



# The EchoWater Project

## Leveraging Technology to Enhance Project Delivery

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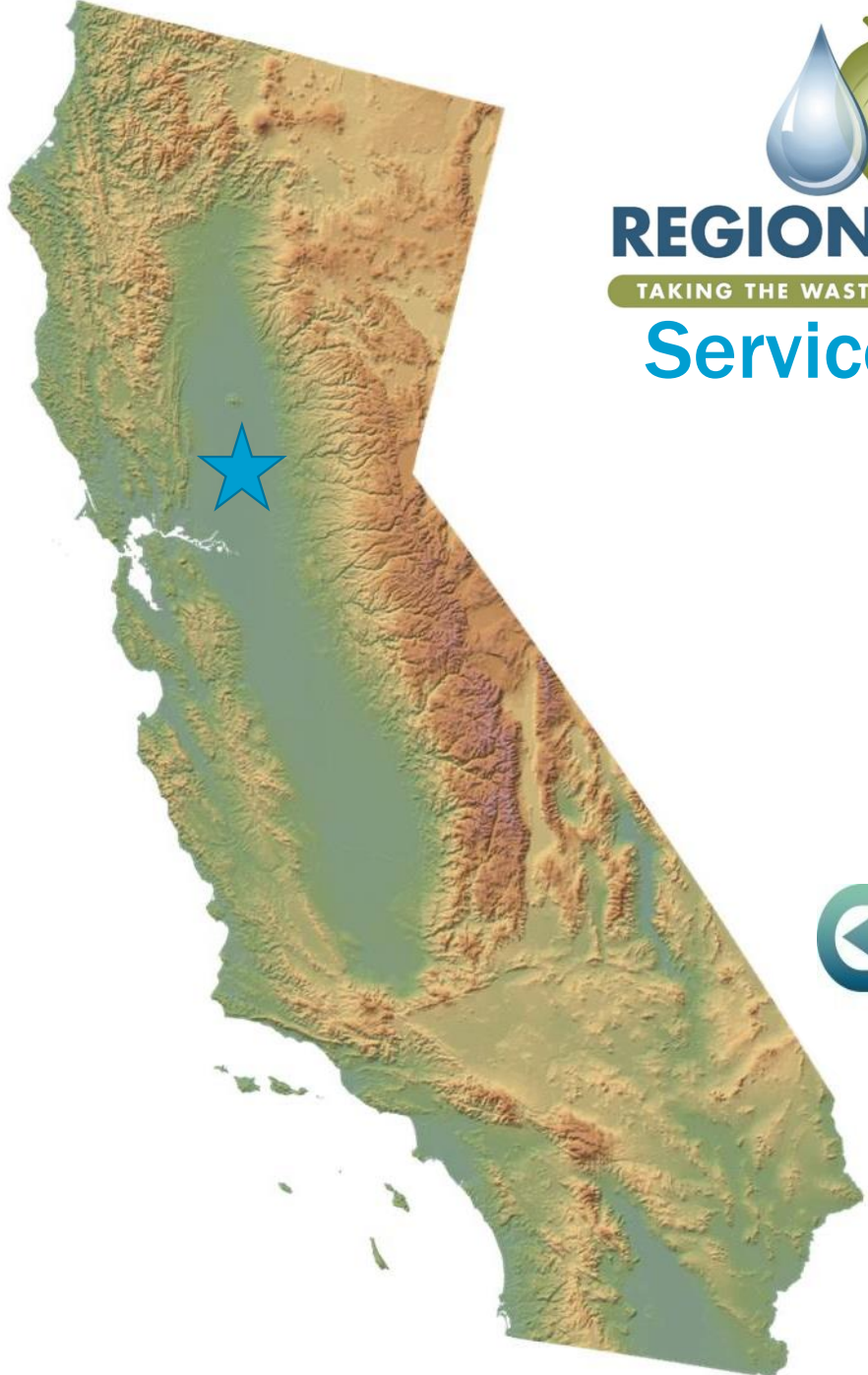




- 01 **What is the EchoWater Project**
- 02 **Implementing 3D/4D/5D**
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- 04 **Benefit: Schedule Analysis**
- 05 **Benefit: Project/Operations Coordination**
- 06 **Benefit: Asset Data Transfer**
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# 01 What is the EchoWater Project

