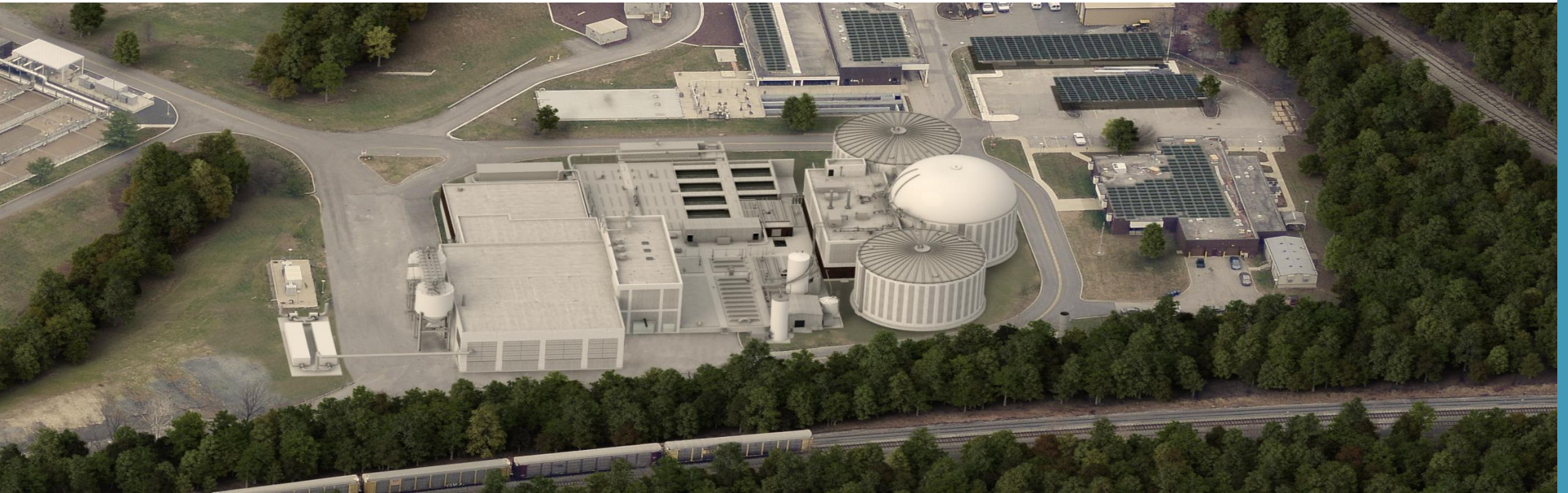
... to where we finally landed



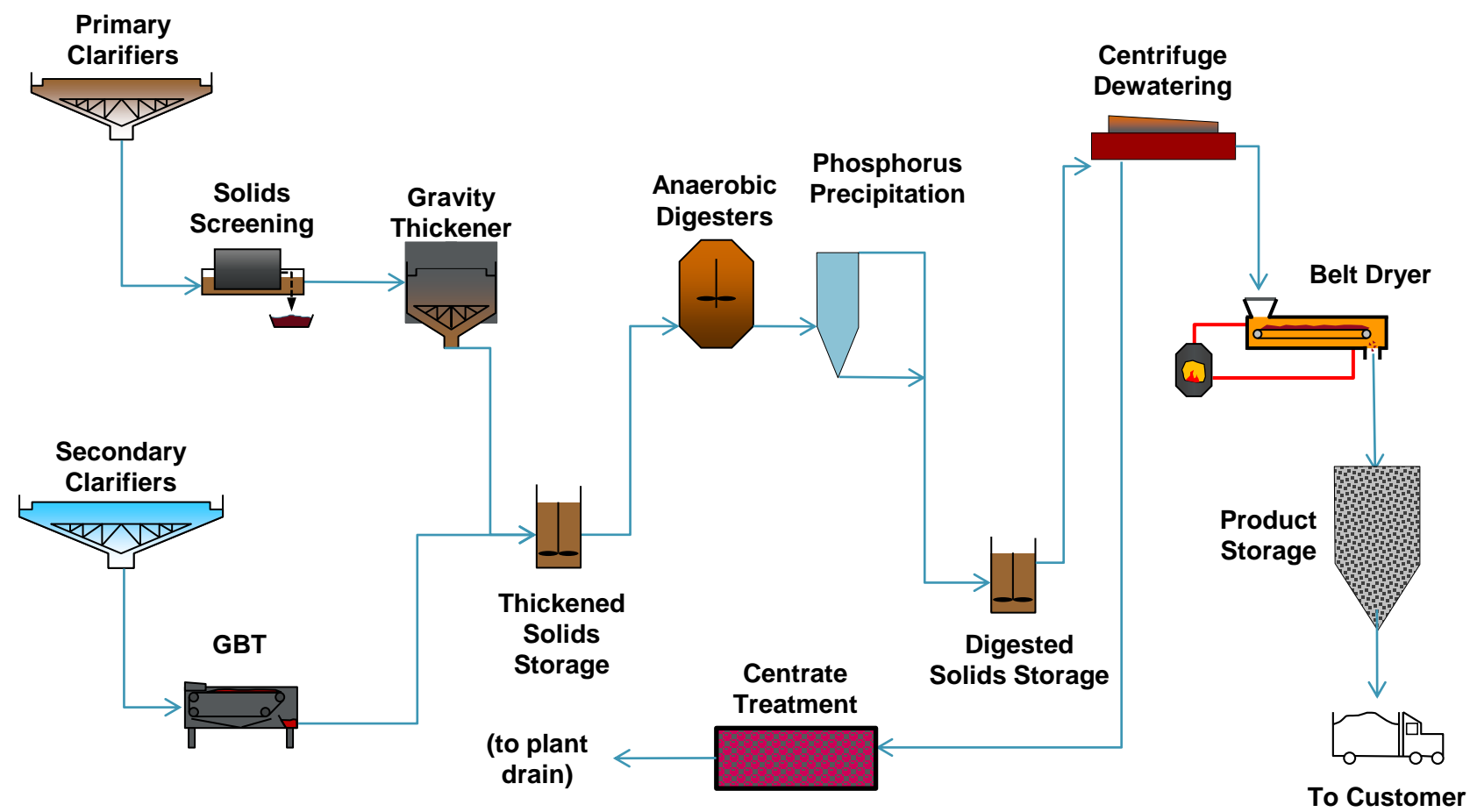
Final Design

- Three new digesters and single digester building
- Phosphorus precipitation for struvite management
- Deammonification process for control of nitrogen in centrate
- Belt dryer system selected
- Dryer building relocated
- New prefabricated motor control center centrally located
- Split power distribution with two substations vs. one originally

