EchoWater Project

April 20, 2017

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EchoWater Project

UPDATE

Topics

Program Background |

Early Efforts, Pilot Testing

Program Delivery |

Cost Control, BIM

Program Status |

Schedule, Budget, Project Updates

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Regional San is California's Largest inland Discharger

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TAKING THE WASTE OUT OF WATER

It is responsible for **major interceptors** and the **Sacramento Regional Wastewater Treatment Plant (SRWTP)**

It serves approximately **1.4 million residents** in the greater Sacramento Region

SRWTP began operating in 1982; **it replaced 22 separate treatment systems**

The plant discharges to the Sacramento River, which flows to the Delta and the San Francisco Bay

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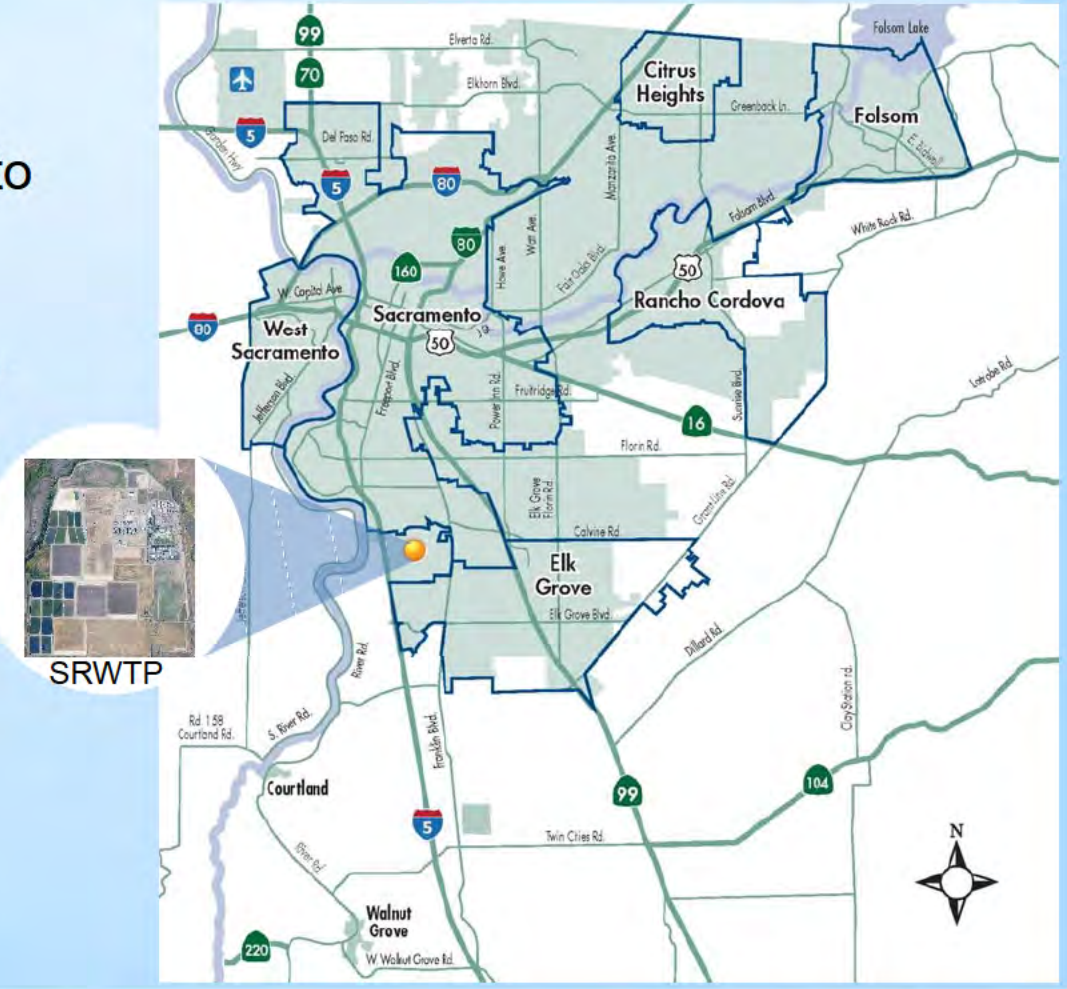
Regional San

- Service Area over 383 square miles in the greater Sacramento Region
- 111 miles of gravity interceptor pipes, 58 miles of force mains and 11 pump stations
- SRWTP is permitted for 181-MGD ADWF
- Currently average 135-MGD influent flow



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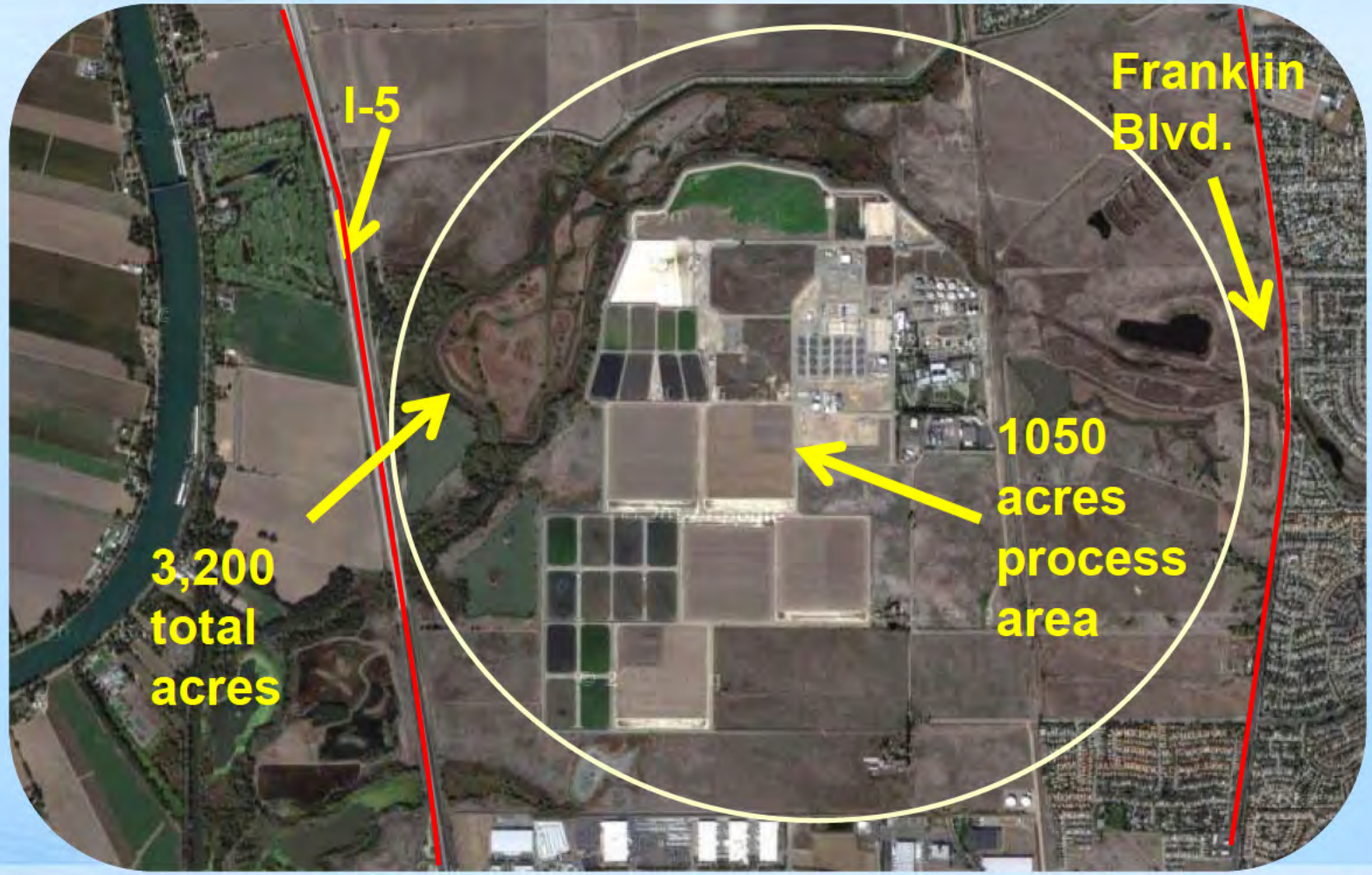
Sacramento Regional Wastewater Treatment Plant



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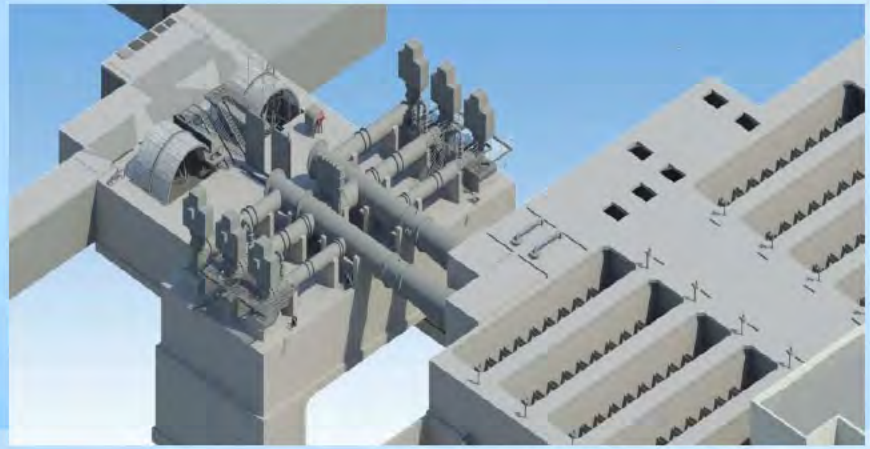
2010 NPDES Discharge Permit

- Required significantly higher treatment to remove ammonia, nitrates, and further reduce pathogens in the treated water
- Cost to comply: Estimated in range of $1.5 to $2.1 billion, with additional annual operation and maintenance costs
- **Ammonia removal MUST be completed and operational by May 2021; filtration/disinfection by May 2023**