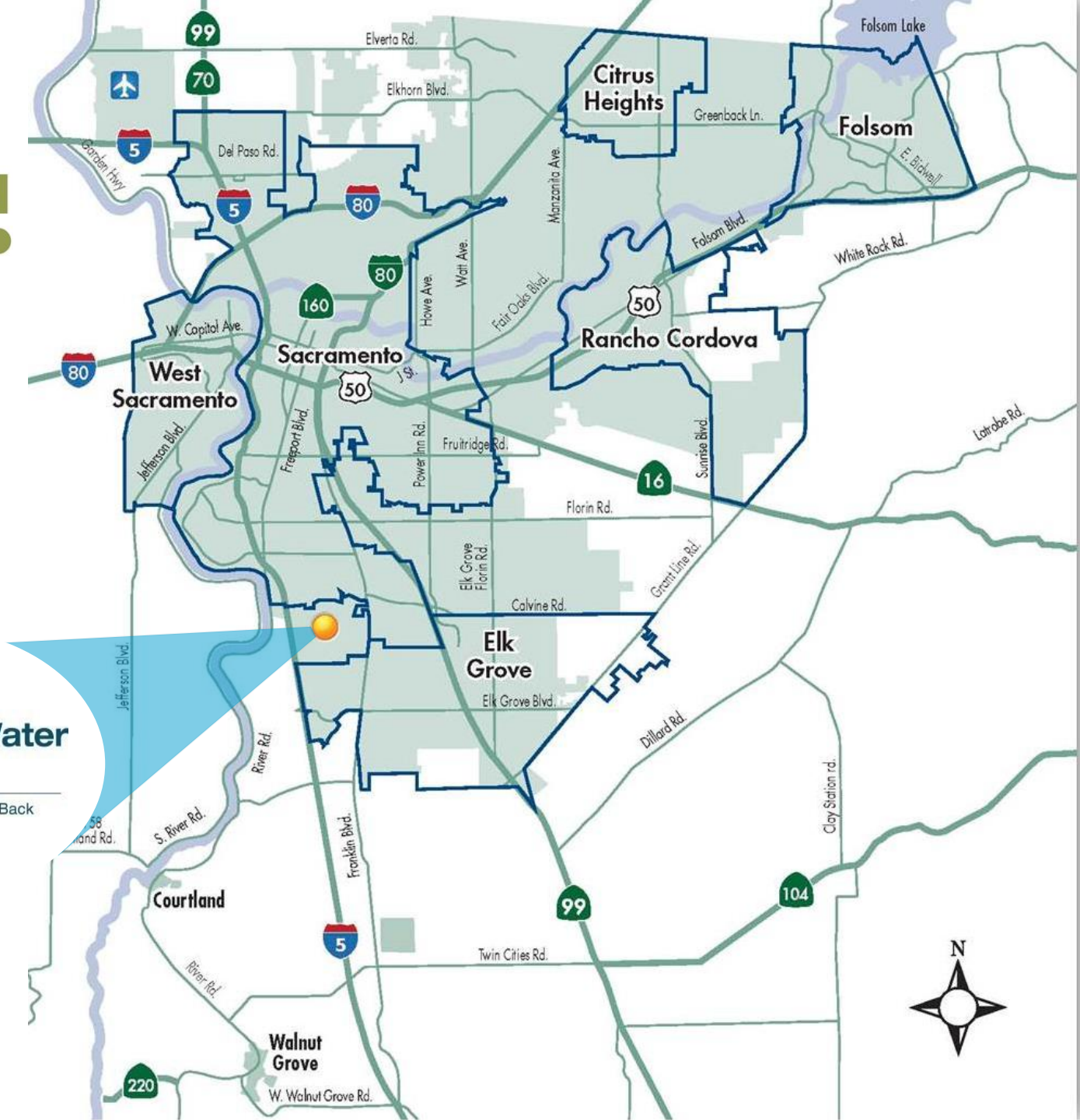


# REGIONALSAN

TAKING THE WASTE OUT OF WATER

## Service Area

 **EchoWater Project**  
Bringing Water Back



# Regional San is California's Largest Inland Discharger



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

# 2010 Discharge Permit (NPDES)

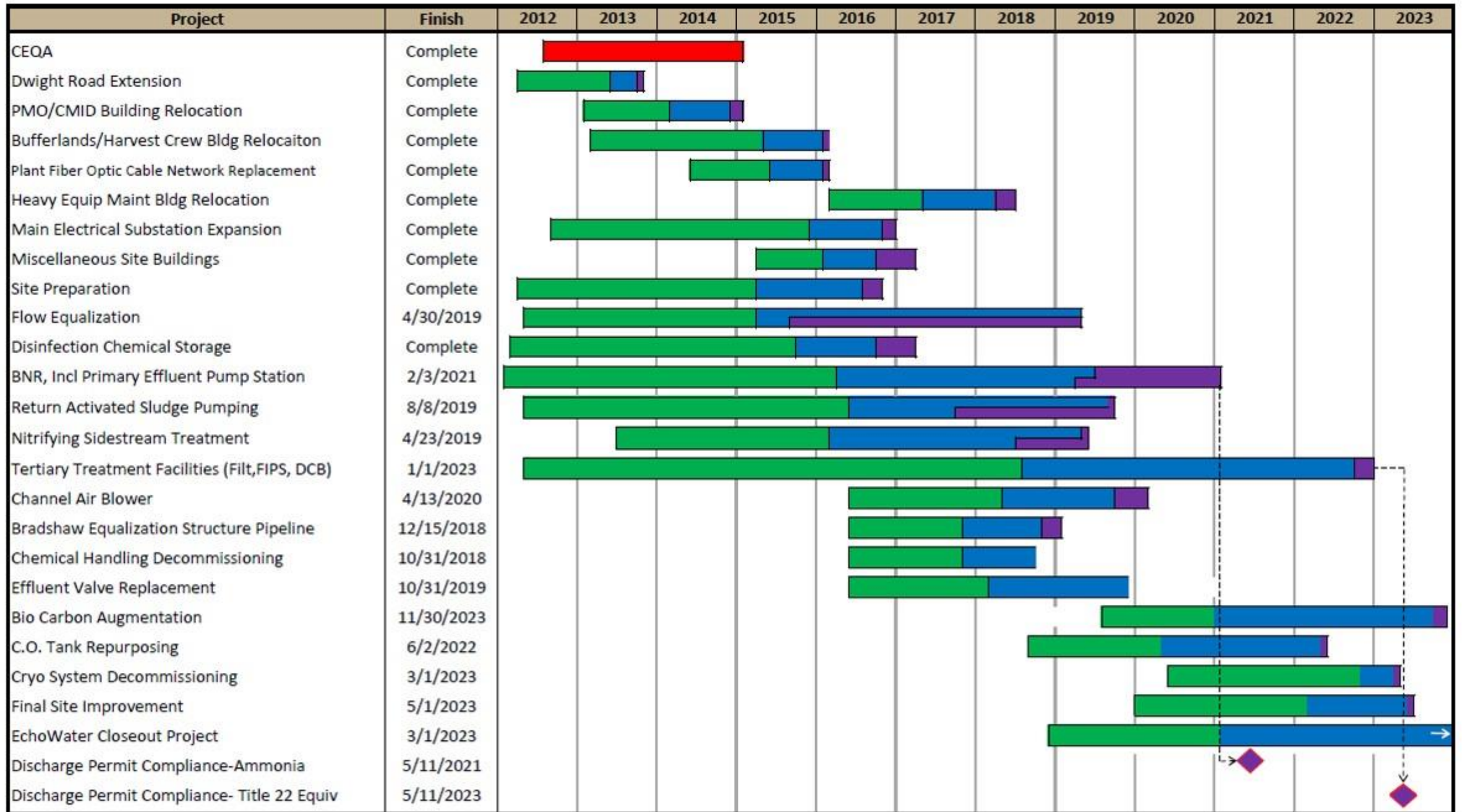
- Required significantly higher treatment to remove ammonia, nitrates, and further reduce pathogens in the treated water
- Ammonia removal **MUST** be completed and operational by **May 2021**; filtration/disinfection by **May 2023**
- 2011 – 2012 – Initial Studies, Design, and Build 0.5-mgd Pilot Plant
- February 2012 – Commissioned Program Management Office
- Late 2014 – Environmental Document Complete



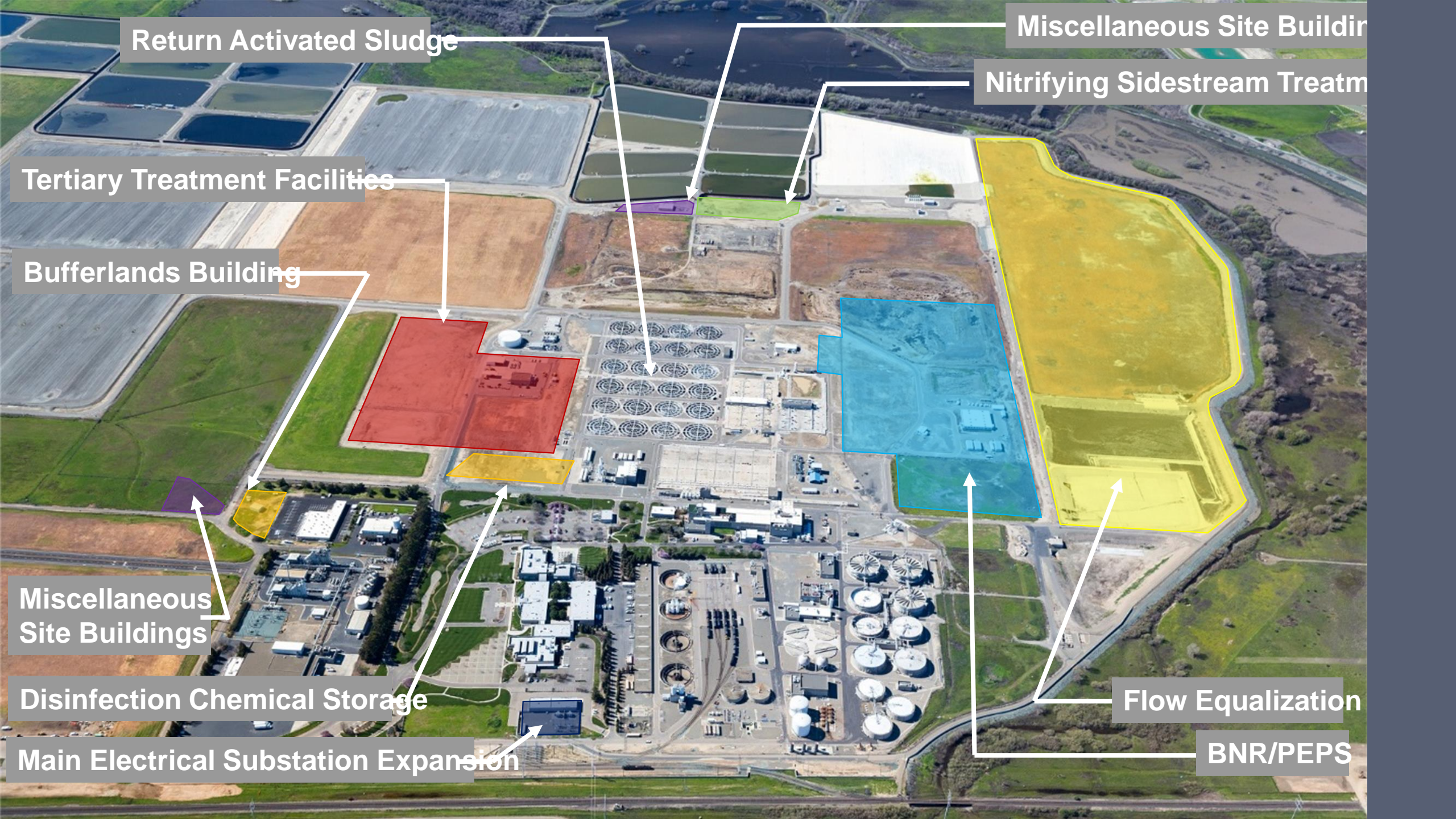
# EchoWater Project Stats

- Original Program cost estimate:  
**\$2.1 billion**
- Current Program cost estimate:  
**\$1.735 billion**
- Number of discrete projects:  
**24**
- Peak month spending:  
**\$35 million**
- Estimated daily workers at site:  
**500 at peak**









Return Activated Sludge

Miscellaneous Site Building

Nitrifying Sidestream Treatment

Tertiary Treatment Facilities

Bufferlands Building

Miscellaneous Site Buildings

Disinfection Chemical Storage

Main Electrical Substation Expansion

Flow Equalization

BNR/PEPS



## 02 Implementing 3D/4D/5D

# 3D

## VISUALIZATION

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- Existing Conditions
- Animations
- Renderings
- Walkthroughs

# 4D

## SCHEDULING

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- Project Phasing
- Visual Validation
- Interproject Coordination