Done 

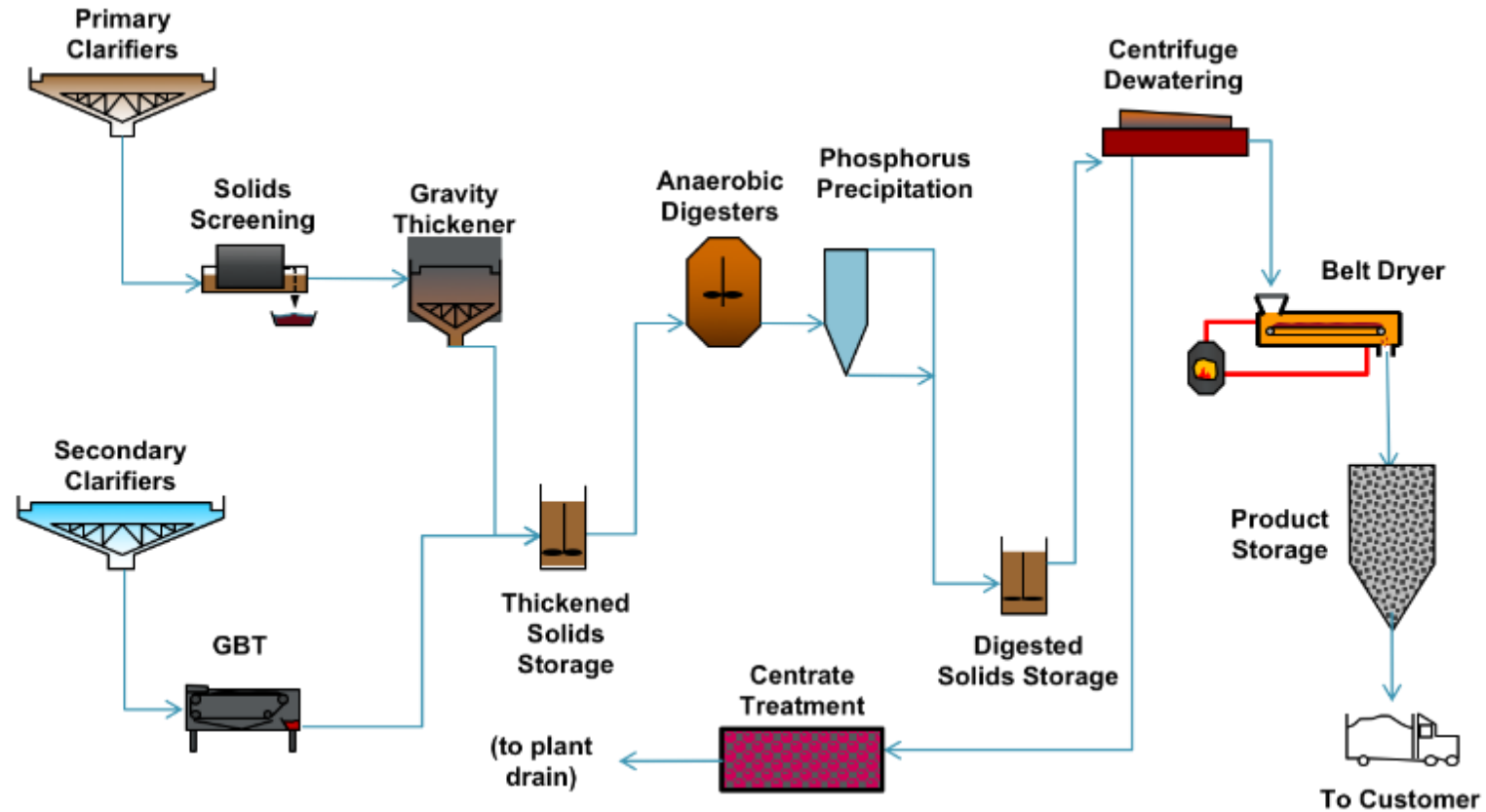


LPWRP Biosolids Improvements



RESULT AT END OF PHASE 1 (LATE 2016)

- Finalized digester configuration
- Phosphorus precipitation
- MOPO
- Deammonification process selection
- Belt dryer pre-selection



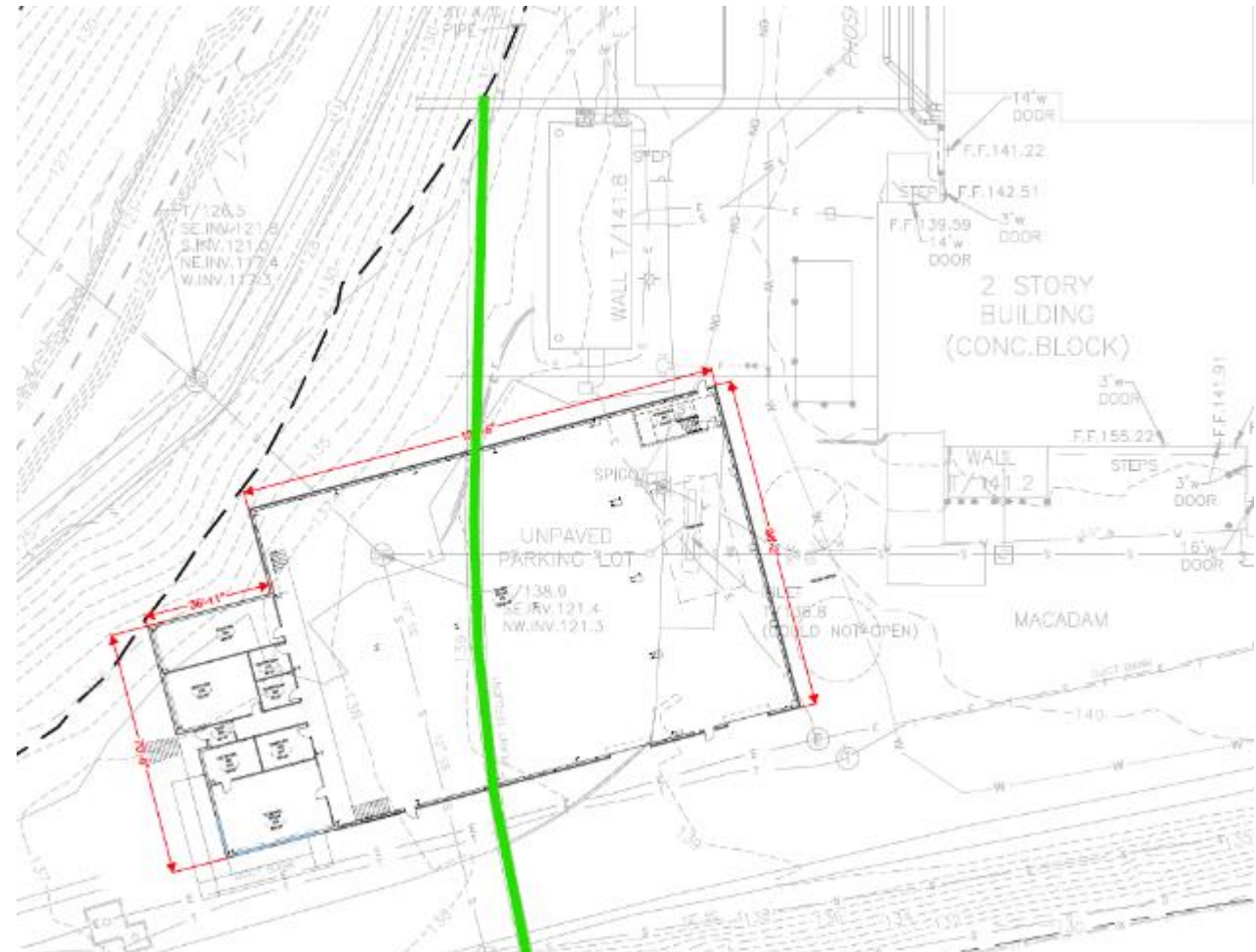
RESULT AT END OF PHASE 1 (LATE 2016)