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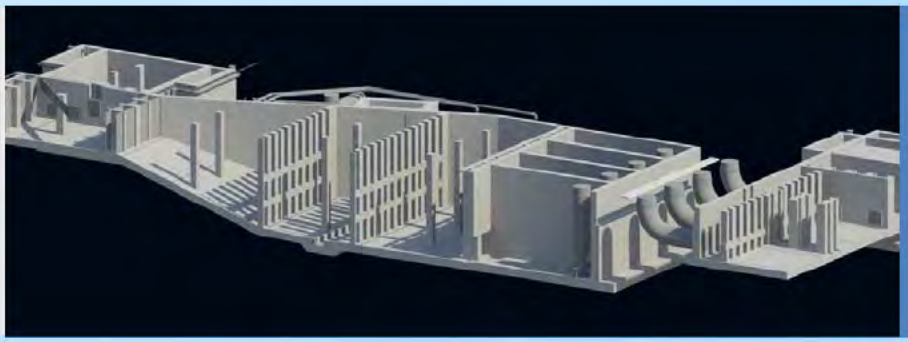
Early Planning Efforts

- Early 2011 – Initial Studies Identified Processes for Testing
- July, 2011 to April 2012 – Design and Build 0.5-MGD Pilot Plant
- February 2012 – Commissioned Program Management Office
- 2012 - Define Treatment Processes and Design/Construction Packages
- Early 2015 – Environmental Document Complete



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Pilot Study for Technology Selection

- Plant designed for a flow capacity of 0.25 mgd with peak flow capacity of 0.50 mgd (for scale up factors)
- Gather data to verify BNR process and test processes for Title 22 treatment requirements.
- Total pilot project cost = $17.5 million
  - CalFed grant funding $3.24 million

Pilot Project

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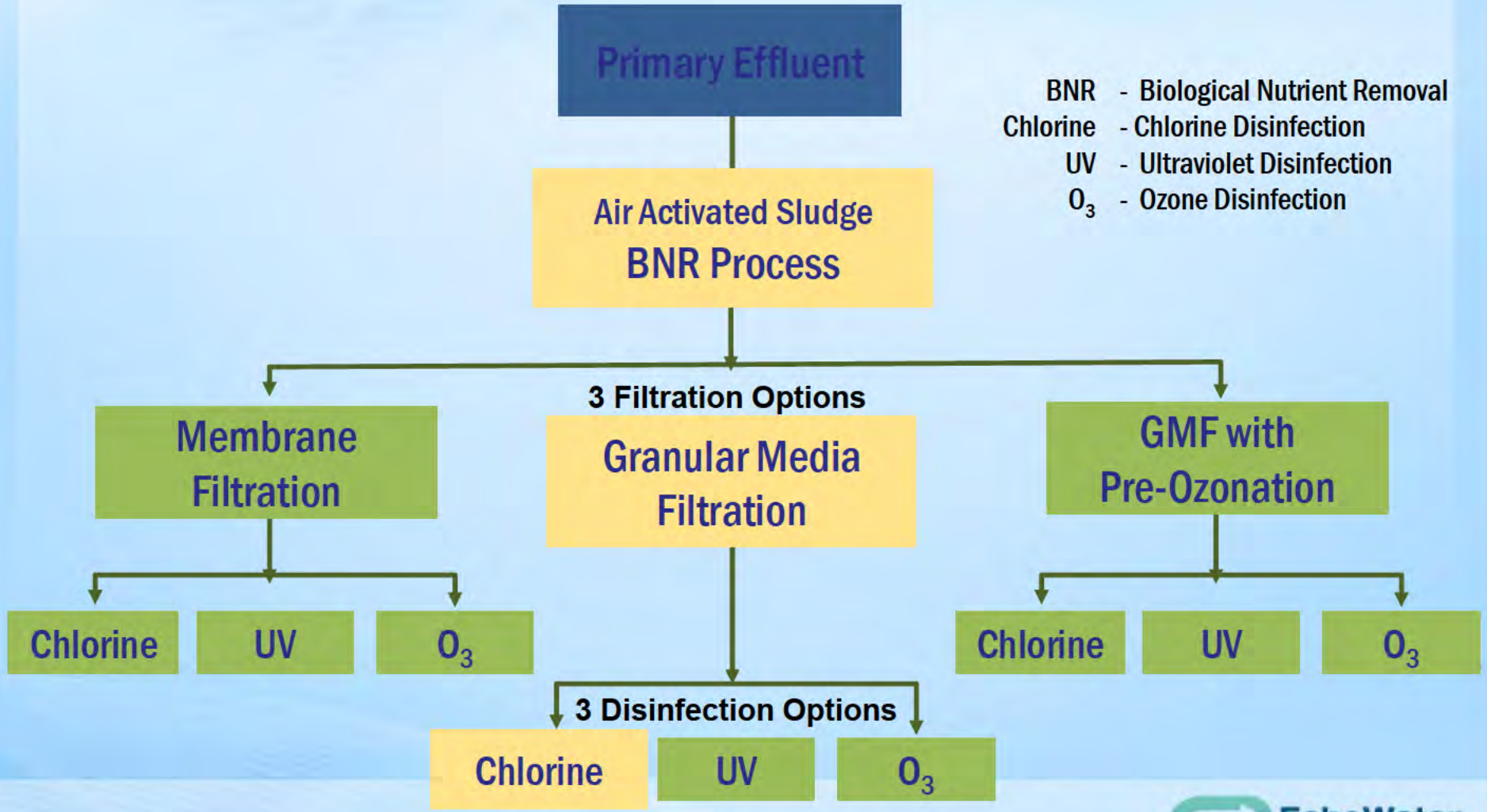
Pilot Study Configuration



BNR - Biological Nutrient Removal
Chlorine - Chlorine Disinfection
UV - Ultraviolet Disinfection
O_3 - Ozone Disinfection

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Pilot Study Findings

BNR and GMF facilities would reliably meet permit limitations and were the lowest life cycle cost alternatives

Higher GMF loading rate (from 5 to 7.5 gpm/sf) will reduce construction costs about $53 million

Reduction in disinfection contact time from 90 to 46 min modal contact time reduces construction cost by $47 million

Eliminating the need for coagulant chemical feed saves $2.9 million/year

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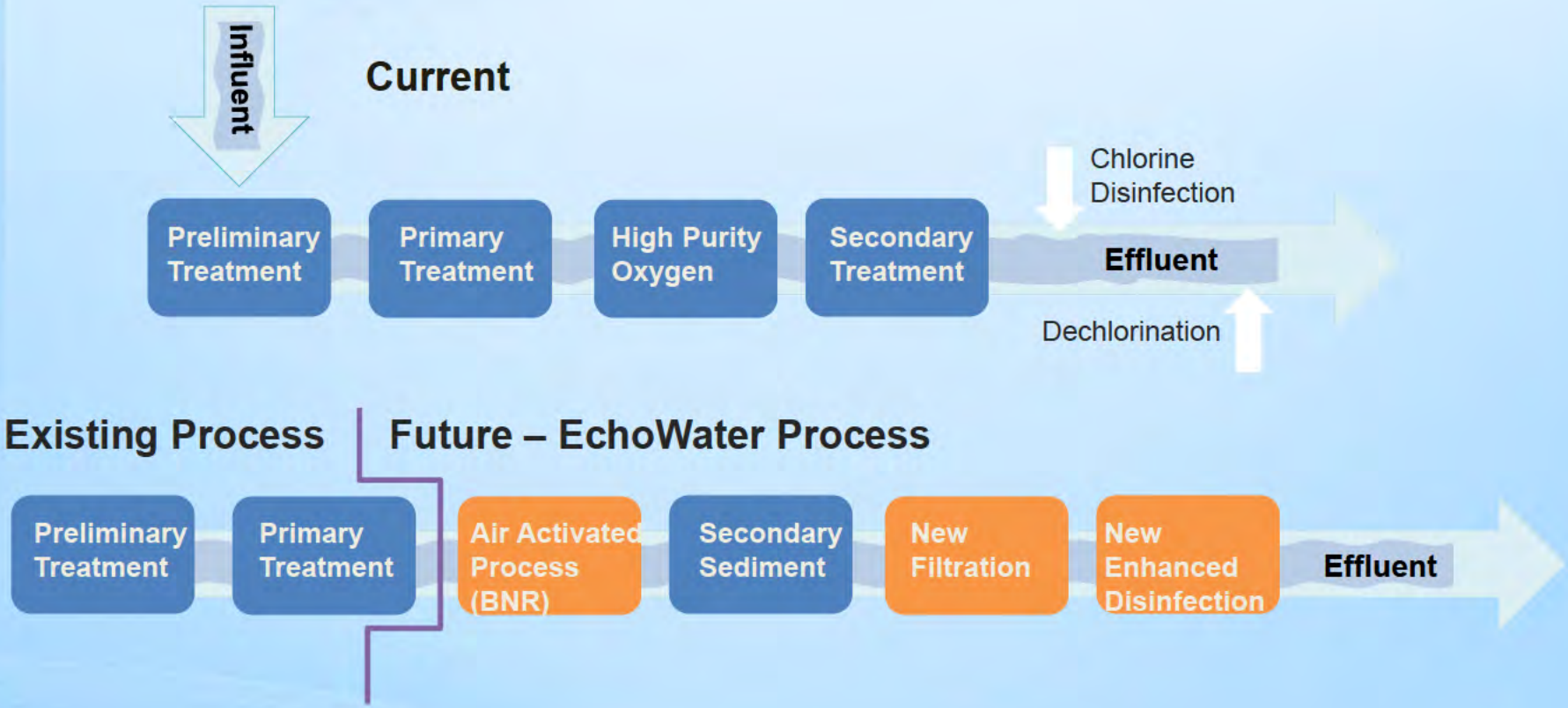
Process Upgrades



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EchoWater Project Stats

- Original Program cost estimate: **$1.5 – $2.1 billion**
- Number of discrete projects: **20**
- Peak month spending: **$27 million**
- Estimated daily workers at site: **300 at peak**

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Cost Control Through Three Core Elements

Business Case Evaluations (BCEs)

for lifecycle cost containment

Reliability Centered Design (RCD) and Reliability Centered Maintenance (RCM)

for smart asset decisions and maintenance strategies

Mining key data from data-driven designs (smart P&IDs and 3-D BIM)

to populate CMMS

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Building Information Modeling – the Ds