# 5D

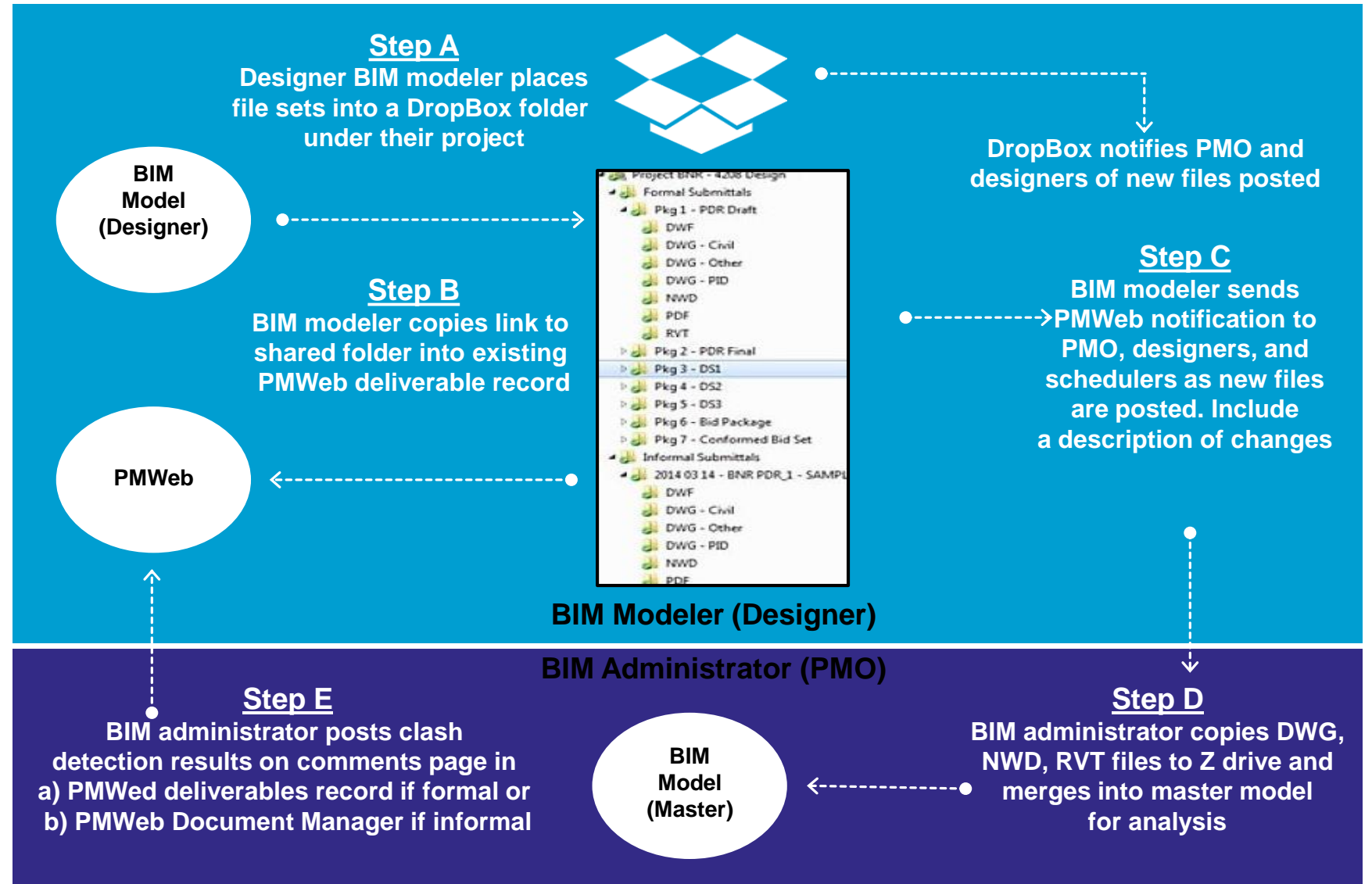
## ESTIMATING

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- Cost Phasing
- Quantity Extractions
- Funding Projections

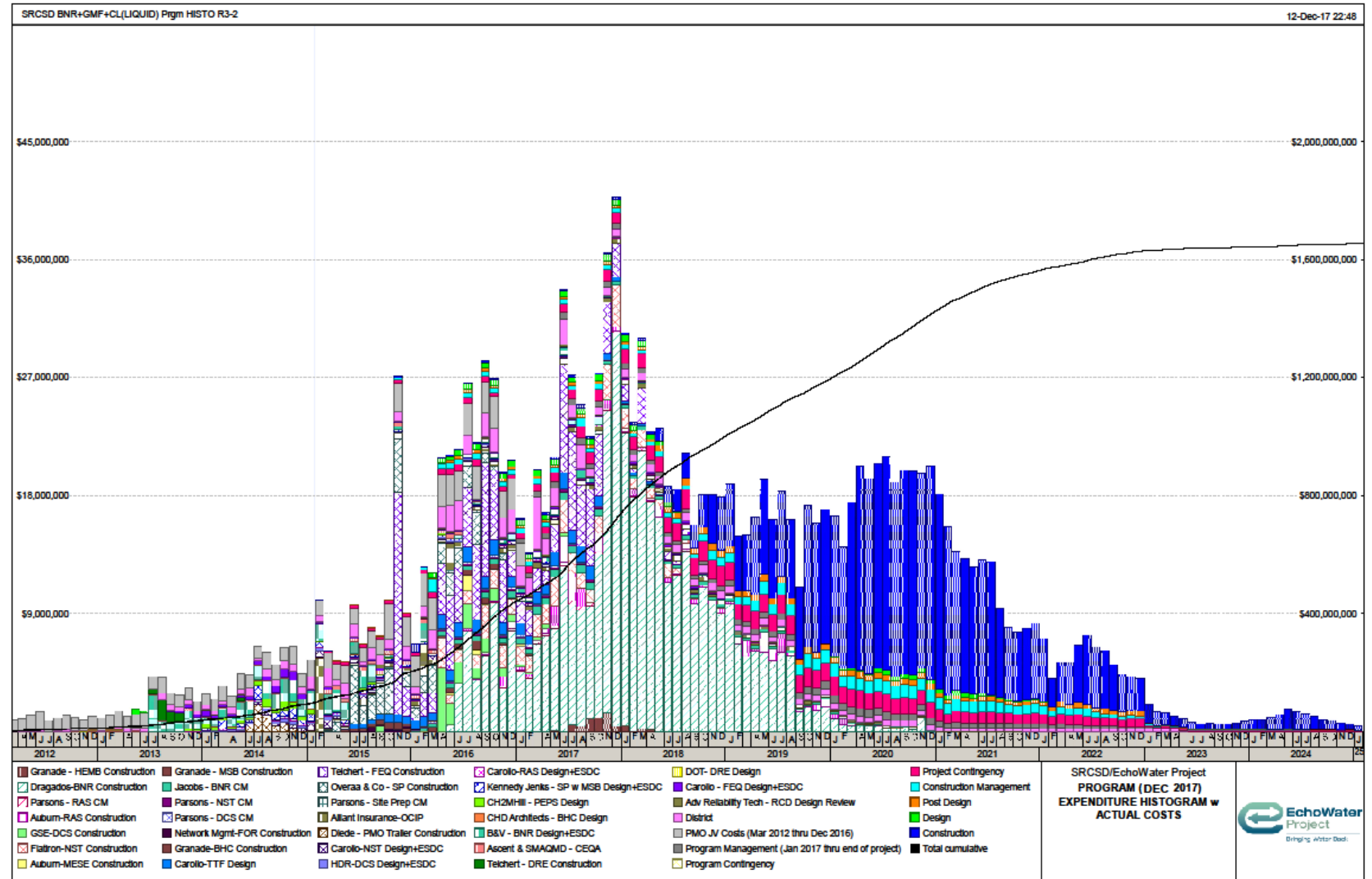
# Establish BIM Standards

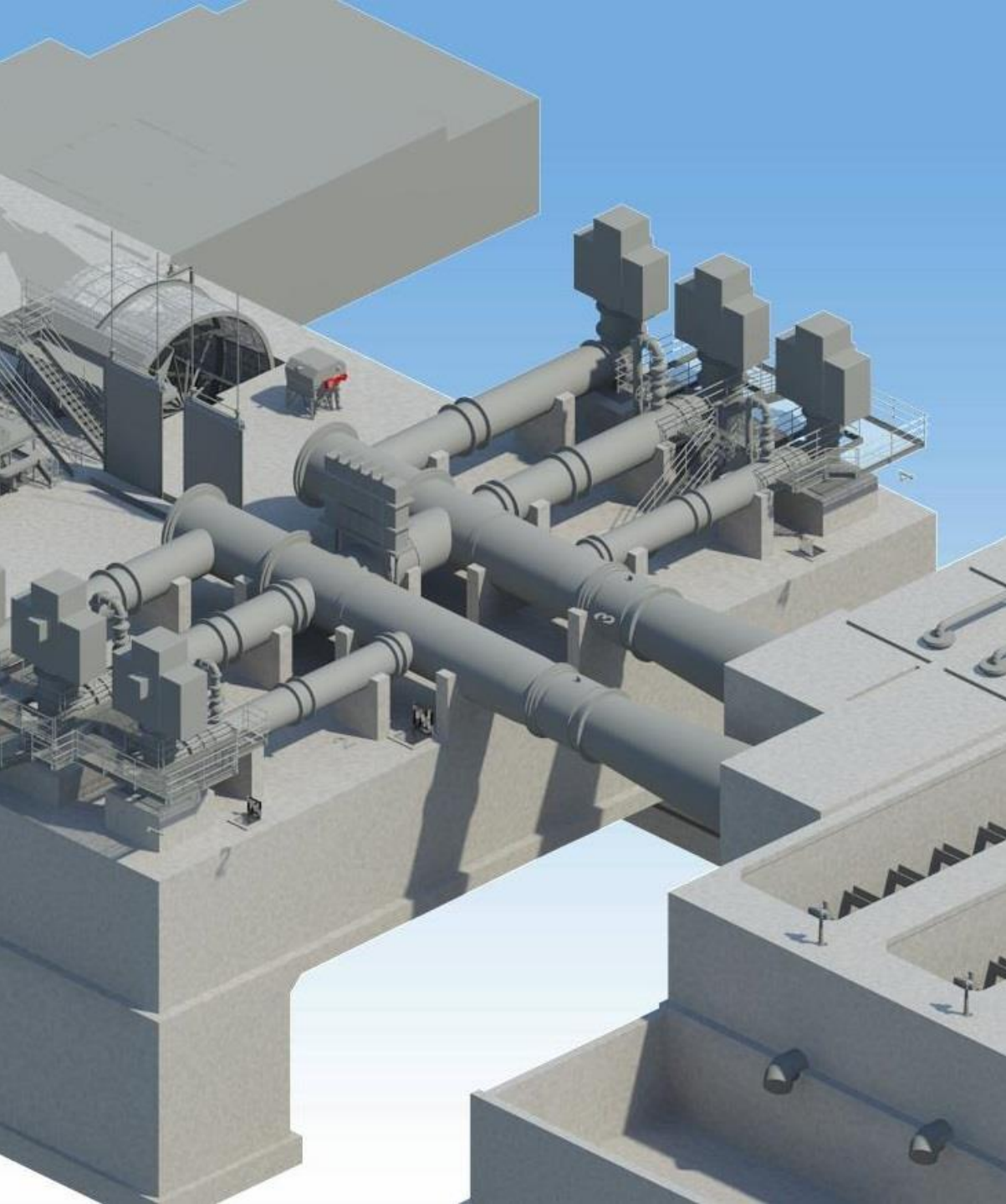
- Established CAD/BIM standards for all designers
- Established processes for updating files from design through construction



# Establish Scheduling/4D/5D Standards

- Established scheduling standards for all designers and contractors
- Established processes for updating schedules design through construction