JANUARY 2017 – PHASE 2 30% DESIGN CHALLENGES

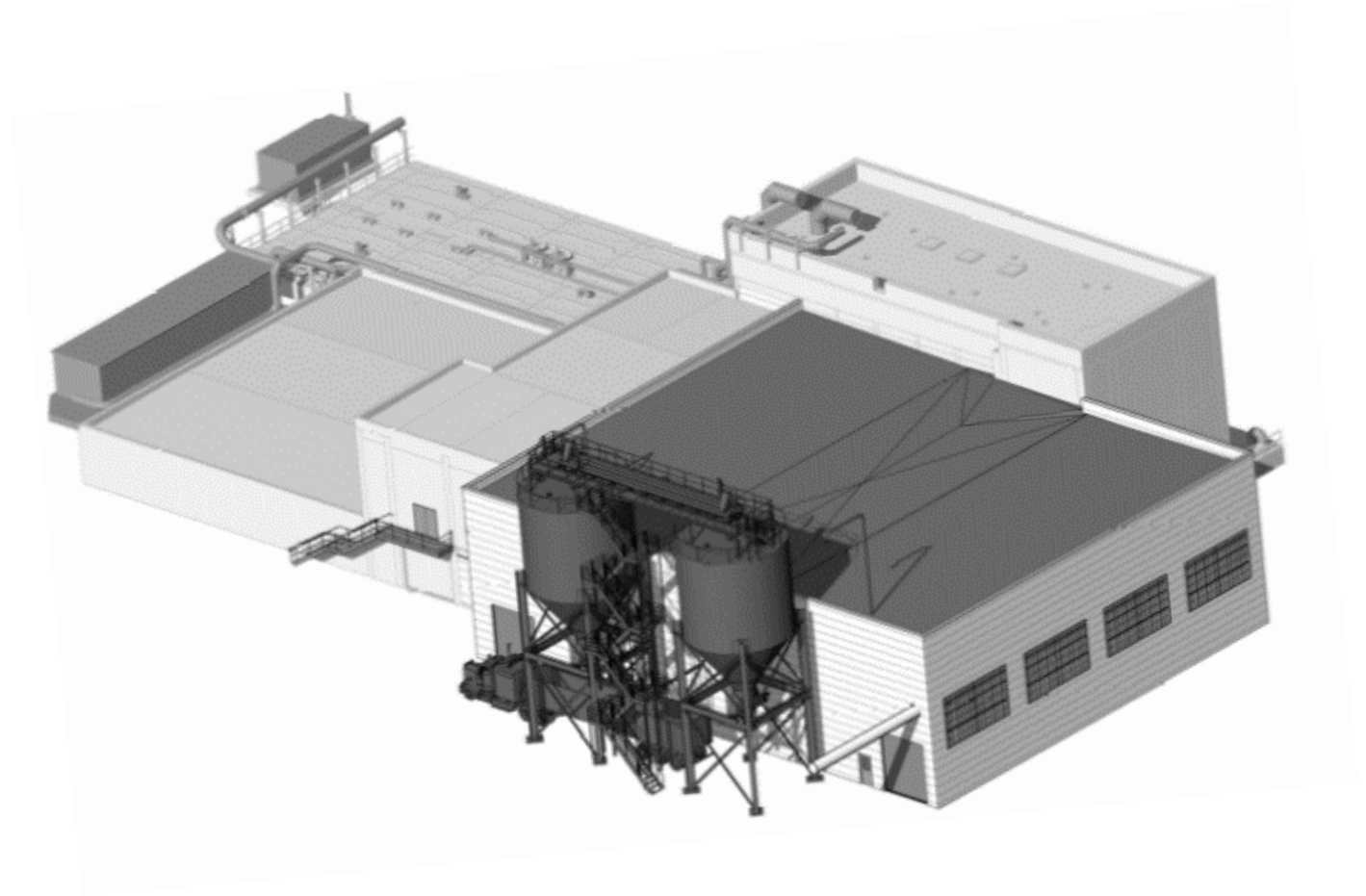
- 54-inch effluent pipe under proposed Dryer Building
- Irregular space
- Encroaching on stream
- Relocate centrifuges
- Multiple facility locations

Challenge: As presented, the current option was not viable. Two weeks to provide three options for Dewatering Building location.