3D
VISUALIZATION

- Existing Conditions
- Animations
- Renderings
- Walkthroughs

4D
SCHEDULING

- Project Phasing
- Visual Validation

5D
ESTIMATING

- Cost Phasing
- Quantity Extractions

6D
FACILITY MANAGEMENT

- Life-Cycle
- As-builts
- O&M
- Asset Assessment

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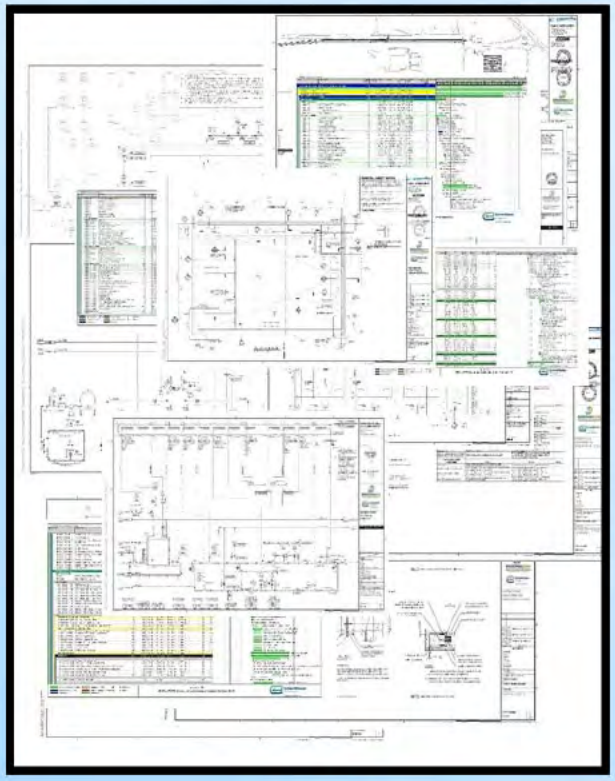
Why Building Information Modeling (BIM)?



This?

Or this?

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Benefits During Design

- Site planning
- Visualization of design options
- Helps visualize potential constructability issues
- Advance coordination of site logistics and utility connections
- O&M staff can "walk" the site before it is constructed

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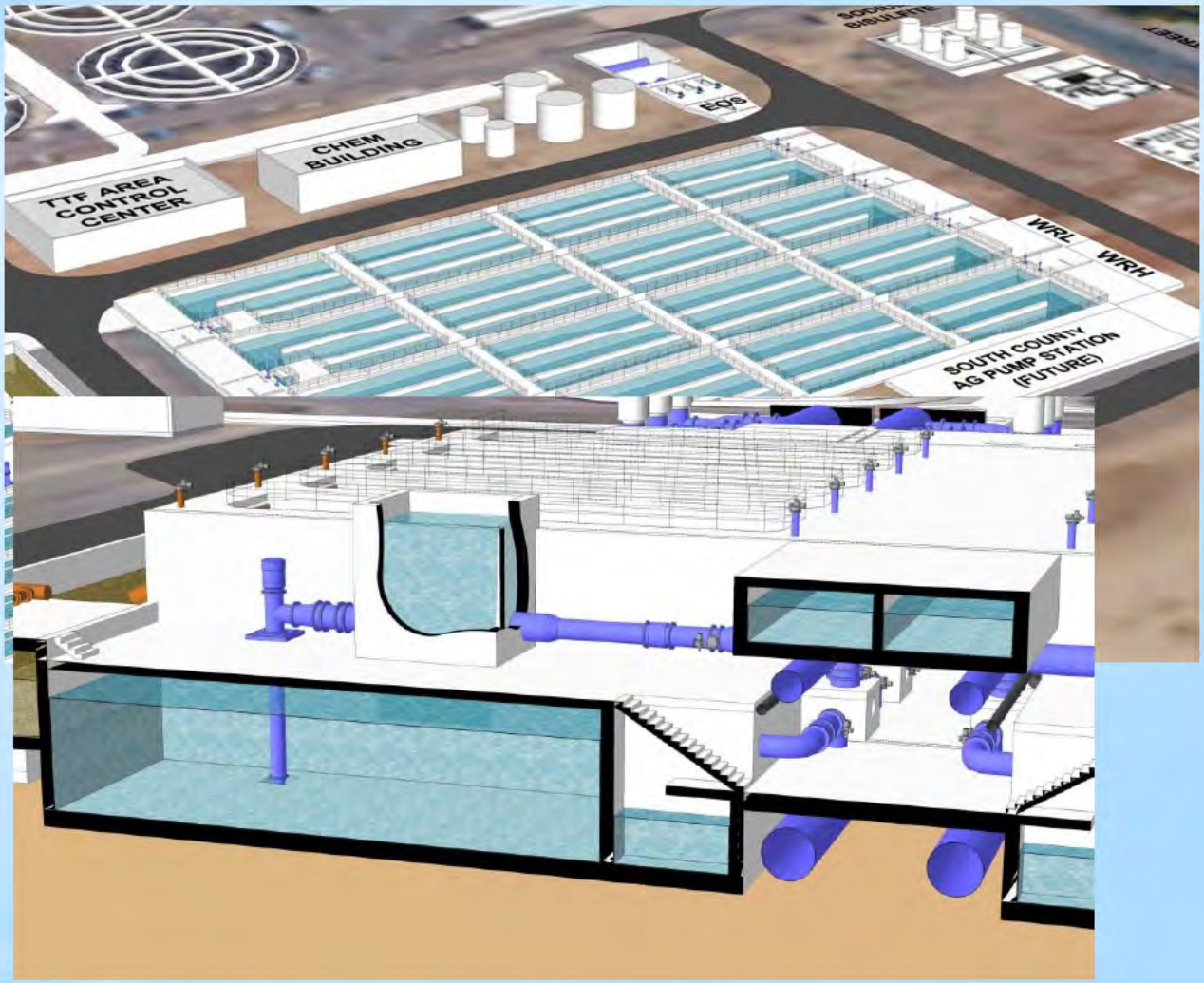

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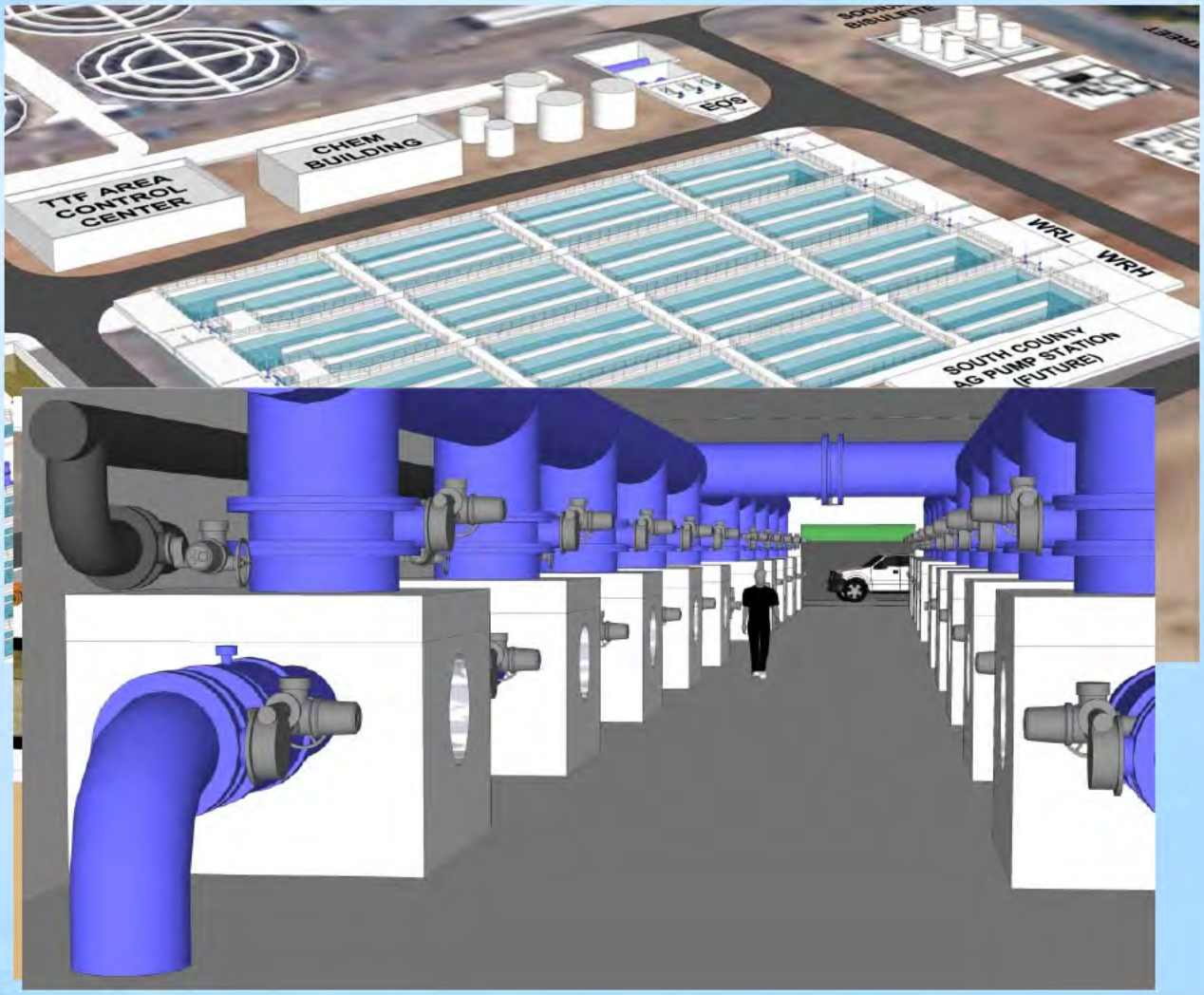