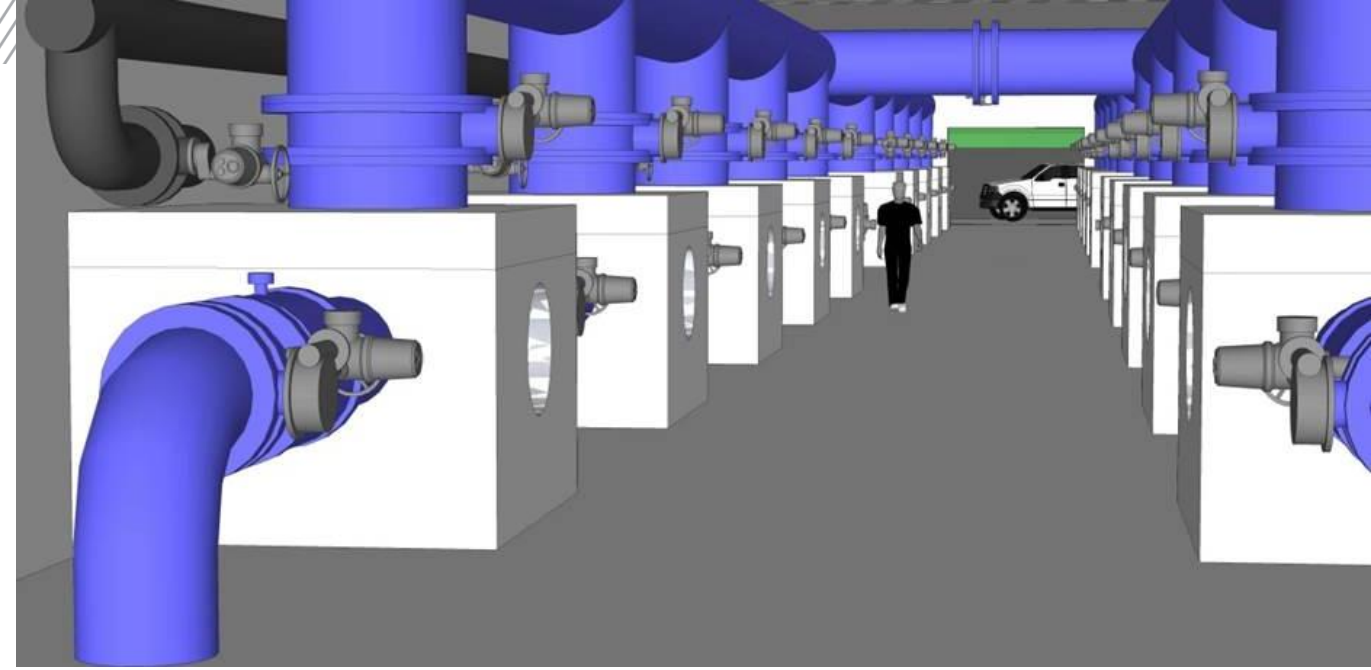
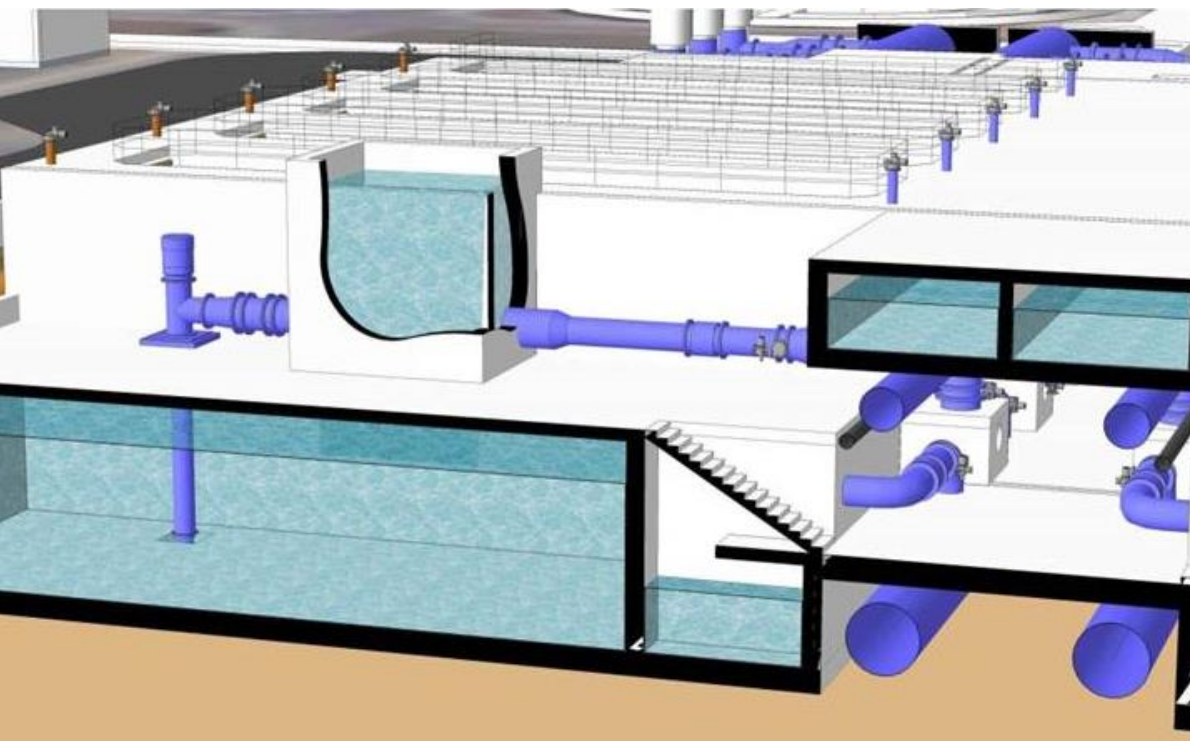