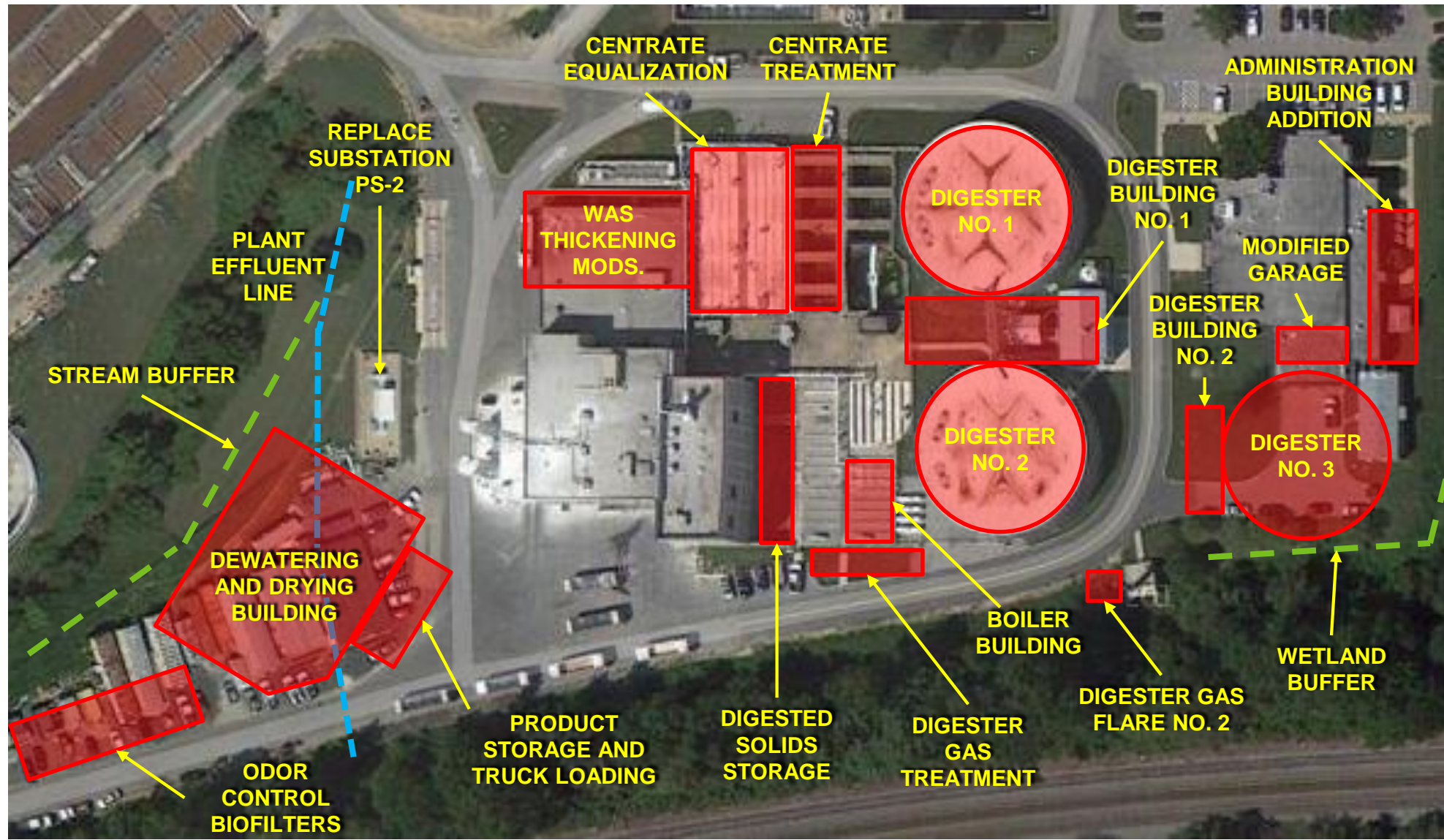


COLLABORATIVE RESULTS

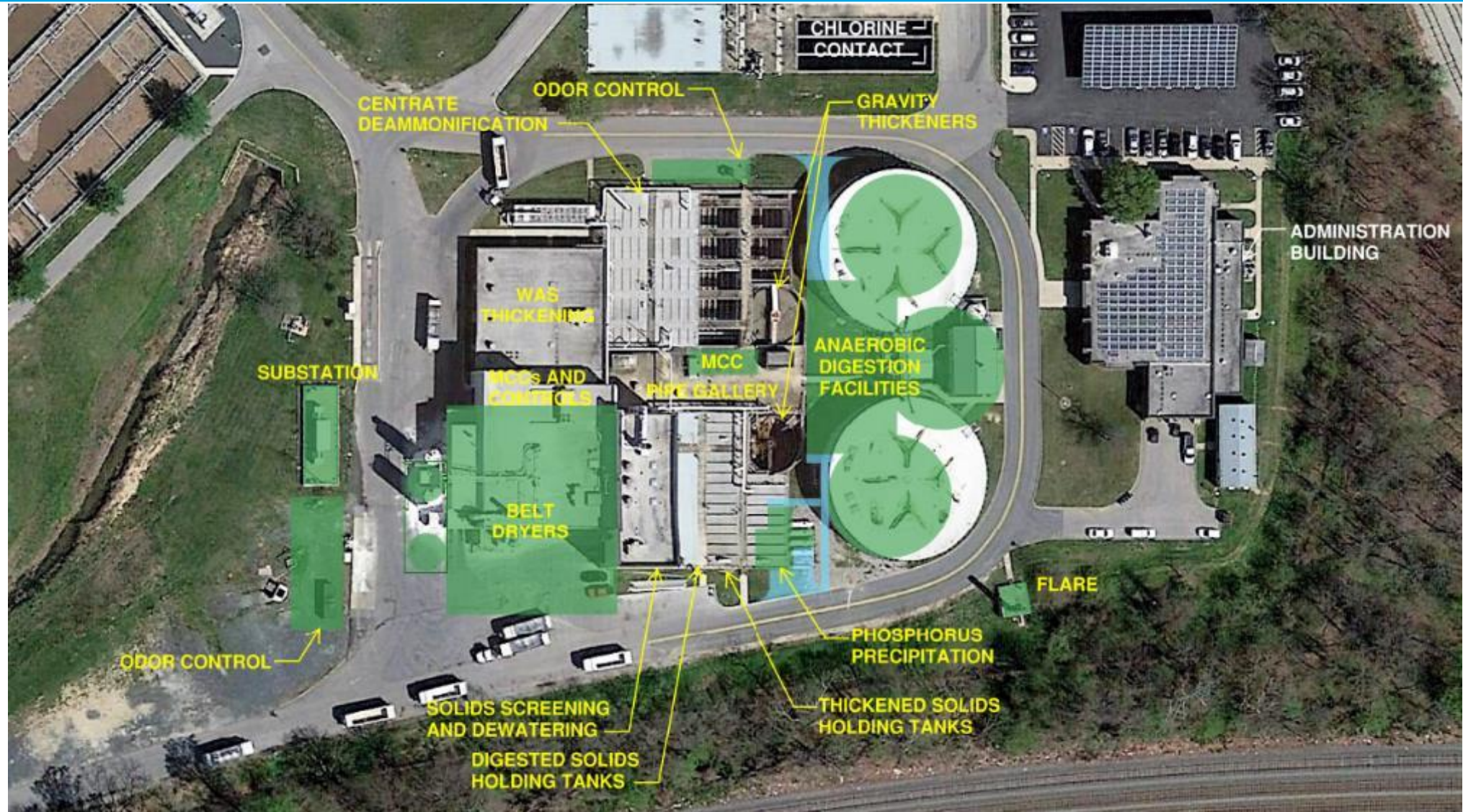
- In those two weeks:
 - Engineering due diligence
 - Decision making tools to review costs and risks
- Collaborative workshop to make decision
- Move forward with retrofit in location of existing building



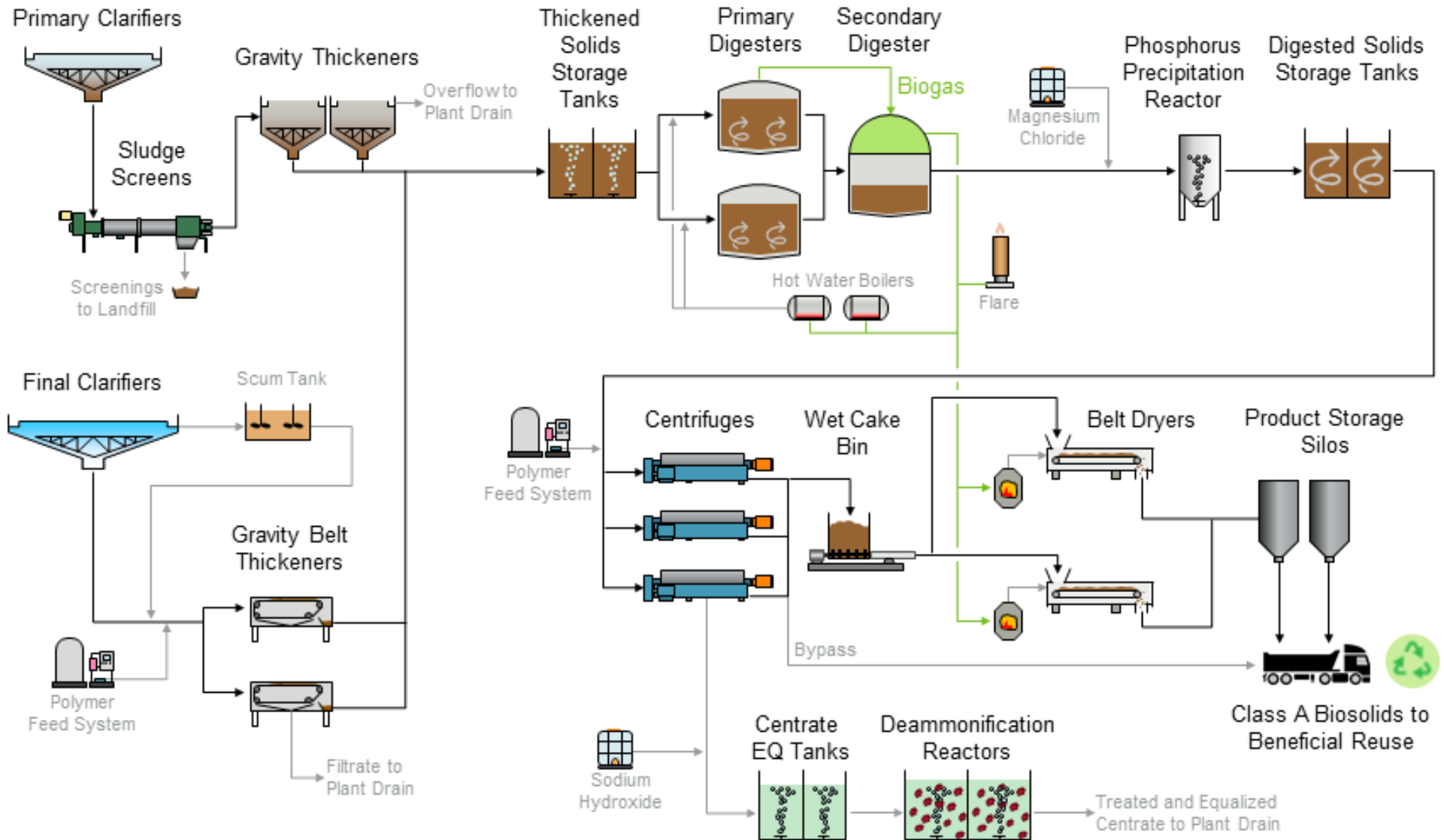
PLAN FROM PRELIMINARY ENGINEERING



WHERE WE ENDED



WHERE WE ENDED



An abstract architectural wireframe drawing in white lines on a solid blue background. The drawing features a complex, multi-level structure with various rectangular and cubic forms, some of which are interconnected by thin lines, suggesting a modern building design or a conceptual framework. The perspective is from a low angle, looking up at the structure.