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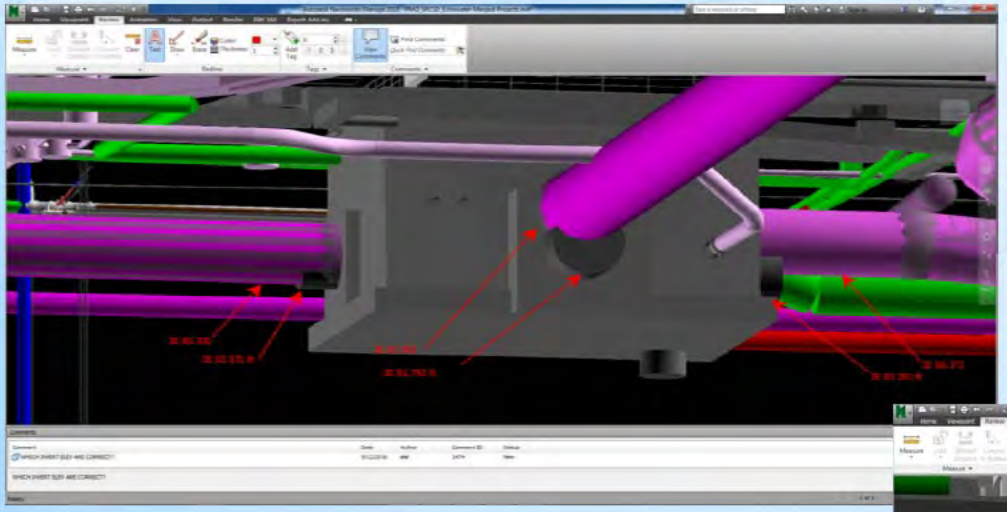
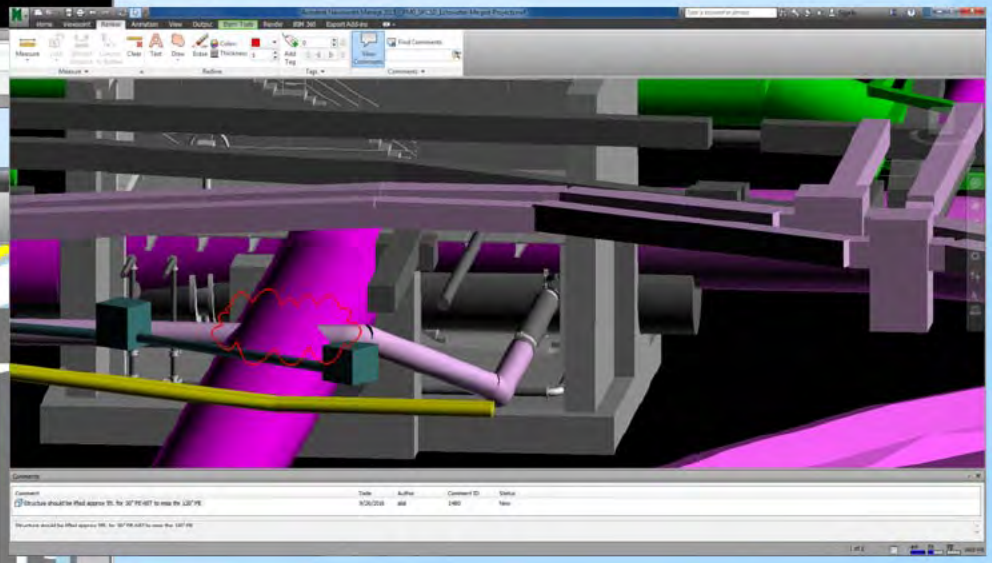
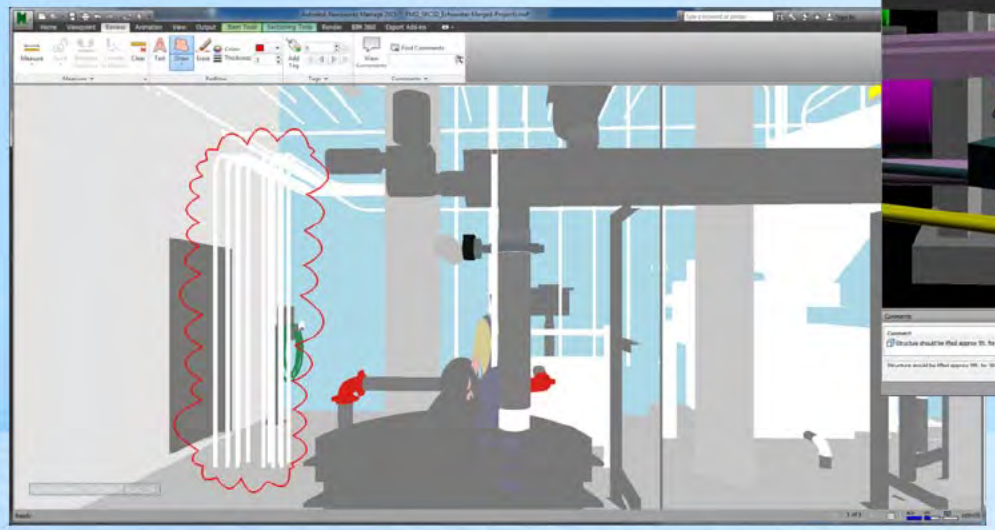
BIM-Clash Detection







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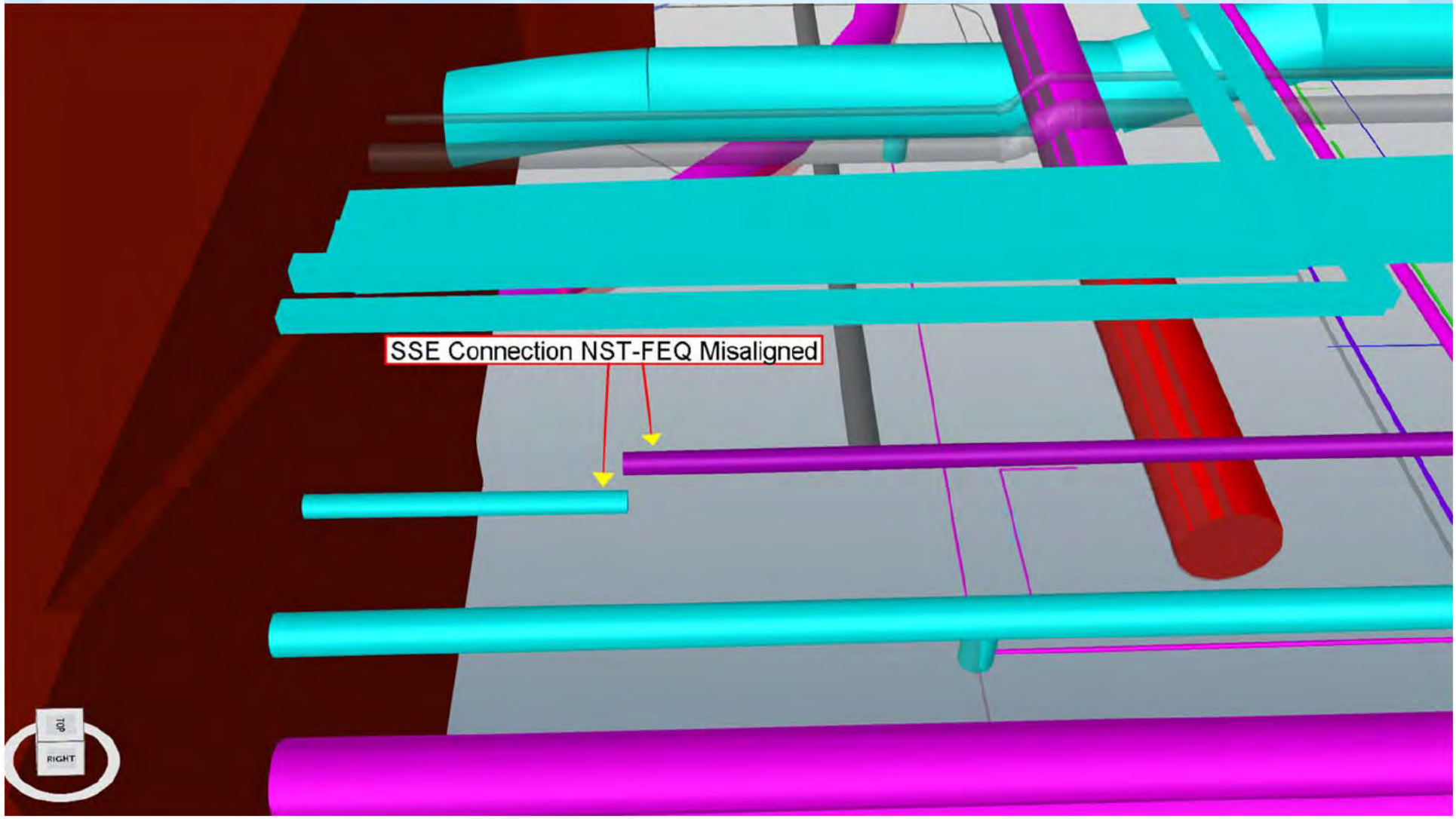
Inter-Project Connections



Construction Use of BIM

Jul			Oct			Jan 2016			Apr		
	Aug	Sep		Nov	Dec		Feb	Mar		May	Jun
wk -33	wk -28	wk -24	wk -20	wk -15	wk -11	wk -7	wk -2	wk 3	wk 7	wk 12	wk 16