## 03 **Benefit: Issue Visualization**

# Pre-Construction Use of BIM

## Effective Project Planning

- Visualization of design options/studies
- Site utilization planning

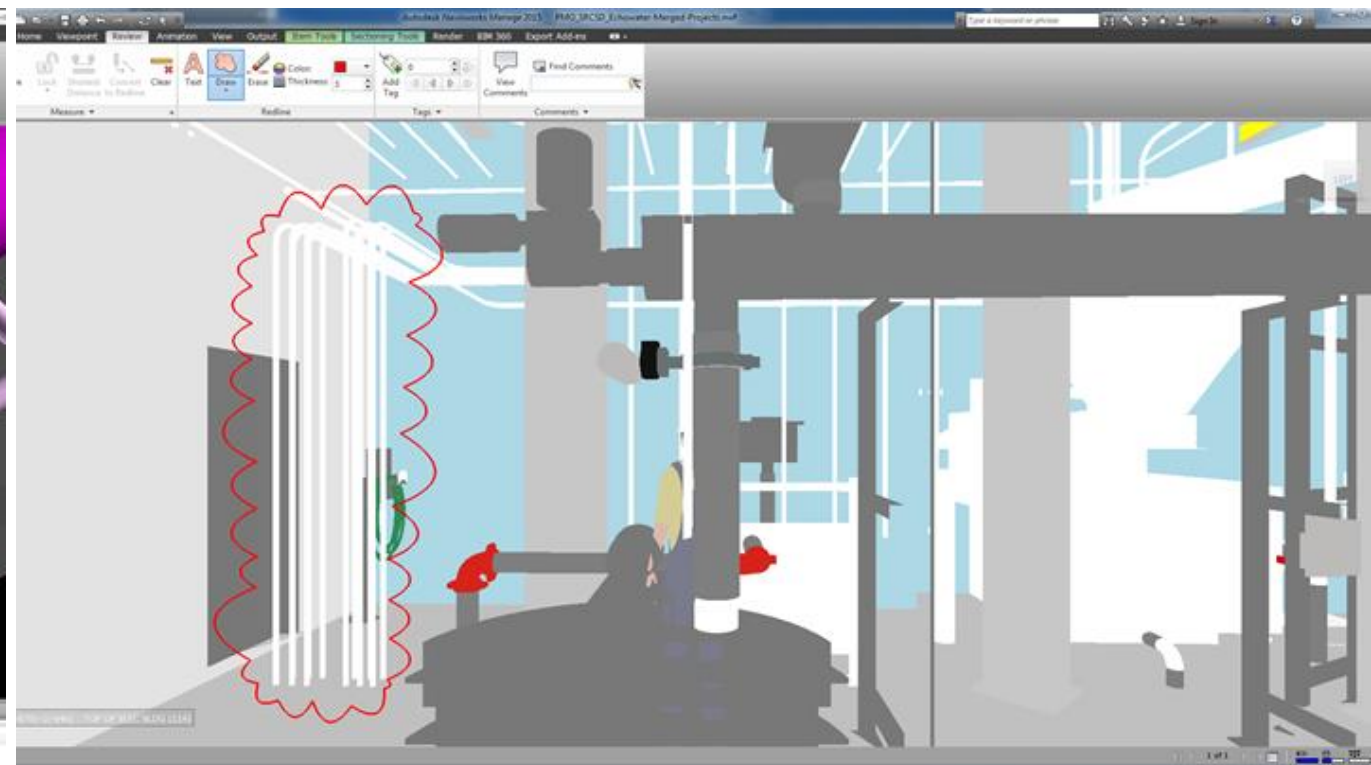
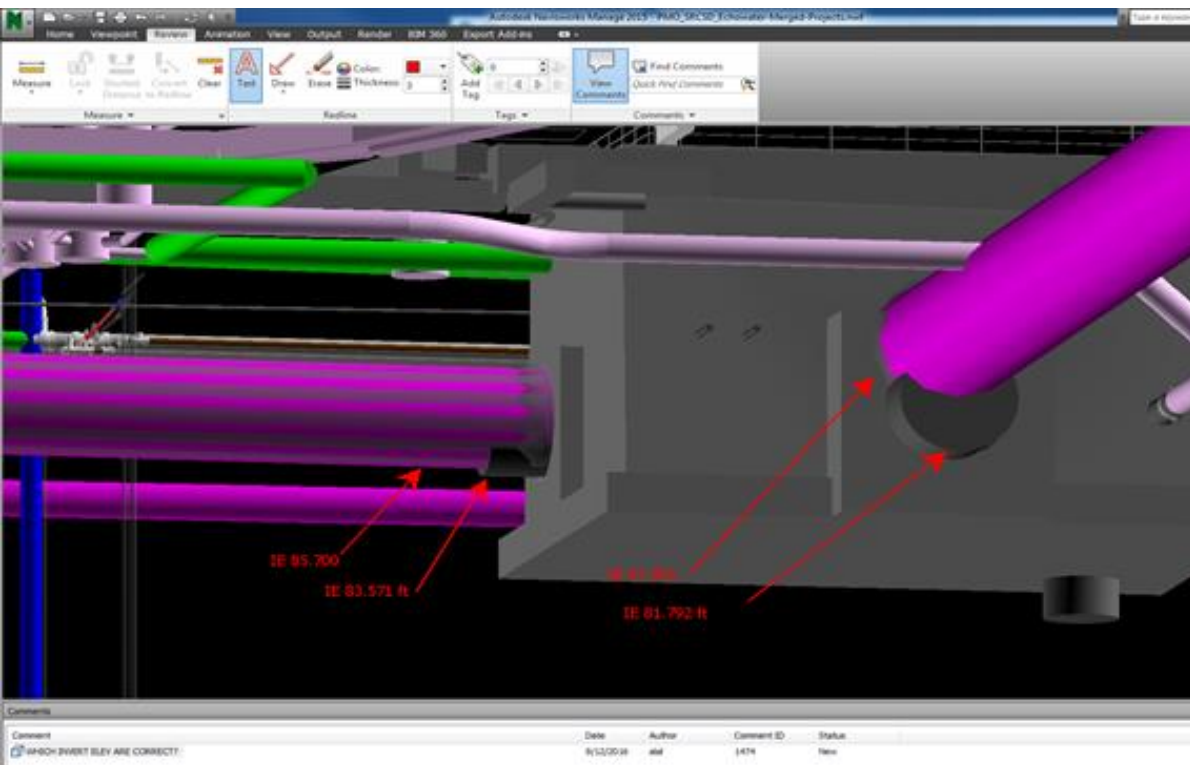
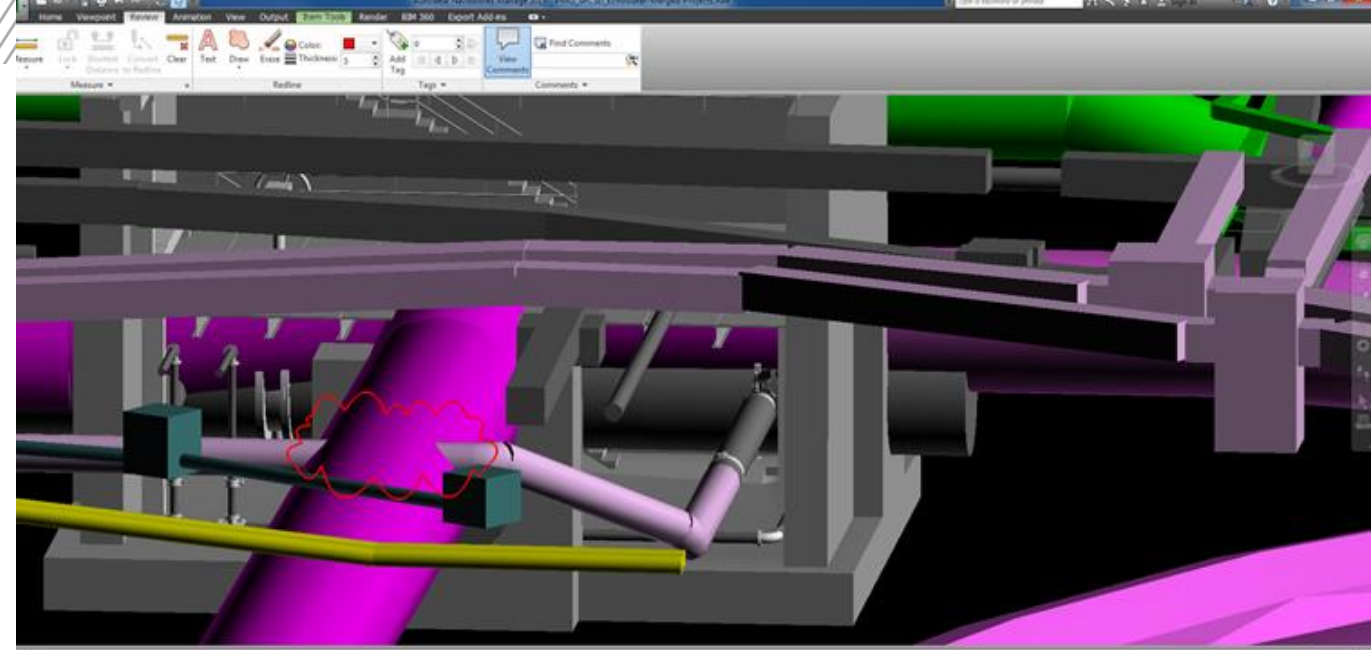