CONSTRUCTION PROGRESS AND CHALLENGES



FEBRUARY 2017







MARCH 2017







APRIL 2017







MAY 2017





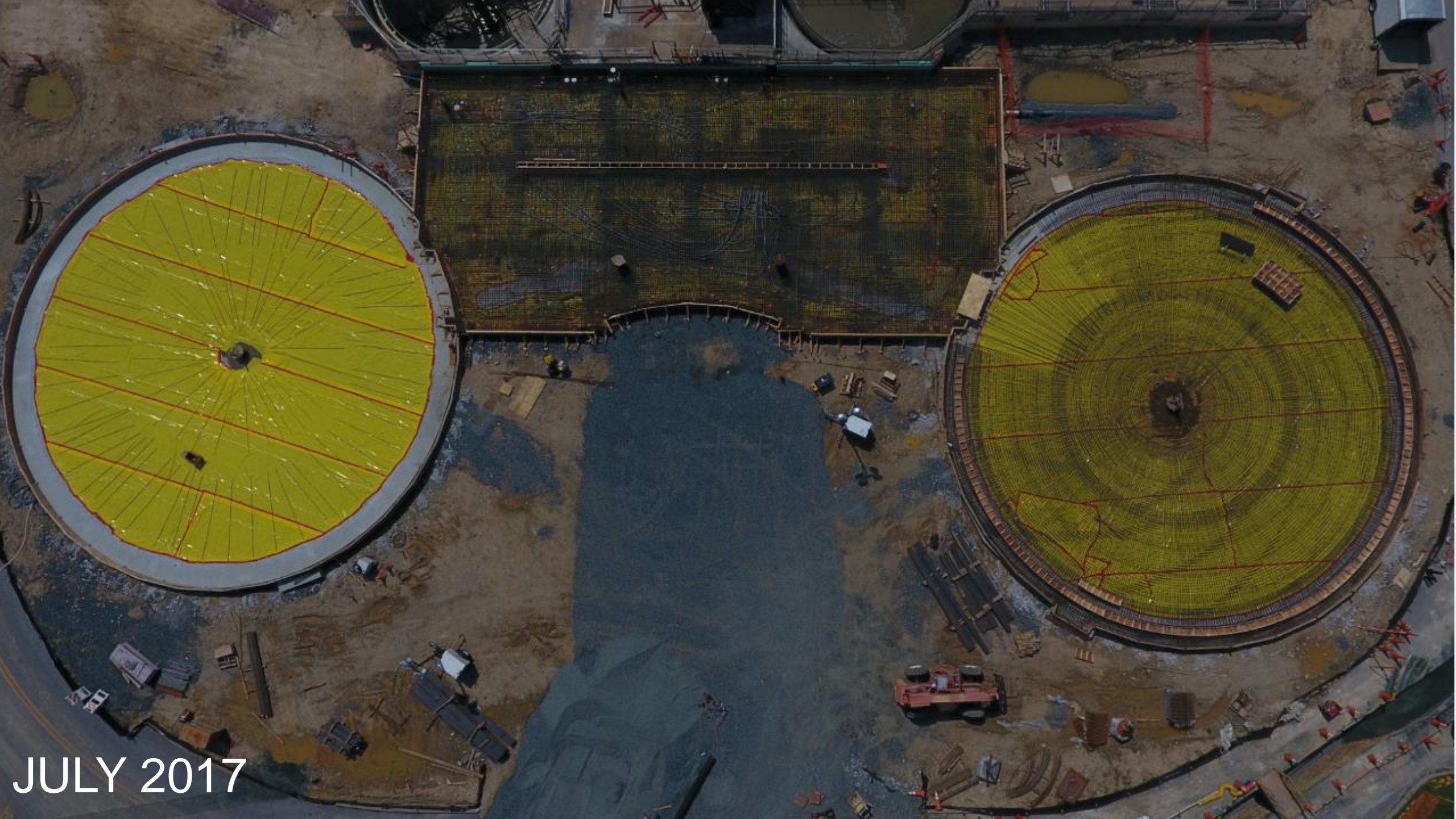
JUNE 2017



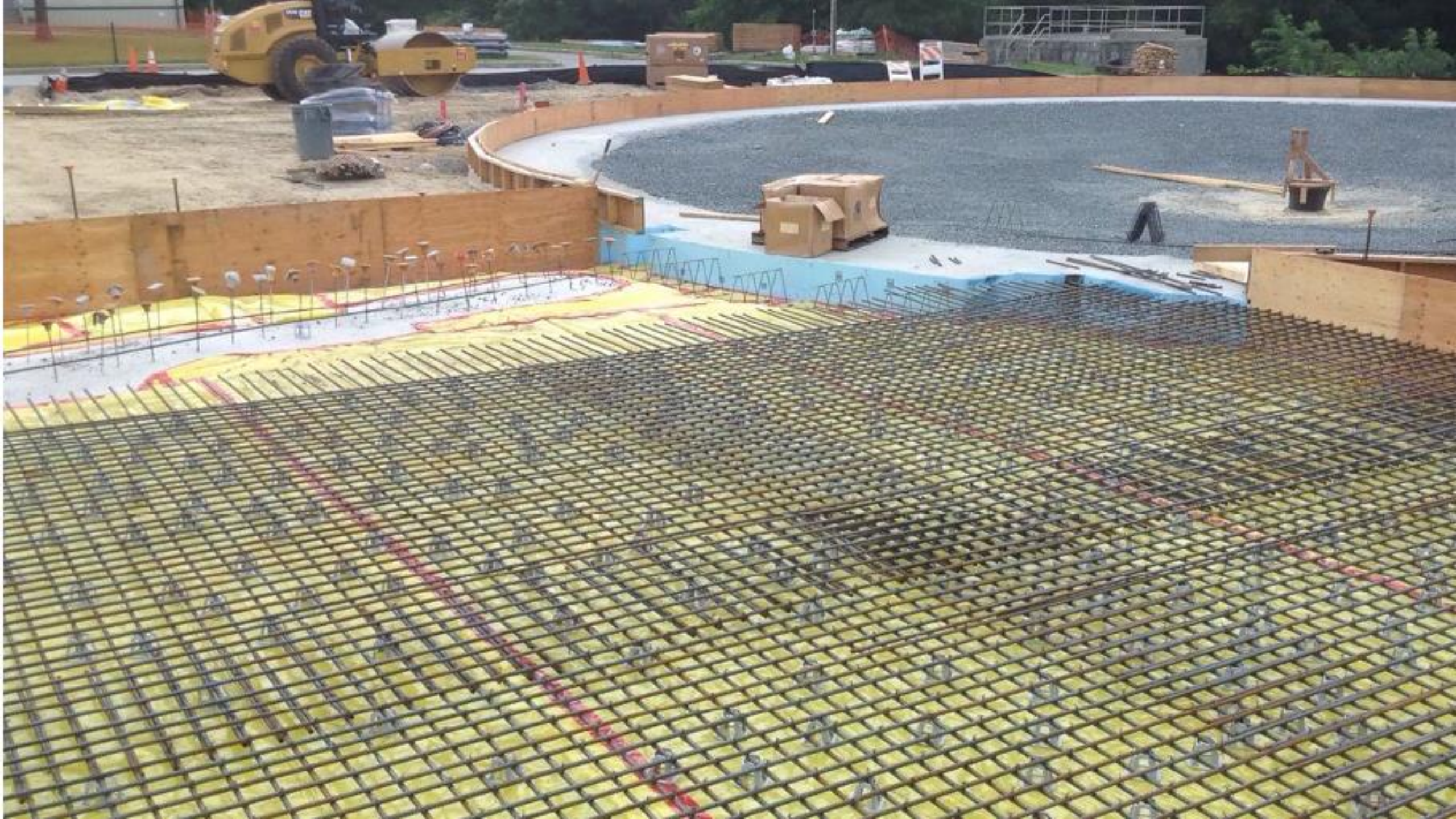


Paul Schneider 6/29/2017 9:32 AM - LPWRP 8th Addition





JULY 2017







AUGUST 2017





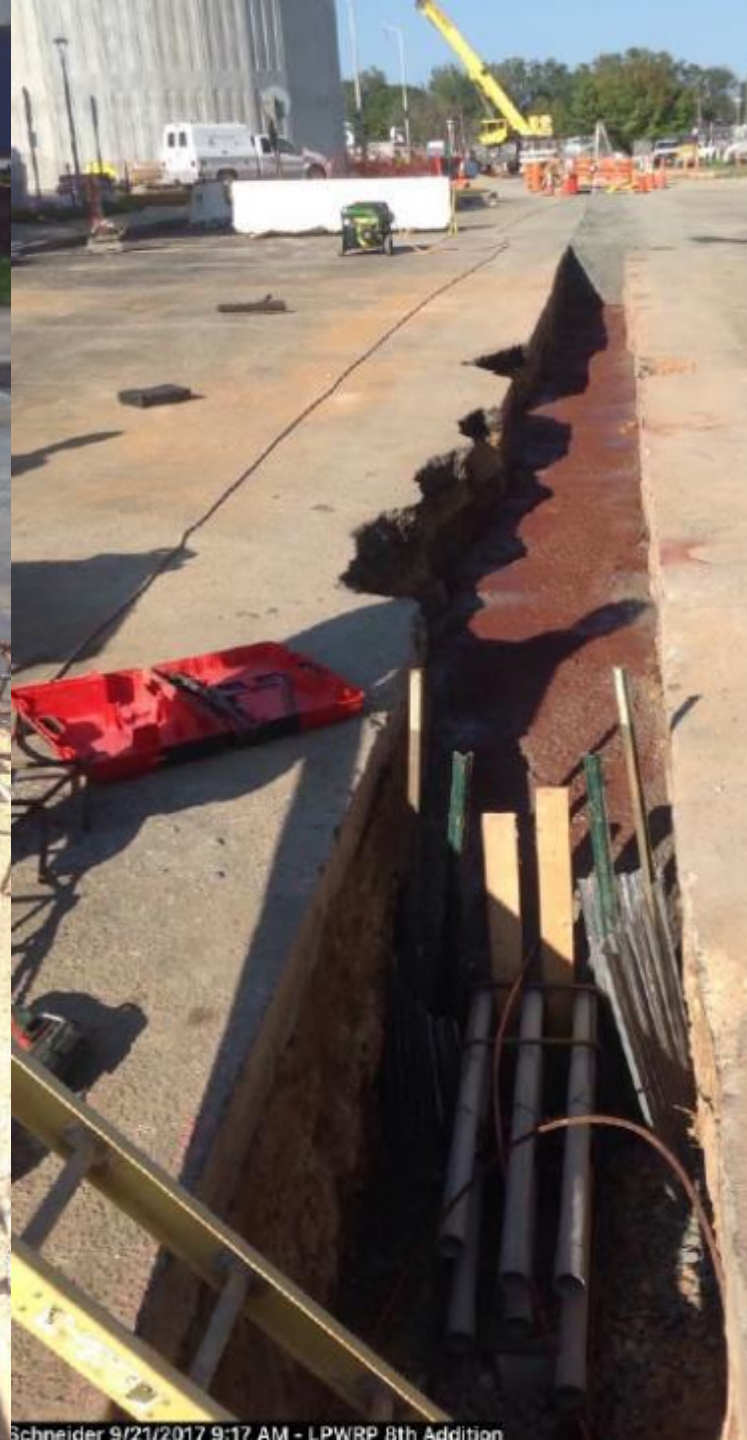
Paul Schneider 8/30/2017 11:55 AM - LPWRP 8th Addition