Federated Model and Schedules

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Construction Use of BIM

Inter-Project Conflicts

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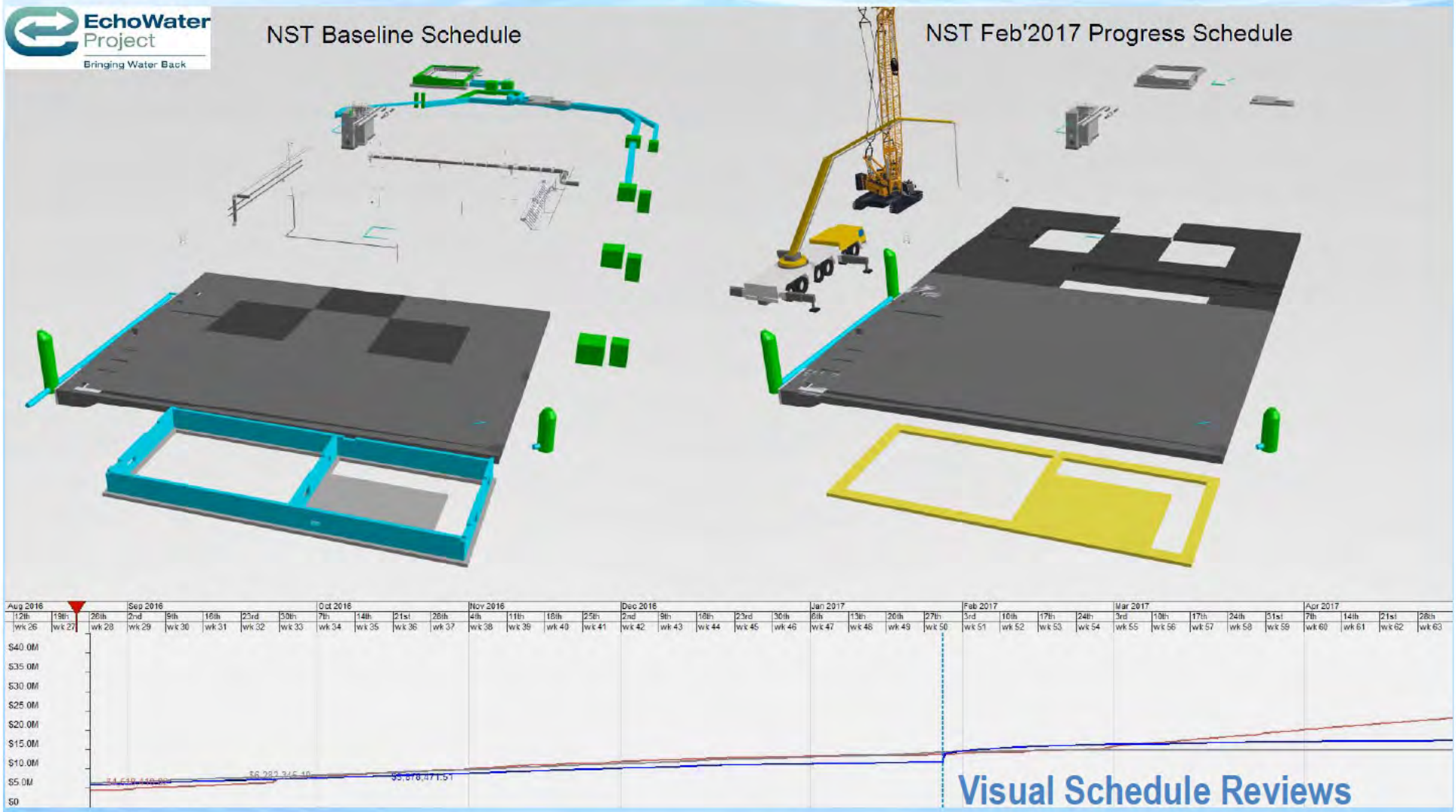
Construction Use of BIM



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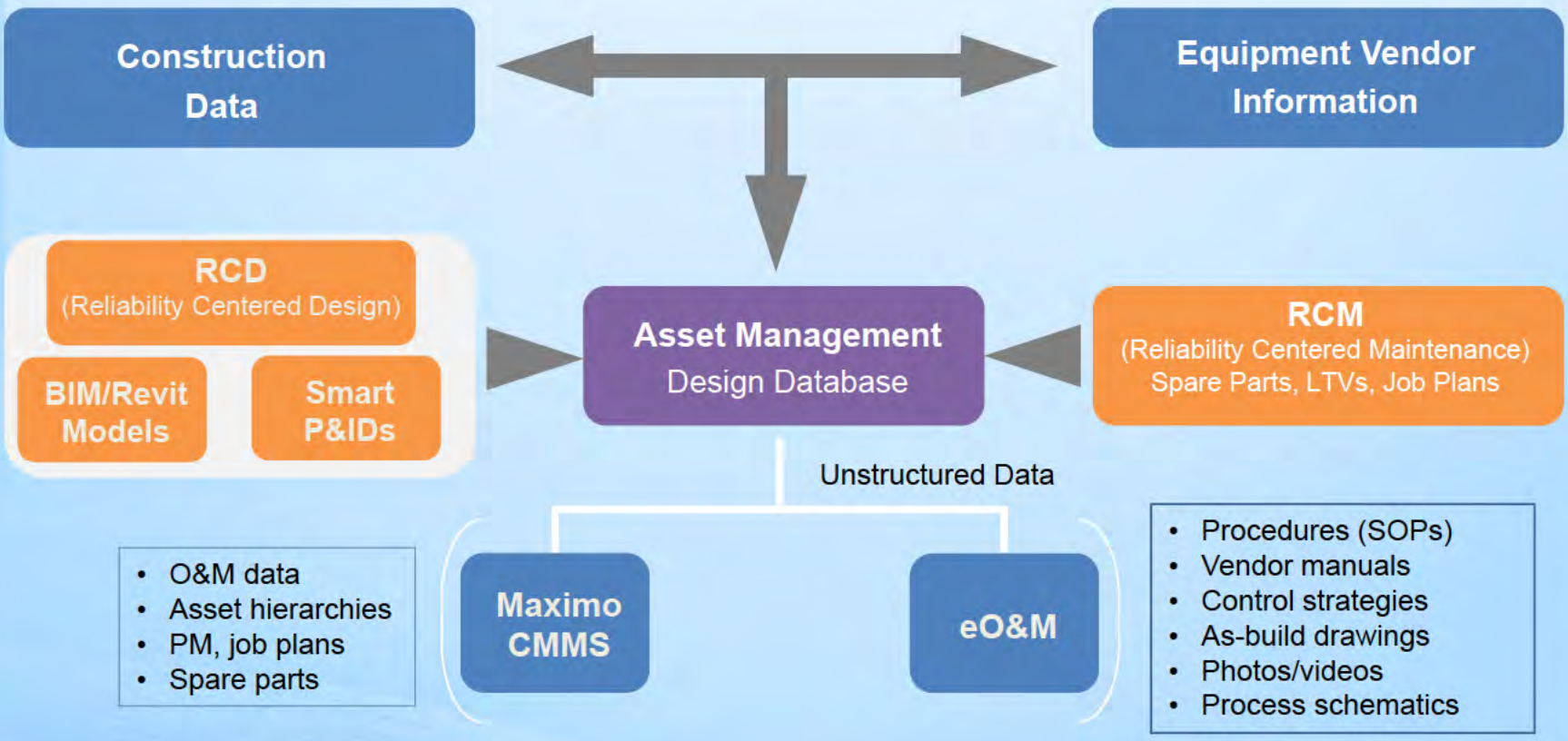
Data Migration Framework



- O&M data
- Asset hierarchies
- PM, job plans
- Spare parts

- Procedures (SOPs)
- Vendor manuals
- Control strategies
- As-build drawings
- Photos/videos
- Process schematics

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EchoWater Project Update

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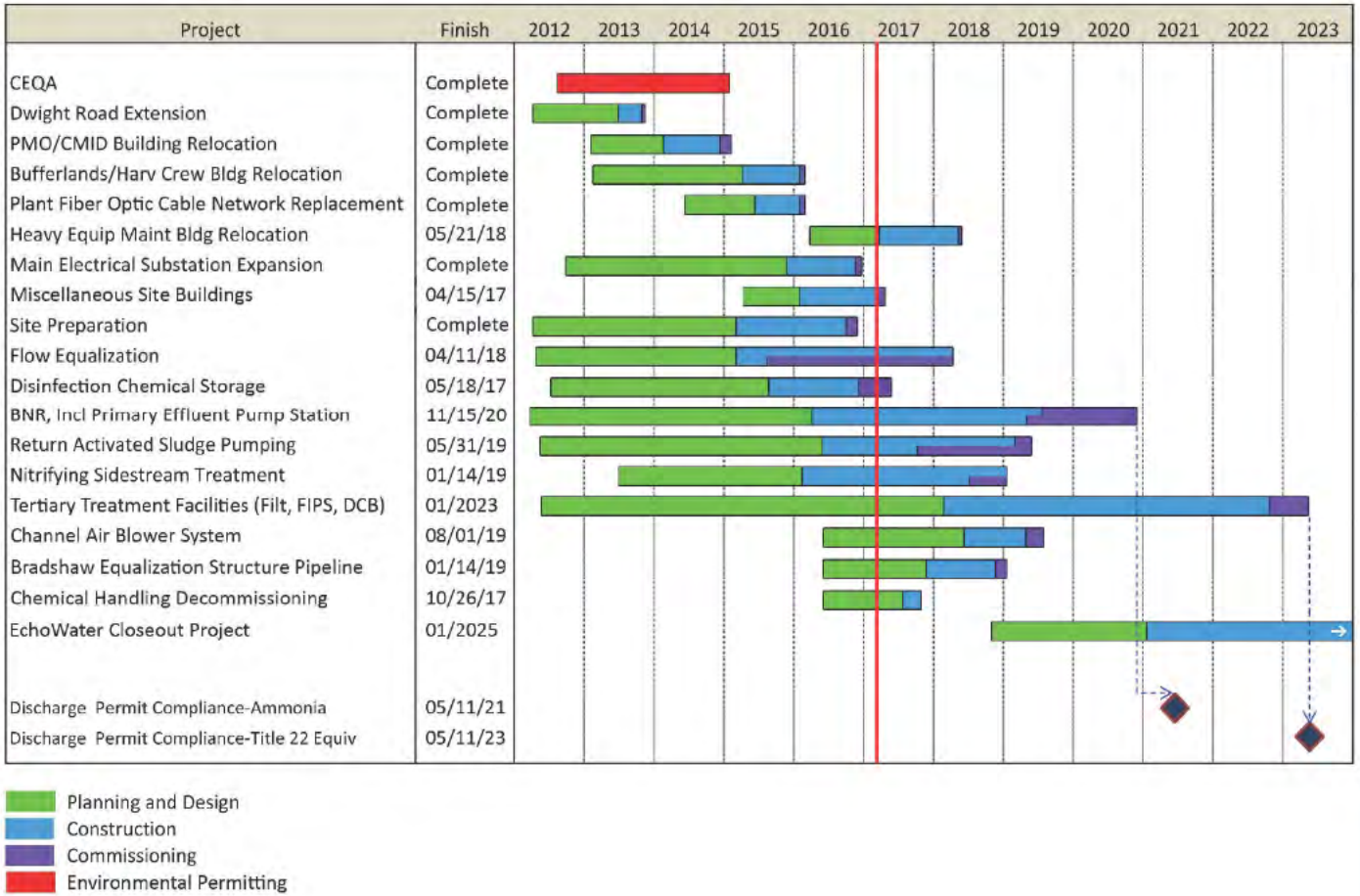
Summary Program Schedule