# Primary Effluent Pumps 3D Rendering

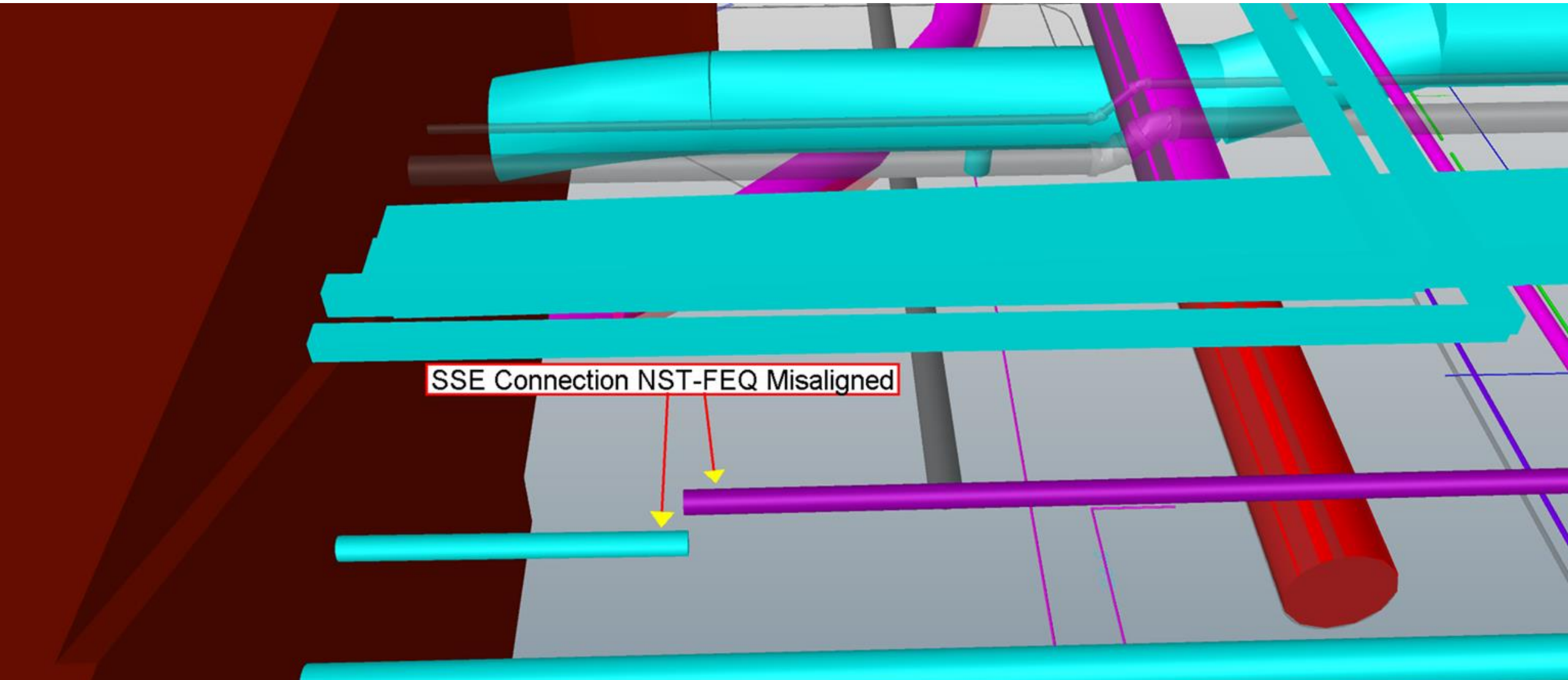




# BIM-Clash Detection



# Inter-Project Connections





## 04 **Benefit: Schedule Analysis**

# 4D and 5D BIM

- Synchro Model, P6 Schedule, and Cost Integration

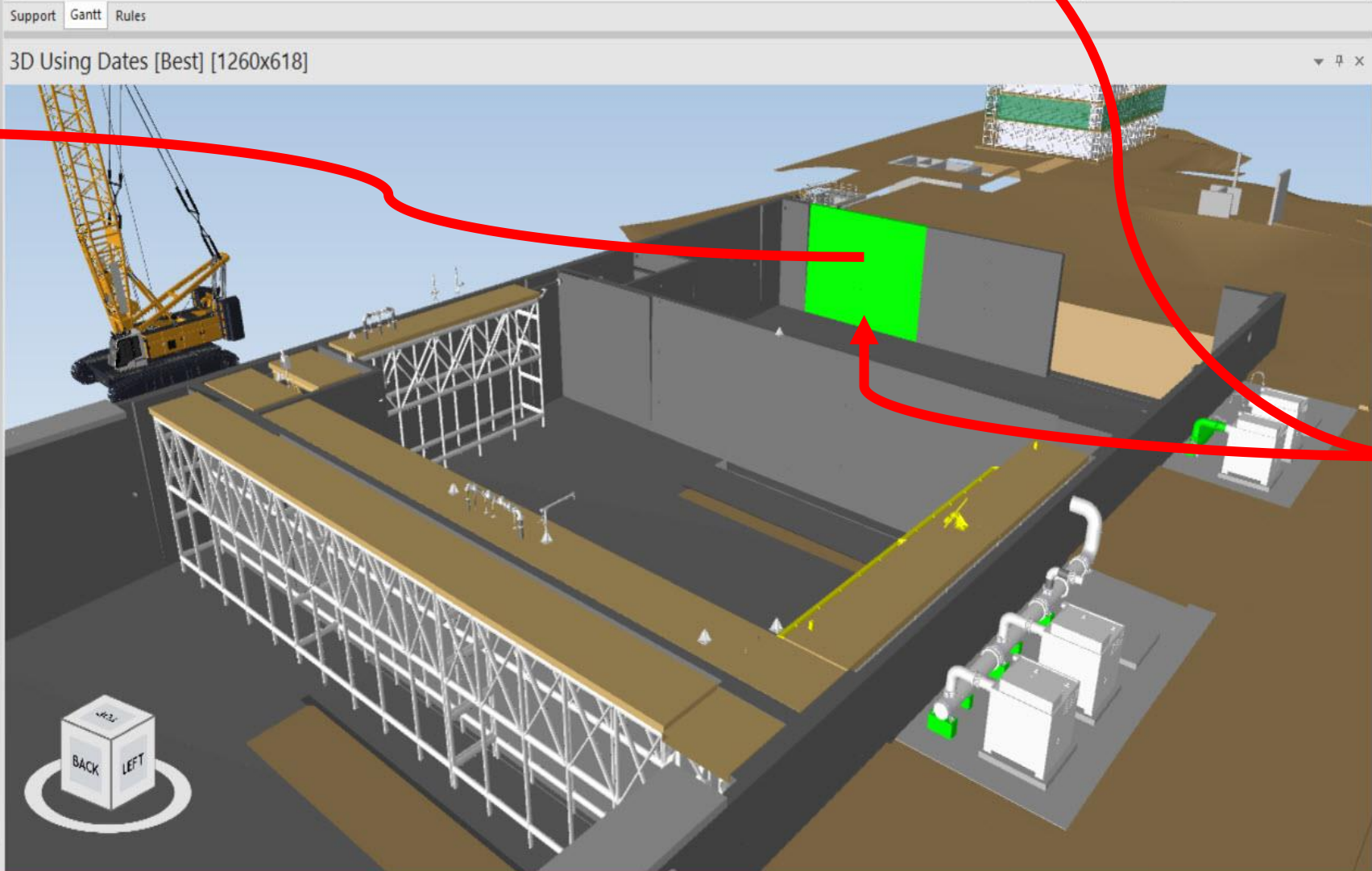
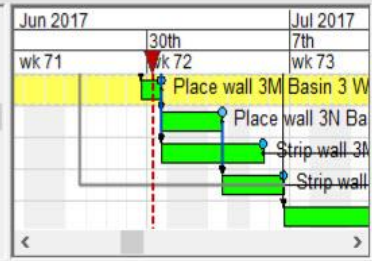


### 3D Objects

- Walls (42) KEEP
  - Basic Wall (32)
  - Battered Wall-1 (1)
    - Battered Wall-1 (1)
      - Battered Wall-1 [1083207]
        - Subdivision 1
        - Subdivision 2
        - Subdivision 3
        - Subdivision 4
        - Subdivision 5**
        - Subdivision 6
- Battered Wall-10 (1)
- Battered Wall-2 (1)
- Battered Wall-3 (1)
- Battered Wall-4 (1)
- Battered Wall-5 (1)
- Battered Wall-6 (1)
- Battered Wall-7 (1)
- Battered Wall-8 (1)
- Battered Wall-9 (1)

- 4212-NST NSBR Foundation Slab KEEP
- 4212-NST NSBR EQ Wall Cut
- 4212-NST NSBR Excavated Dirt
- 4212-NST NSBR Falsework.sp
- 4212-NST NSBR Fine Bubble Diffusers.fbx
- 4212-NST NSBR Guard Rails
- 4212-NST NSBR's Only.sp
- 4212-NST YP MH40 Backfill
- 4212-NST YP MH40 Excavate
- 4212-Storm Drain Pumping Station.spx
- 4212\_NST- Dirt Surface
- 4212\_NST-CNF\_Master-Model.nwf.spx WDPS
- 4212\_NST-Master\_Finish\_Surface.nwf.spx
- 4212\_NST-Master\_Proposed\_Utility.nwf.spx
- 4283 TTF DS1 Submittal Navisworks Federated Model 071
- ??? RAS paving
- Equip DND EXT DM WIPST

ID	Name	3D Resources	Duration	Start	Finish
8016	NSTC-B3-Wall-631	1	1d	6/29/2017	6/30/2017
8046	NSTC-B3-Wall-621	1	1d	6/29/2017	7/3/2017
8019	NSTC-B3-Wall-651		2d	6/30/2017	7/5/2017
8014	NSTC-B3-Wall-641		2d	7/3/2017	7/5/2017
8031	NSTC-B3-Wall-711	14	8d	7/6/2017	7/18/2017



### Task Properties

General

Links

Predecessors

ID	Name
NSTC...	Double up wall 3M Basin 3 Walls

Successors

ID	Name
NSTC...	Strip wall 3M Basin 3 Walls

Resources

- Equipment Resources
- Human Resources
- Material Resources**
  - 4212 NST NSBR Wall Basin 3 M Flatiron - Material

General

Appearance Pr...