SEPTEMBER 2017



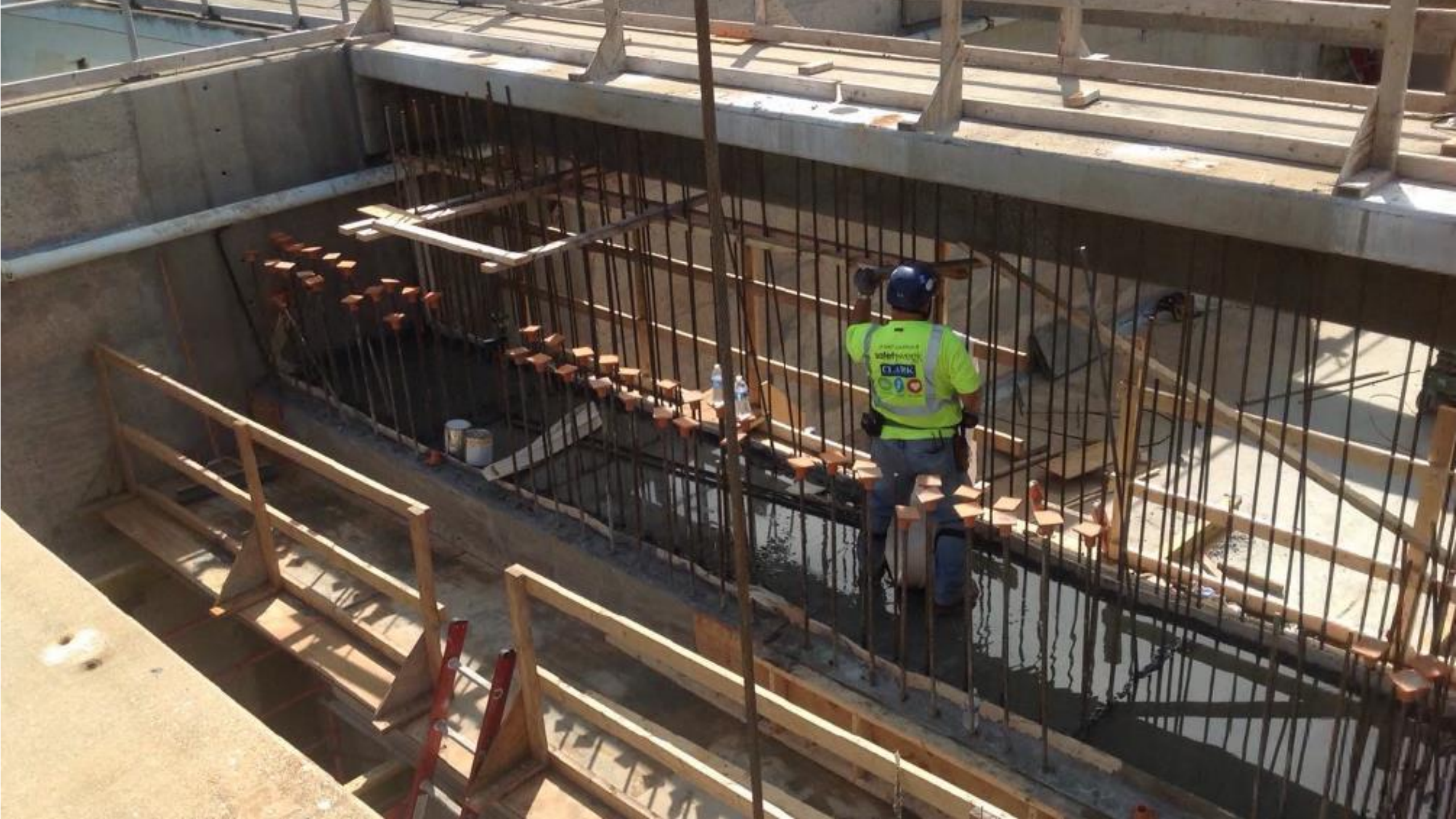
2017 9:17 AM - LPWRP 8th Addition



Schneider 9/21/2017 9:17 AM - LPWRP 8th Addition



ul Schneider 9/21/2017 9:17 AM - LPWRP 8th Addition





OCTOBER 2017







NOVEMBER 2017



DECEMBER 2017





JANUARY 2018







FEBRUARY 2018





Paul Schneider 2/13/2018 10:35 AM - LPWRP 8th Addition



MARCH 2018







3:36 AM - LPWRP 8th Addition



APRIL 2018







Paul Schneider 4/24/2018 9:42 AM - LPWRP 8th Addition



Paul Schneider 4/24/2018 9:42 AM - LPWRP 8th Addition







JUNE 2018







JULY 2018

Paul Schneider 7/13/2018 9:05 AM - LPWRP 8th Addition



Paul Schneider 7/10/2018 11:04 AM - LPWRP 8th Addition



10:24 AM - LPWRP 8th Addition



0:24 AM - LPWRP 8th Addition



Paul Schneider 8/7/2018 10:06 AM - LPWRP 8th Addition



Paul Schneider 8/2/2018 9:36 AM - LPWRP 8th Addition



SEPTEMBER 2018





OCTOBER 2018

key Carr 10/18/2018 8:07 AM - LPWRP 8th Addition



:21 PM - LPWRP 8th Addition









NOVEMBER 2018

Mickey Carr 11/30/2018 11:29 AM - LPWRP 8th Addition



Carr 11/29/2018 8:18 AM - LPWRP 8th Addition



DECEMBER 2018







JANUARY 2019





FEBRUARY 2019





MARCH 2019

Mickey Carr 3/19/2019 7:49 AM - LPWRP 8th Addition







APRIL 2019

Mickey Carr 4/25/2019 2:07 PM - LPWRP 8th Addition





MAY 2019







Mickey Carr 6/12/2019 1:44 PM - LPWRP 8th Addition



JULY 2019







AUGUST 2019





SEPTEMBER 2019

2/2019 4:38 PM



Aaron Remondy 10/2/2019 4:21 PM
LPWRP 8th Addition



sky 10/2/2019 4:27 PM
ddition



SEPTEMBER 2019

Aaron Rosansky 10/2/2019 4:27 PM
LPWRP 8th Addition



7 PM



OCTOBER 2019

Arnon Rodansky 10/31/2019 2:10 PM
LPWRP 8th Addition



Arnon Rodansky 10/31/2019 2:49 PM
LPWRP 8th Addition



OCTOBER 2019



nsky 10/31/2019 2:46 PM
Addition



OCTOBER 2019



NOVEMBER 2019

NOVEMBER 2019





Aaron Rosansky 12/4/2019 9:51 AM
LPWRP 8th Addition



y 12/4/2019 10:35 AM
dition

NOVEMBER 2019



NOVEMBER 2019





DECEMBER 2019

Aspen Rosansky 1/2/2020 1:33 PM
LPWRP 8th Addition



Aaron Rosansky 1/2/2020 1:33 PM
LPWRP 8th Addition





Aaron Rosansky 2/6/2020 9:22 AM



JANUARY 2020

Aaron Rosansky 2/6/2020 9:10 AM
LPWRP 8th Addition



Aaron Rosansky 2/6/2020 9:10 AM
LPWRP 8th Addition



Aaron Rosansky 2/6/2020 9:10 AM
LPWRP 8th Addition



Aaron Rosansky 2/6/2020 9:10 AM
LPWRP 8th Addition





Aaron Rosansky 2/6/2020 9:10 AM
LPWRP 8th Addition



/2020 9:10 AM



Aaron Rosansky 3/5/2020 2:11 PM
LPWRP 8th Addition



Aaron Rosansky 3/5/2020 2:11 PM
LPWRP 8th Addition

FEBRUARY 2020



Aaron Rosansky 3/5/2020 2:14 PM
LPWRP 8th Addition











An abstract graphic featuring a complex, multi-layered wireframe structure. The structure is composed of numerous thin, white lines that form a series of overlapping rectangular frames, creating a sense of depth and architectural complexity. The lines are set against a solid blue background. The structure appears to be a stylized representation of a building or a large-scale architectural plan, with various rectangular volumes and connecting lines that suggest a three-dimensional space.

COMMISSIONING AND STARTUP

COMMISSIONING (PHASE 2)

- Dry and Wet checkout
 - Mechanical Tests
 - Control System Tests
 - Integrated Systems Tests
- Performance Testing
 - Product sieve analysis, 0.5 – 4.0 mm