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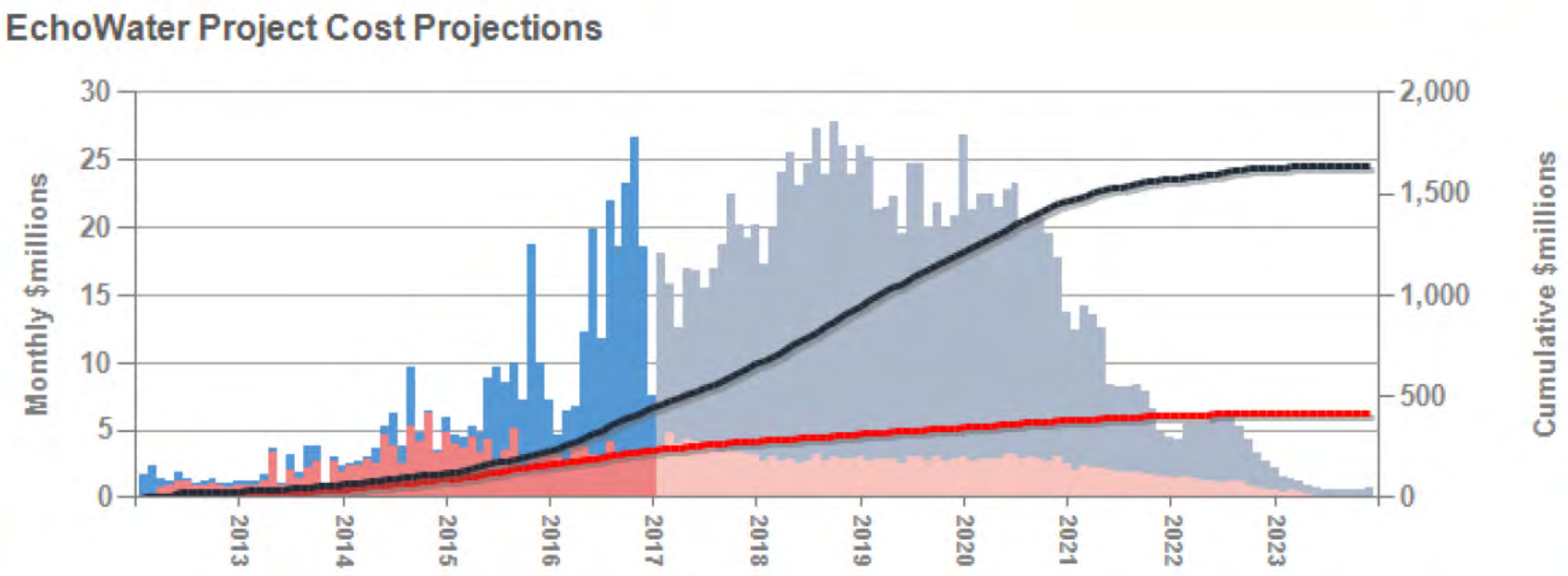
Program Cash Flow



Construction - Cumulative
Construction - Spent
Construction - Monthly Projection
Soft Costs - Cumulative
Soft Costs - Spent
Soft Costs - Monthly Projection

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Aerial Photo of EchoWater Project

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Aerial Photo of EchoWater Project

January 11, 2017 – Post Rain Event

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Site Preparation Project
$31 M – Overaa & Co.

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Bufferlands Building Project
$2.7 M – D. G. Granade

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Flow Equalization Project
$114 M – Teichert Construction

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Basin A Floor

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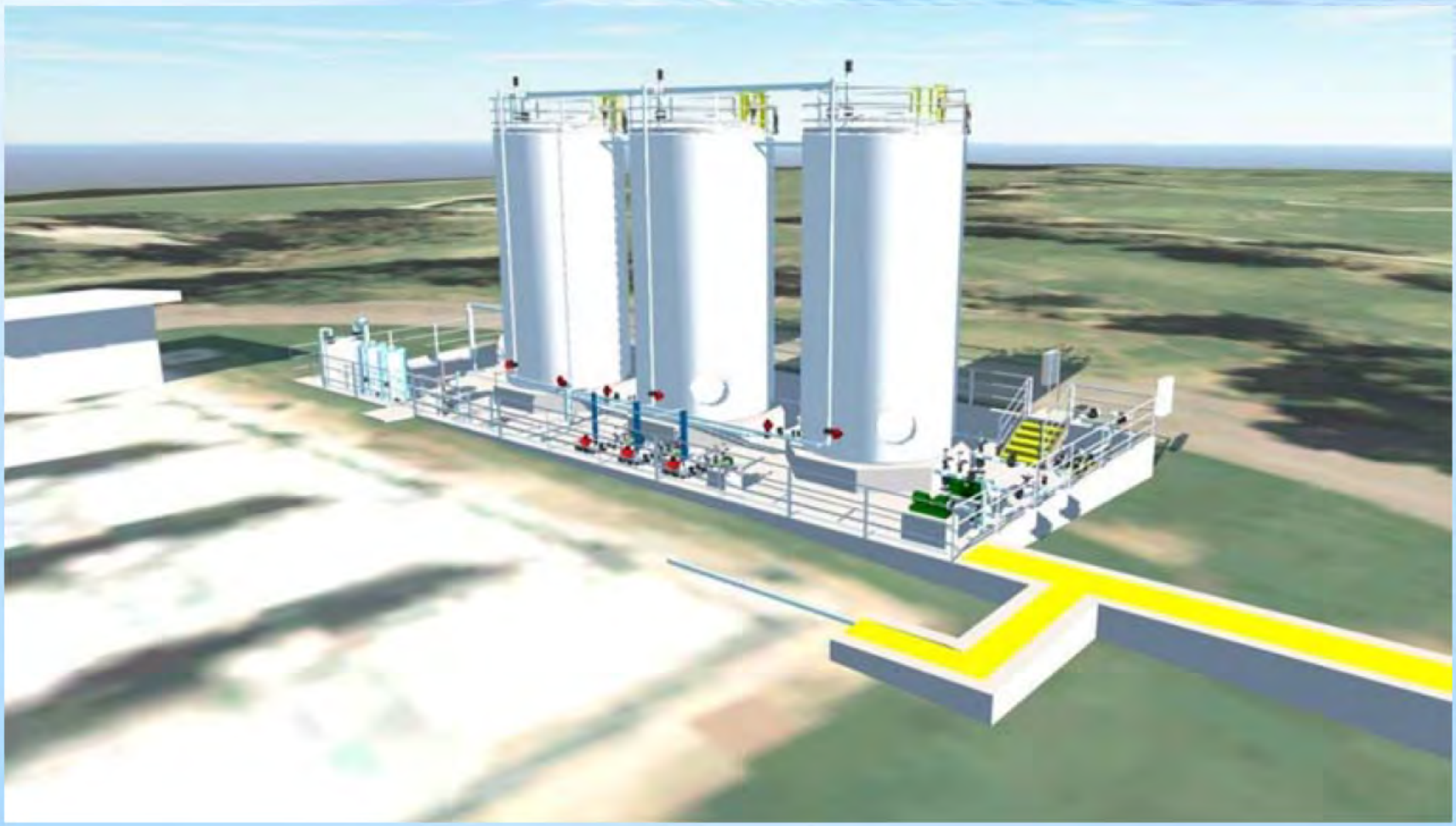

Disinfection Chemical Storage Project
$15 M – GSE Construction

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Nitrifying Sidestream Treatment
$40 M – Flatiron Construction

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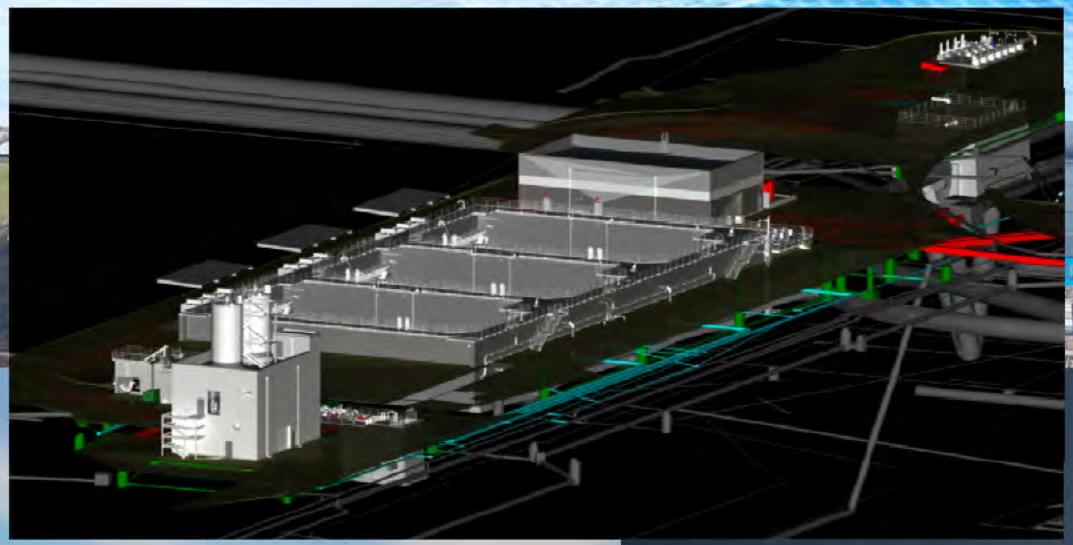

Nitrifying Sidestream Treatment
$40 M – Flatiron Construction

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Return Activated Sludge Project
$24 M – Auburn Constructors