Utilisation Curve

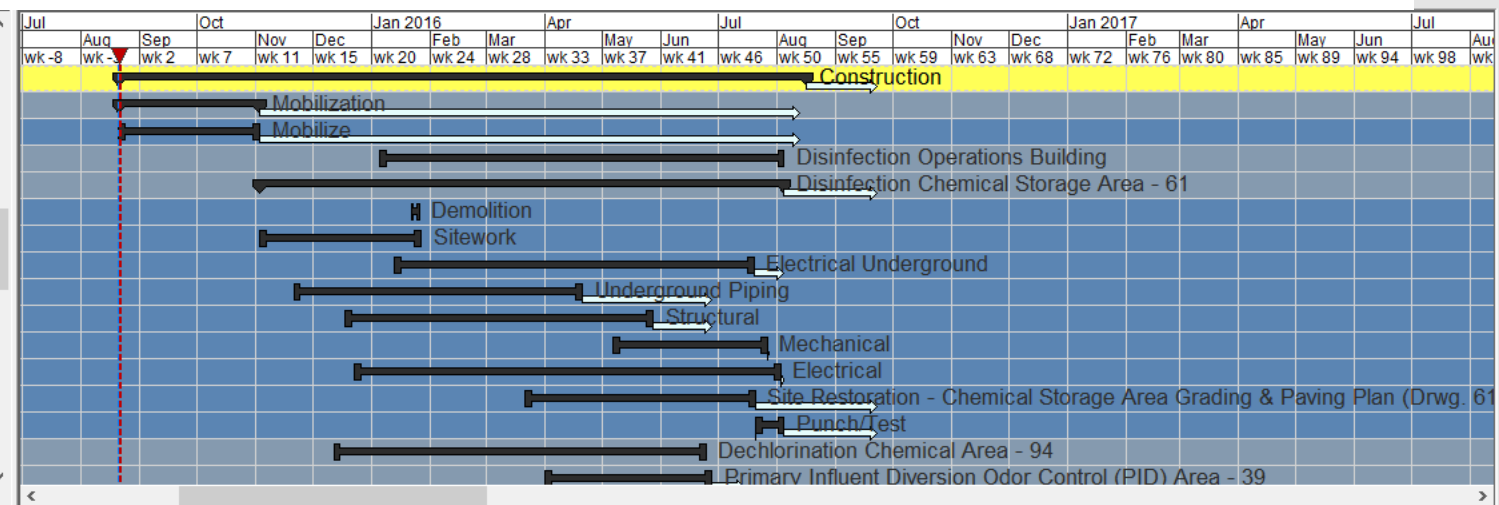
Assignment Rule

Driving

Fixed Units

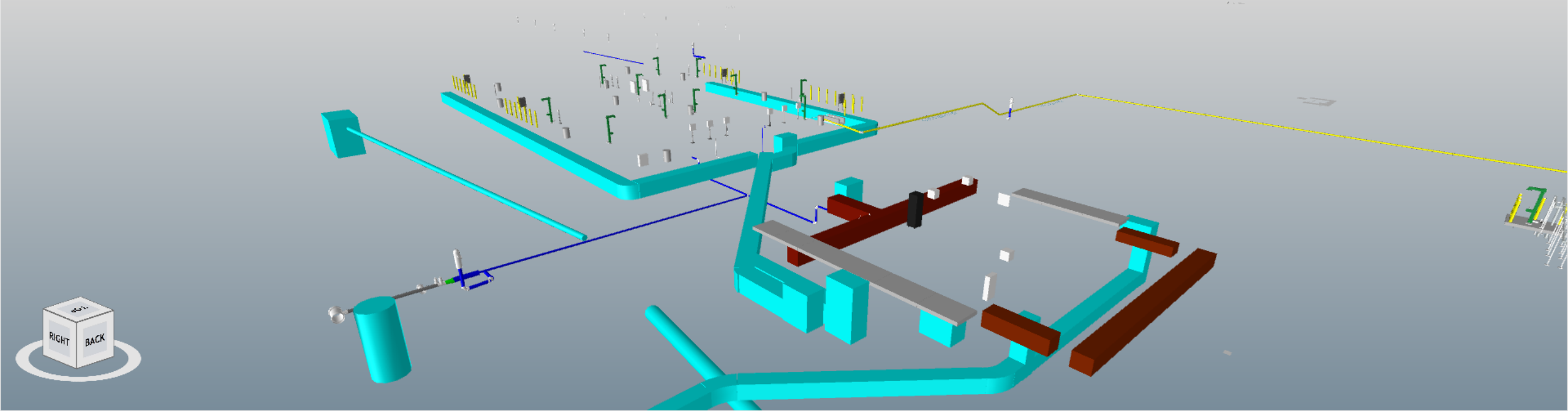
# Baseline Schedule Scope Gap

ID	Name
2	DCS BAS01 AU... Construction
3	DCS BAS01 AU... Mobilization
4	DCS BAS01 AU... Mobilize
8	DCS BAS01 AU... Disinfection Operations Building
10	DCS BAS01 AU... Disinfection Chemical Storage Area - 61
11	DCS BAS01 AU... Demolition
14	DCS BAS01 AU... Sitework
16	DCS BAS01 AU... Electrical Underground
78	DCS BAS01 AU... Underground Piping
72	DCS BAS01 AU... Structural
63	DCS BAS01 AU... Mechanical
37	DCS BAS01 AU... Electrical
23	DCS BAS01 AU... Site Restoration - Chemical Storage Area Grading & Paving Plan (Drwg. 61CG101)
39	DCS BAS01 AU... Punch/Test
32	DCS BAS01 AU... Dechlorination Chemical Area - 94
11	DCS BAS01 AU... Primary Influent Diversion Odor Control (PID) Area - 39

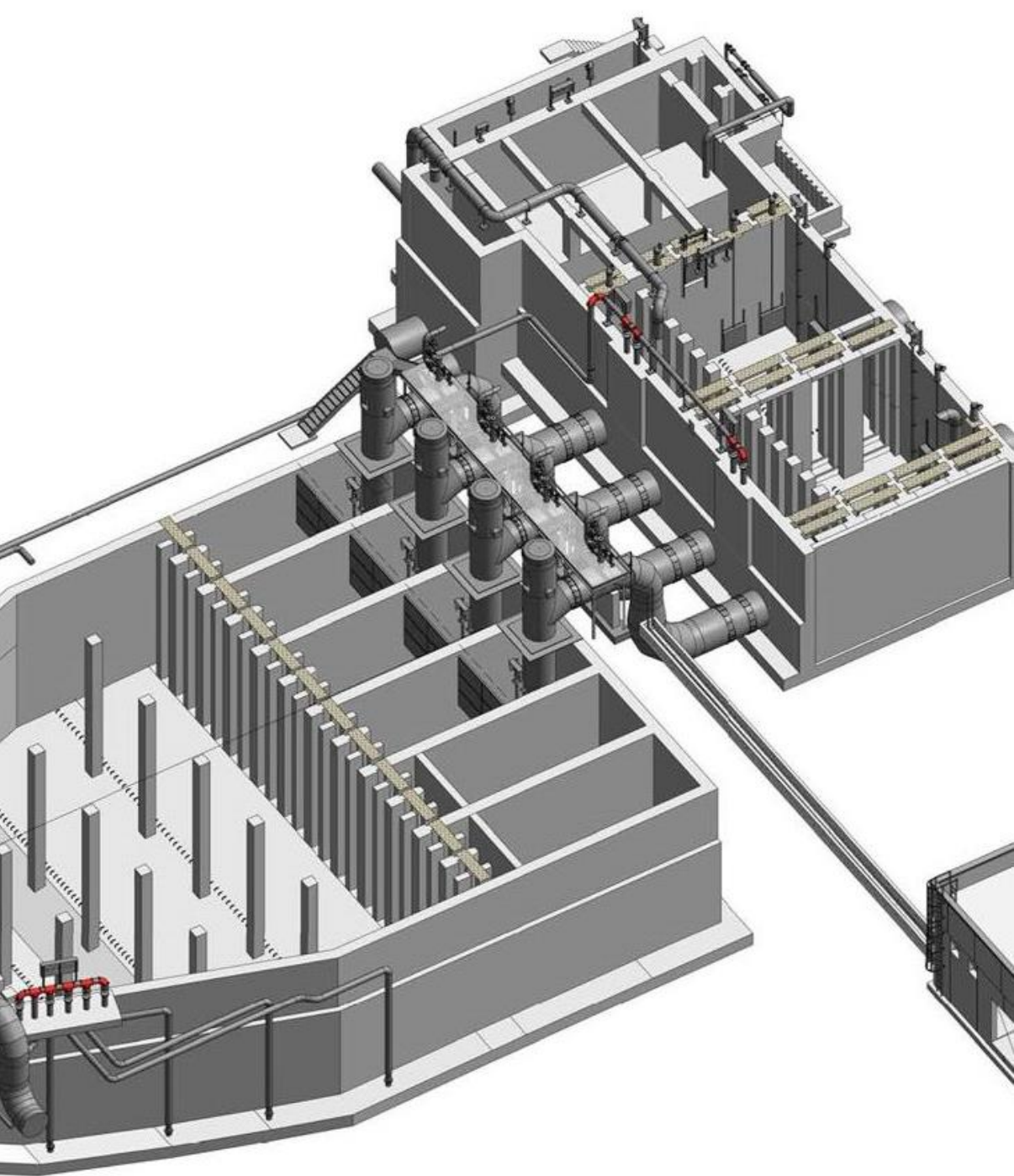


Support Gantt Rules

3D Using Dates[Best] [1918x503]







05 **Benefit: Project/Operations  
Coordination**



- LEGEND**
- Conc Form
  - Conc Pour
  - Conc Strip
  - Cure
  - Install
  - Leak Test
  - Out Of Service
  - Tie-In/Cut-over



Jun 2016		Jan 2017				Jan 2018				Jan 2019				Jan 2020				Jan 2021			
Jul	Oct		Apr	Jul	Oct		Apr	Jul	Oct		Apr	Jul	Oct		Apr	Jul	Oct		Apr	Jul	Oct
wk -49	wk -36	wk -23	wk -10	wk 4	wk 17	wk 31	wk 43	wk 56	wk 70	wk 83	wk 96	wk 109	wk 122	wk 135	wk 148	wk 161	wk 174	wk 187	wk 200	wk 213	wk 226

Legend

- Backfill Gr...
- Conc Form
- Conc Rebar
- Conc Strip
- Conc Strip ...
- Cure
- Install
- Remove

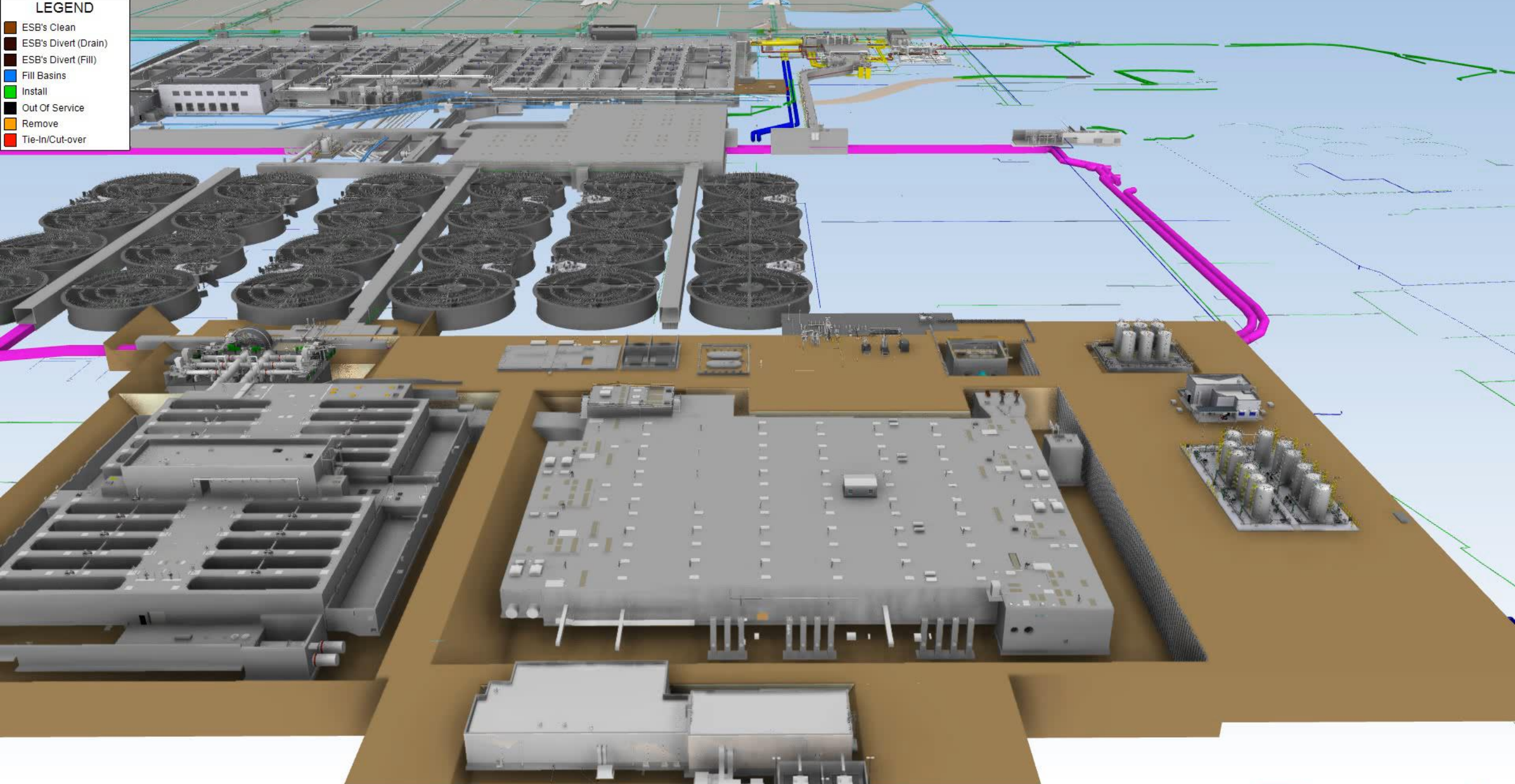
3/17/2017

Week: 106



BNR & FEQ  
Equipment Conflict

Jul 2014		Jan 2015				Jan 2016				Jan 2017				Jan 2018				Jan 2019	
Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul
wk -23	wk -10	wk 4	wk 17	wk 30	wk 43	wk 56	wk 69	wk 82	wk 95	wk 108	wk 121	wk 134	wk 147	wk 160	wk 173	wk 186	wk 199	wk 212	wk 225