 - 92-95% dry
 - Bulk Density, 35 lbs./cf
 - Heat energy consumption
 - Evaporation rate
 - 3 - 8hr days run cont. for ea. dryer
- Six (6) months needed for full commissioning and full start-up with performance testing

B. The belt dryer shall be designed to operate under the following conditions:

Design / Operating Parameters	Value(s)
Number of trains	Two (2). Capacity values listed are for throughput of one (1) Dryer.
Operation / Required run time, each dryer	7 days/week, 24 HRS/day Dryers are not redundant. A total of 10-days of dryer operation per week required to meet solids loading.
Solids processing capacity, each dryer	12.2 dry tons per day (DTPD) (24 HRS/day)
Process feed rate, wet, each dryer	61 Wet tons per day (WTPD) (24 HRS/day)
Cake dryness	20% Total Solids (T.S.) Design Value 18% to 28% Operating Range
Cake dryness variation	2% DS in any one (1) hour, maximum (For purposes of performance testing only)
Final pellet dryness	92% T.S. Average Class A compliant 90% to 94% Range
Estimated dry product rate, each dryer	13.3 TPD at 92% T.S. 1,105 LBS/HR at 92% T.S.
Design evaporative capacity, each dryer	3,961 LBS/HR H ₂ O
Maximum evaporative capacity, each dryer	4,400 LBS/HR H ₂ O
Fuel source	Natural gas, LHV of 950 BTU/CF. Biogas , LHV of 450-640 BTU/CF
Heat consumption	1,500 BTU per LB of water evaporation based on LHV
Final product characteristics	95% inclusive 0.5 – 4.0mm Diameter at product silo outlet Bulk density equal to or greater than 35 lbs/cf
Final product temperature	≤100 DegF at dryer outlet or product cooler outlet

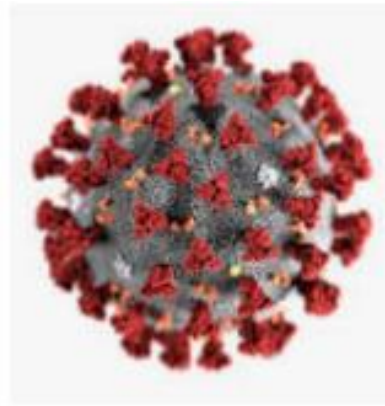
TRAINING

- Training was planned nearly from the beginning and conducted throughout construction
- Training included classroom training as well as field training during commissioning
- A huge investment of County Operations and Maintenance personnel time
 - (ex. Ph1: 56 classroom training sessions Apr'18 – Jul'18)
- Required a tremendous amount of coordination and subcontractor, Passaro Associates was used for this purpose exclusively
 - (ex. Ph2: 38 training plan submittals)
- COVID impacts during Phase 2 required virtual classroom training and contractor did field training for vendors or postponed until vendors could travel.



COVID IMPACTS AND ADJUSTMENTS

- Project declared “essential” – kept working
- Impacts to productivity – contract extended about 6 months
- Challenges with deliveries and personnel required to typically be onsite (vendors for checkouts and commissioning)
- Followed CDC Guidelines (face coverings, distancing, hand washing, etc.)
- Added hand washing stations through construction areas
- Added signage regarding safe distancing
- Reduced number of office staff
- Allowed teleworking for all team members including onsite engineers and construction managers
- Virtual meetings and trainings





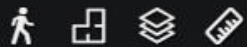
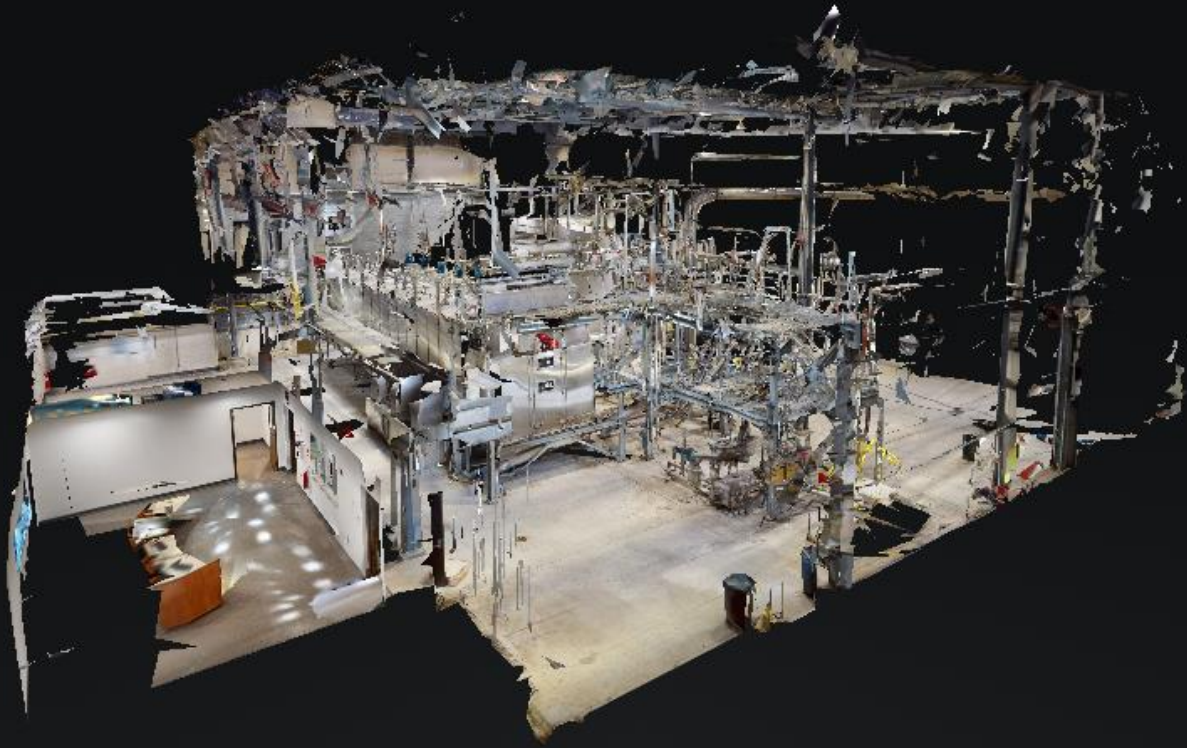
A wireframe architectural rendering of a modern building, featuring a complex structure with multiple levels and a prominent staircase. The building is composed of white lines on a solid blue background, creating a sense of depth and perspective. The lines form a grid-like pattern, highlighting the geometric shapes and structural elements of the design.