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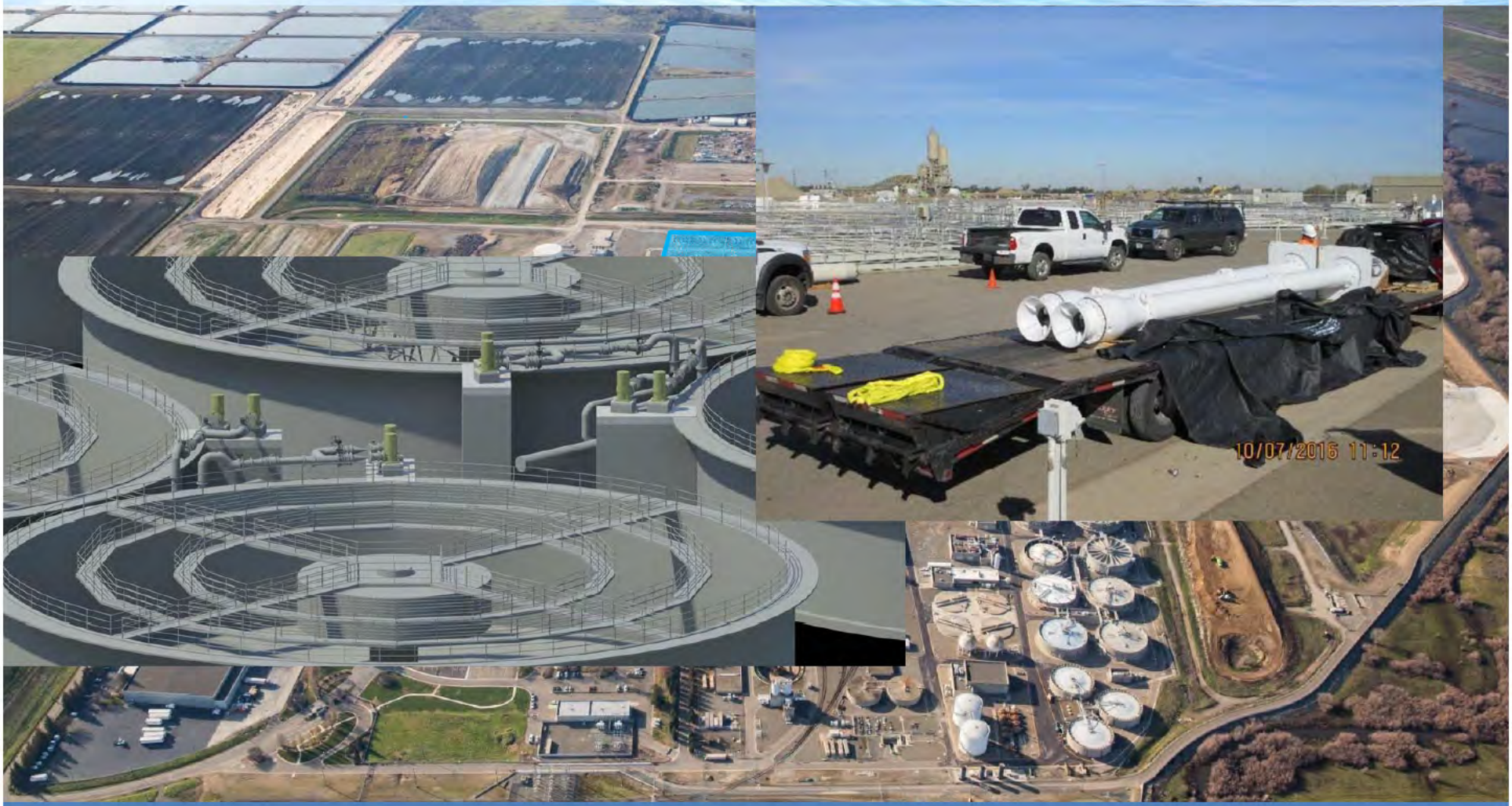

Return Activated Sludge Project
$24 M – Auburn Constructors

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Biological Nutrient Removal
$414 M – Dragados USA

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Tertiary Treatment/Filtration
$350 M (Estimate) Early 2018 Bid

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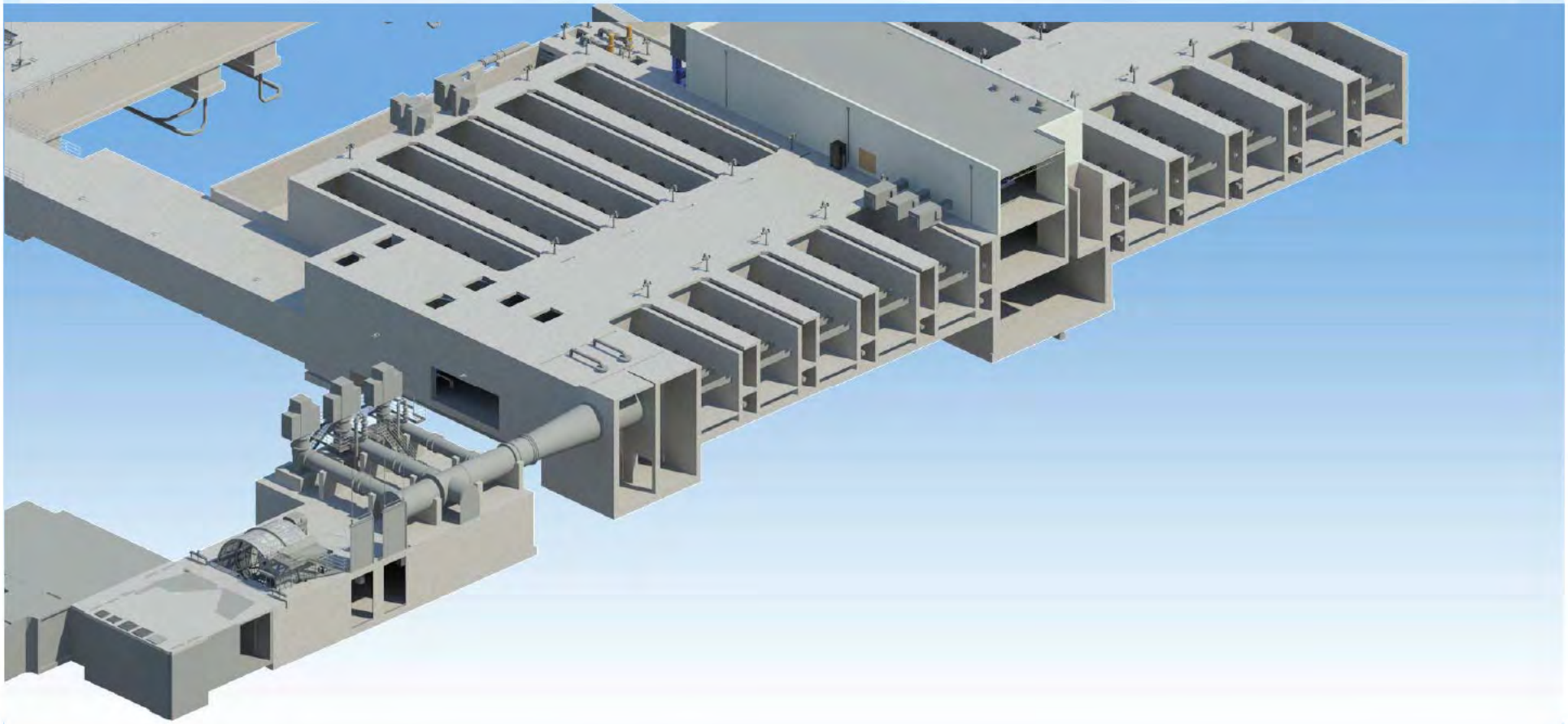

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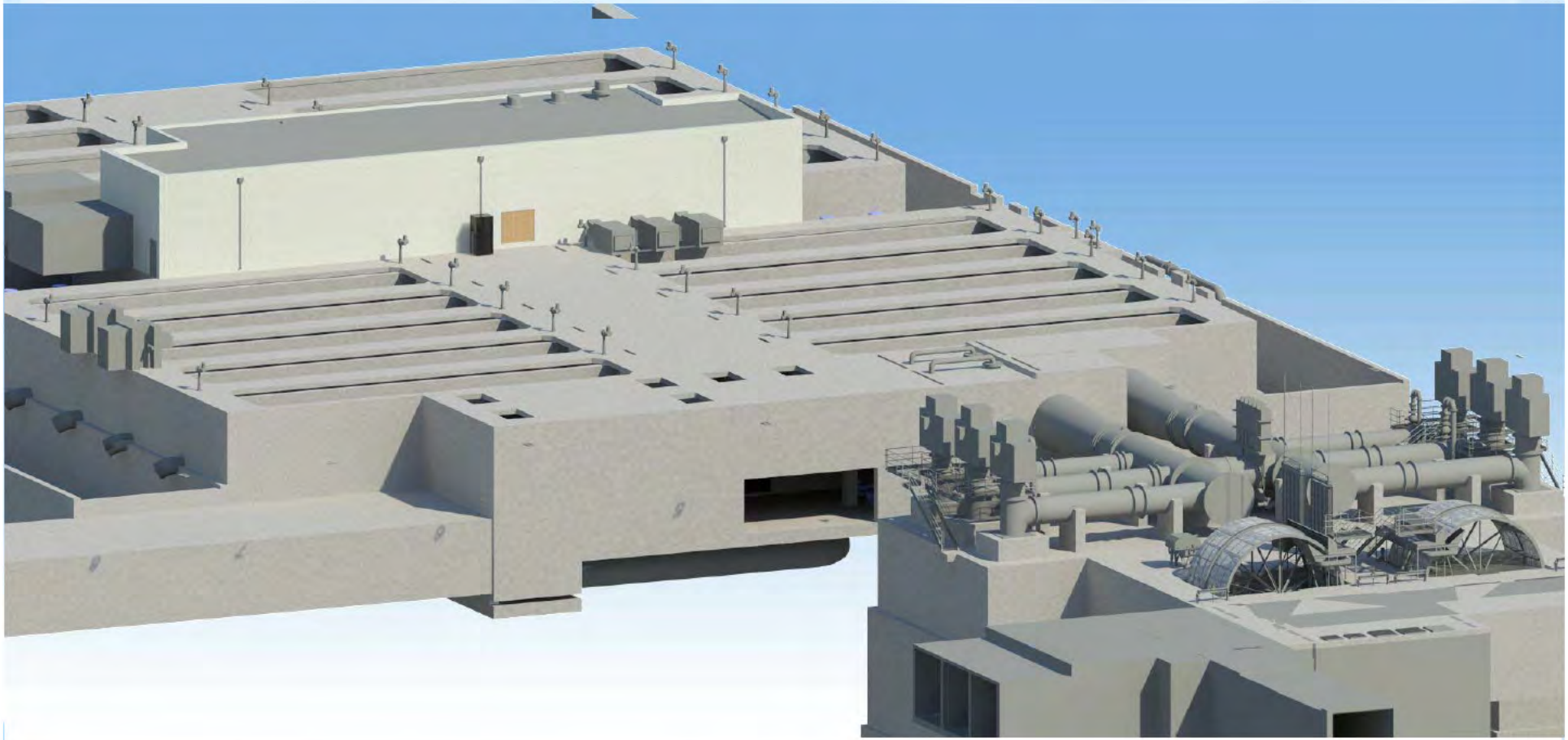