VIRTUAL WALKTHROUGH

<https://my.matterport.com/show/?m=M5MugHpjDSw>

VIRTUAL WALKTHROUGH

  Dryer Facility



VIRTUAL WALKTHROUGH



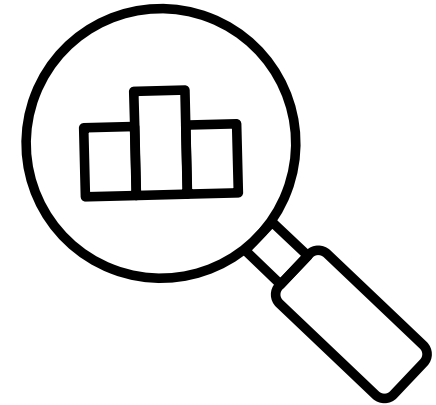
CLOSING



BY THE NUMBERS

- 14 major plant processes rehabilitated or built new
- \$94.3M for Construction, \$19.1M for Engineering
- About 9 years from planning to construction final completion
- Construction 4 years, 8 months, 1 day since the start of preconstruction
- 4,079 material supplier invoices paid
- 1,240 subcontractor payment applications
- 38,671 charge entries to the project (875 pages of costs!)
- 74 owner payment applications
- 627 RFIs, 2,125 submittals, 234 changes
- 450,000 construction manhours
- 166 weekly/bi-weekly coordination meetings with HDR and Howard County
- 73 contracts written through the Clark Contracts Management Group
- Envision Silver Certification
- And.....

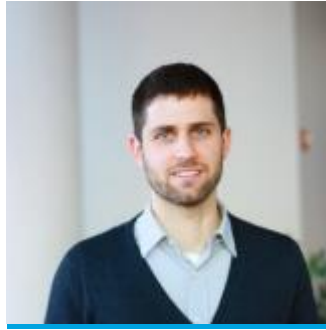
2,140 emails from Josh to Ben (Clark PM)!



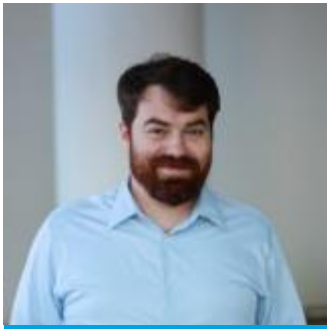
KUDOS TO DESIGN TEAM



Larry Hentz, PM and Principal



Chris Moline, Process Engineer



John Maley, Lead Design Engineer and Resident Engineer



Adam Parmenter, Lead Design Engineer (Dryer) and Start-up

And many, many others:

Brian Balchunas, PM

Bill Cunningham

Billy Fox

Chris Alcorn

Chris Easter

Chris Work

Christina Alito

Dave Ogden

David Brearley

Dennis Scannell

Eric Martin

Henry Antshel

Jason Seagle

John Koch

Jonathan Gordon

Kanu Shah

Kathee Smith

Kelsey Kenel

Kirk Dunbar

Luis Hurtado

Meredith Welle

Michael Little

Michael Shumpert

Nadia Shebaro

PJ Daughton

Ron Emons

Sameer Deo

Scott Joslyn

Sebastian Smoot

Steve Brown

Teigan Gulliver

Tom Kochaba

... and ~ 150 more

THANK YOU CLARK TEAM!

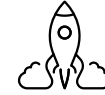


- Aaron Rosansky
- Allison Kim
- Andy Alexander
- Ben Miller
- Brian Wright
- Brionna Farney
- Christian Toth
- Dakota Snyder
- Dave Hill
- Emily Jorgenson
- Eva Johnson
- Gabrielle Ferro
- Harrison Collien
- Joe Kinser
- Liz Hiddemen
- Mickey Carr
- Nic Pepper
- Patrick Szarnicki
- Paul Schneider
- Rob Randolph
- Rocky Levee
- Sandy Mitchum
- Sinara Ly
- Will Miller
- Interns
 - Sam Ramsland
 - Ben Voigt
 - Lainey Reed
 - Tanner Carr
 - Kyle Myers (now an asst. superintendent!)
- Foremen
 - Austin, Tommy, Angel, Hector, Maury, Josh, Wayne

Ten promotions, three marriages, three babies (maybe four depending on closeout...), three house purchases, one master electrician, one pilot



THANK YOU SUBS AND VENDORS!



- A2Z Environmental
- Adtek Engineers
- AEGIS Project Controls
- Allegany Door and Hardware
- Alliance Exterior Construction
- Altoona Pipe & Steel
- Apple Valley Scale
- Architectural Hardware Systems
- Asphalt General
- Aultec
- BA Martin Certified Welding
- Badger Daylighting Corp.
- Bay Ready Mix
- Bay Town Painting
- Biorem Environmental
- **Bowen Engineering**
- Bragunier Masonry
- Cagley & Assocaites
- **CNP/Centrisys**
- Complete Boiler Systems
- Continental Fire Sprinkler Co
- Diversified Safety Services
- DTM Construction
- **Dutchland Inc.**
- Engineered Air
- Fab-Tech
- **Ferguson Enterprises**
- FJ Industrial
- Froehling & Robertson
- Geiger Pump & Equipment
- General Heating & Cooling
- Geoconstructors
- Goel Services
- Gordon Contractors
- **Haarslev, Inc.**
- Havtech
- Heat Tape Solutions
- Horton Mechanical
- Insight
- James Myers
- John Wood Company
- Kimball Construction
- KWS
- **Kruger/Veolia**
- LC Insulations
- **LT Engineering**
- Lady Liberty
- Lloyd Plumbing
- MidAtlantic Photographic
- National Fire Protection
- NEFCO Corporation
- NEFCO Systems
- Nelson Precast
- Nicholson Construction
- Overhead Door of Baltimore
- **Passaro Engineering**
- Potts and Callahan
- ProTAB
- Reading Crane
- Regional Contracting
- Roane's Rigging
- **RPG Surface Prep**
- **Sherwood Logan (x3!)**
- Shirley Underground
- **Singleton Electric**
- SMI Services
- South-Tek Systems
- Sure Shot
- Tekleen
- Velodyne
- Ward Boland
- Westech Engineering
- And all our everyday suppliers...
- HD Supply, Grainger, McMaster, United Rentals, Sunbelt, Herc, Alban, NIN, Freedom Septic, JJ Adams, Metal Supermarkets, Seton, Hilti, Robnet, **MANY** more
- And thanks to Synagro and Plant Staff!

THANK YOU CLARK TEAM! 🏆 👤 👤 ⭐



KUDOS TO COUNTY TEAM

LITTLE PATUXENT WATER RECLAMATION PLANT:

Rob Hindt
Rupa Pandey
Justin Myers
Sonya Williams
Byron Beckham
Chas Heine
Lewis Lockhart
Tim McFarland
Mark Ratliff
Bill Holland (R)

Bruce Taylor
Johnny Good
Keith Hood
Lou Maltese
John Swain (R)
Bob Funk (R)

And many, many others:

Tom Meunier
Art Shapiro
Ross Beschner
Daniel Davis
Tom Butler
Dean Hof
Bob Frances
Don Mock

Jim Hobson
Sidney Garrett
Jim Irvin (R)
Steve Gerwin (R)
Jeff Welty (R)
...and many, many more

(R) - Retired

LESSONS LEARNED

- CMAR method allows for good collaboration and fast delivery
- CMAR method is very beneficial for dealing with a multitude of process improvements happening sequentially and/or simultaneously
- CMAR is helpful for quickly navigating through unforeseen and design changes
- LOTS of skilled personnel are needed to successfully delivery a project of this size and complexity
- Must rely on (and trust) the expertise of each team member to do the part and “stay in their lane”



QUESTIONS

Joshua Gliptis, P.E. – Engineer, Project Manager
jgliptis@howardcountymd.gov