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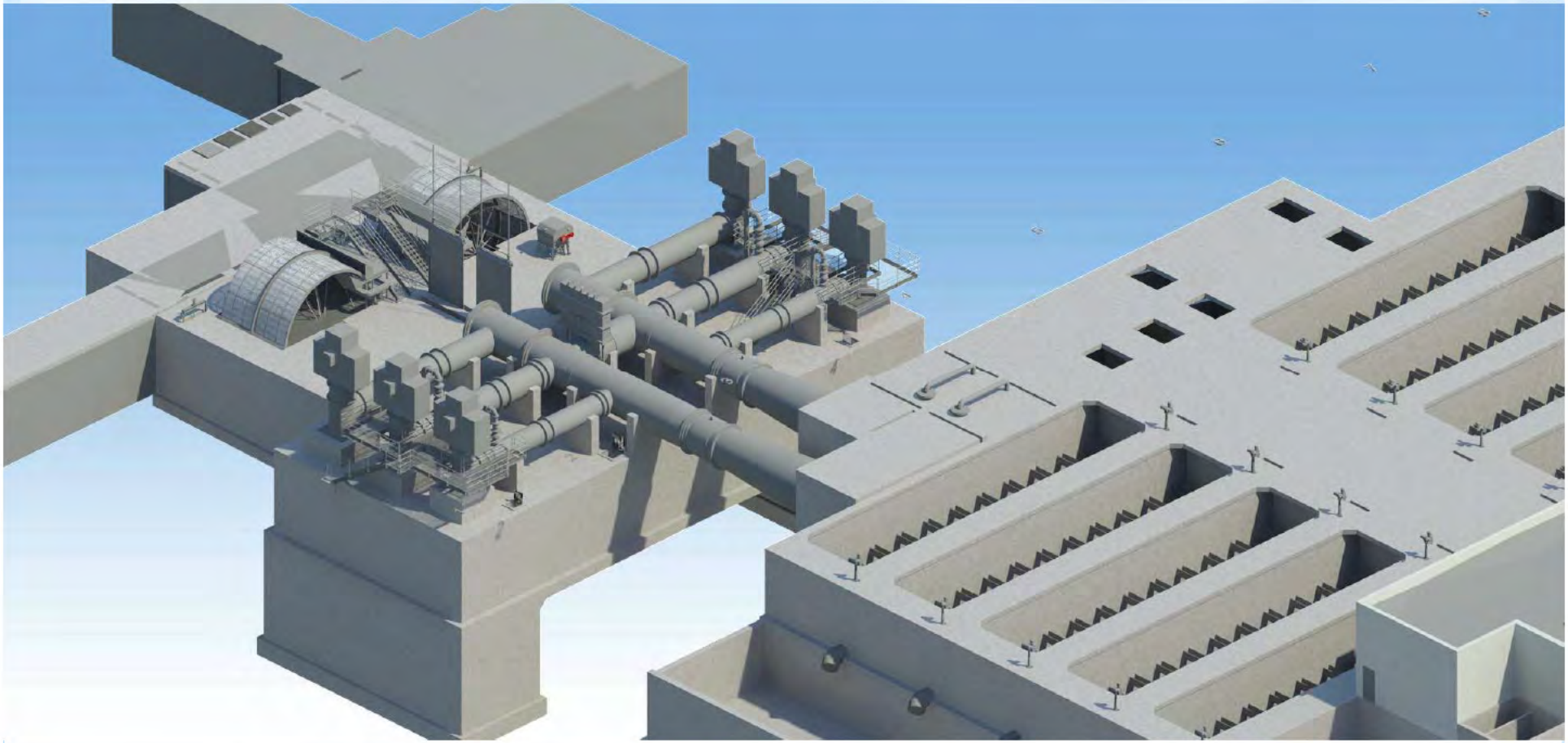

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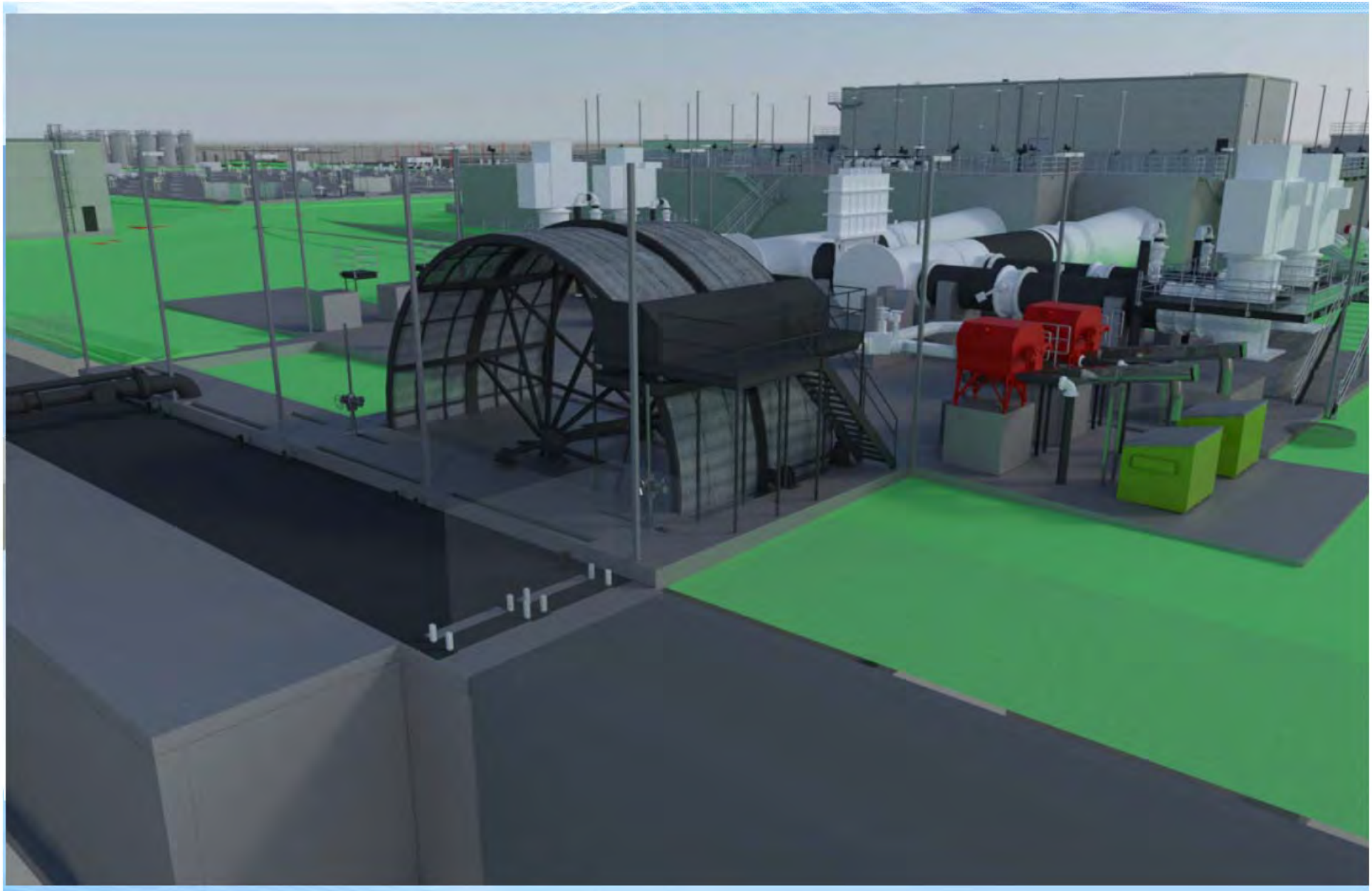

Tertiary Treatment/Filtration
$350 M (Estimate) Early 2018 Bid

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TTF Plan for Full Scale Implementation

Filtration Unit Process Capacity

- Based on a firm 217 mgd, at 7.5 gpm/sf, with at least one filter cell out of service for maintenance, and up to three filter units in backwash.

Disinfection Unit Process Capacity

- DCB size based on temperature adjusted CT required for inactivation of Total Coliforms, and minimum 5-log removal of MS2 Virus,
- Modal contact time 46 minutes
- FRC 3.6 mg/L

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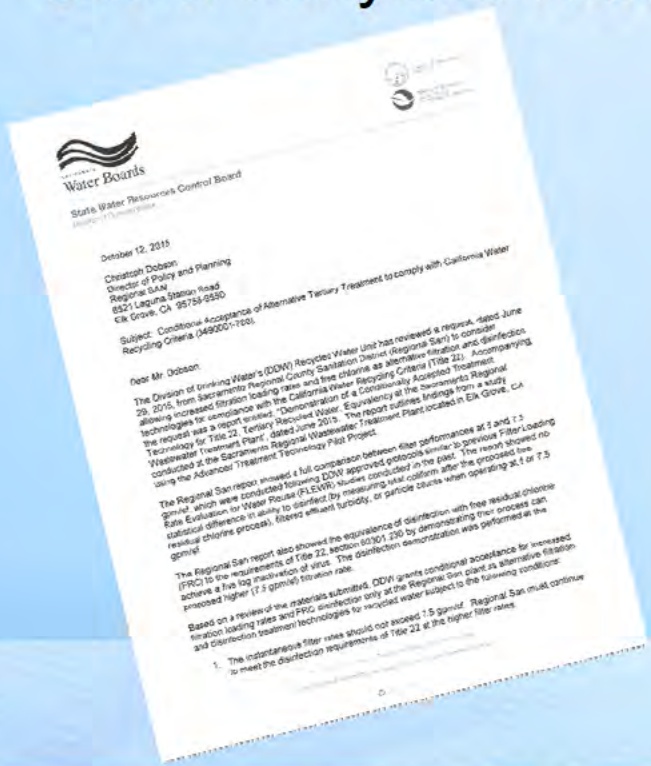
Efforts to Date

- Received Official CATT Acceptance Letter from DDW on October 12, 2015
- Title 22 Report for the Production Distribution, and Use of Recycled Water, February 2017



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Parameter	Current limit	Dec. 2020 limit
Biochemical Oxygen Demand (BOD)	30 mg/L	10 mg/L
Total Suspended Solids (TSS)	30 mg/L	10 mg/L
Total Coliform	23 MPN/100 mL	2.2 MPN/100 mL
Ammonia-N	47 mg/L	1.5 mg/L winter 2.0 mg/L summer
Nitrate-N	None	10 mg/L
Turbidity	None	2 NTU

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