- LEGEND**
- ESB's Clean
  - ESB's Divert (Drain)
  - ESB's Divert (Fill)
  - Fill Basins
  - Install
  - Out Of Service
  - Remove
  - Tie-In/Cut-over

Jan 2021			Apr			Jul			Oct			Jan 2022			Apr			Jul	
Feb	Mar		May	Jun		Aug	Sep		Nov	Dec		Feb	Mar		May	Jun	Aug		
wk 188	wk 192	wk 196	wk 201	wk 205	wk 210	wk 214	wk 218	wk 223	wk 227	wk 231	wk 236	wk 240	wk 245	wk 249	wk 253	wk 257	wk 262	wk 266	wk 270



06 **Benefit: Asset Data Transfer**

# Transition to Operations: Leveraging Smart P&ID and BIM Data

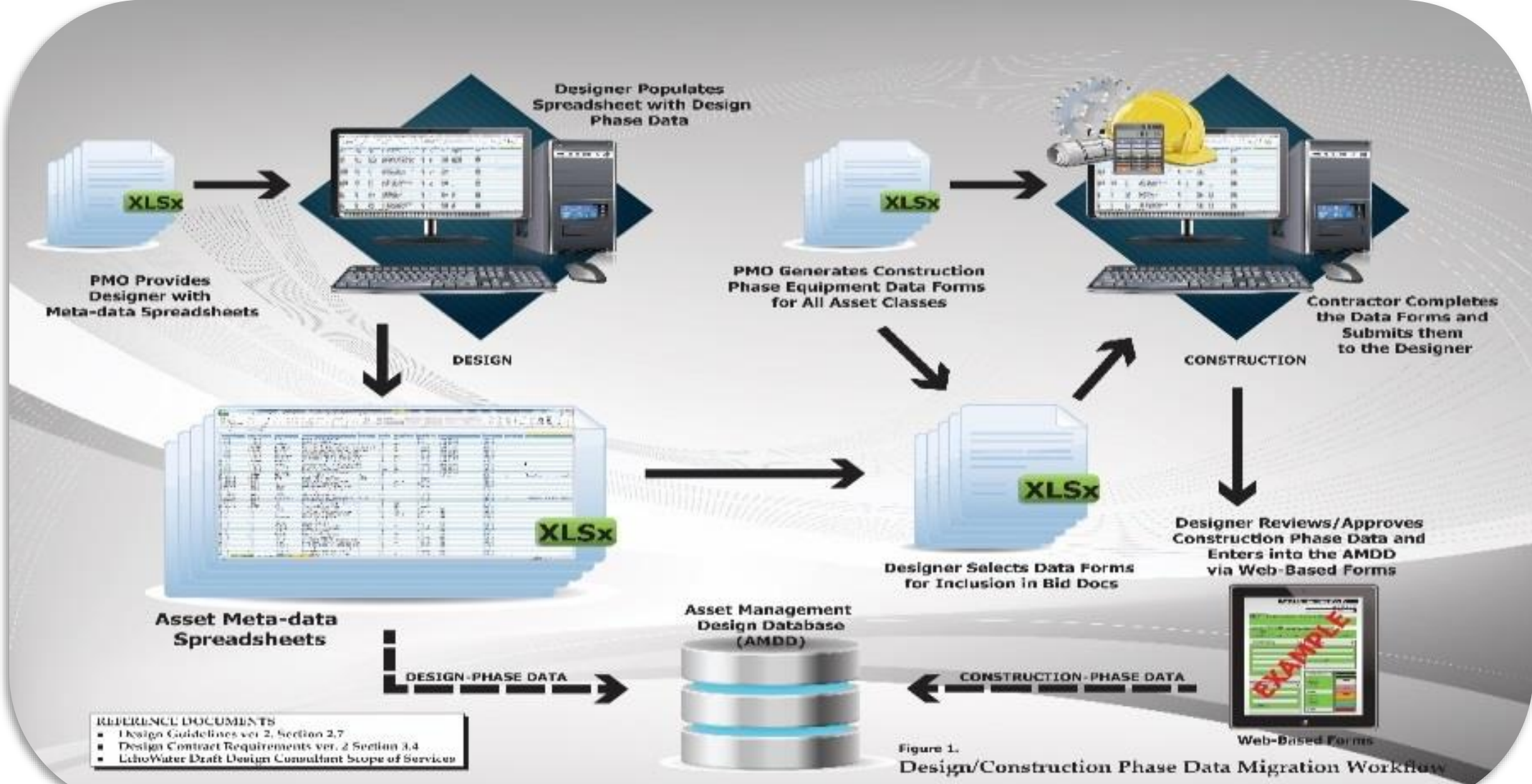
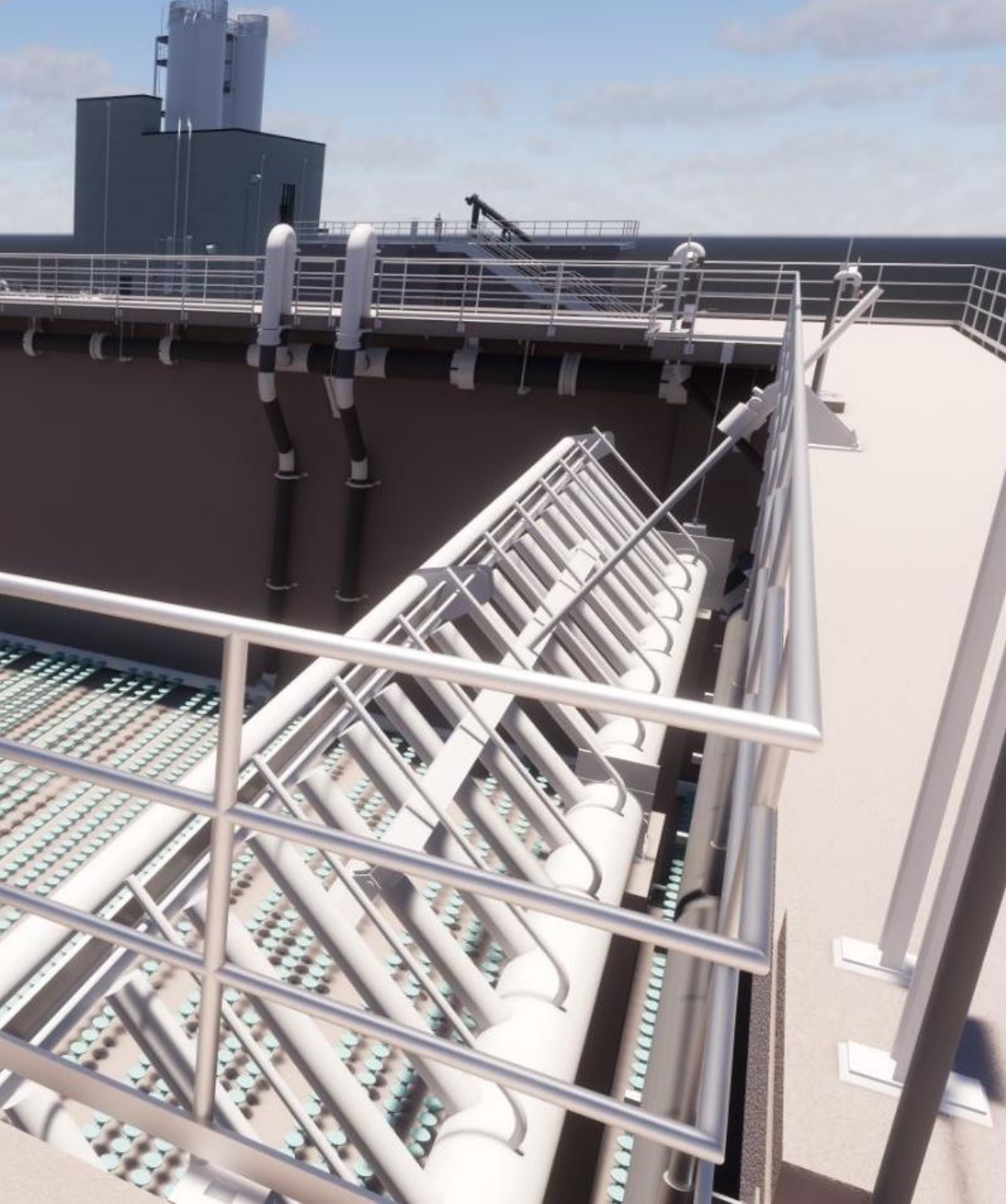


Figure 1. Design/Construction Phase Data Migration Workflow

# Capturing Asset Data for Migration to Plant CMMS

- Asset Management Design Database (AMDD) serves as the hub for design and construction data capture
- AMDD interfaces with design models and construction phase inputs for assets, spare parts, warranties, and maintenance requirements for export to CMMS
- AMDD includes tracking and controls tools for quality and completeness of data being transferred to CMMS

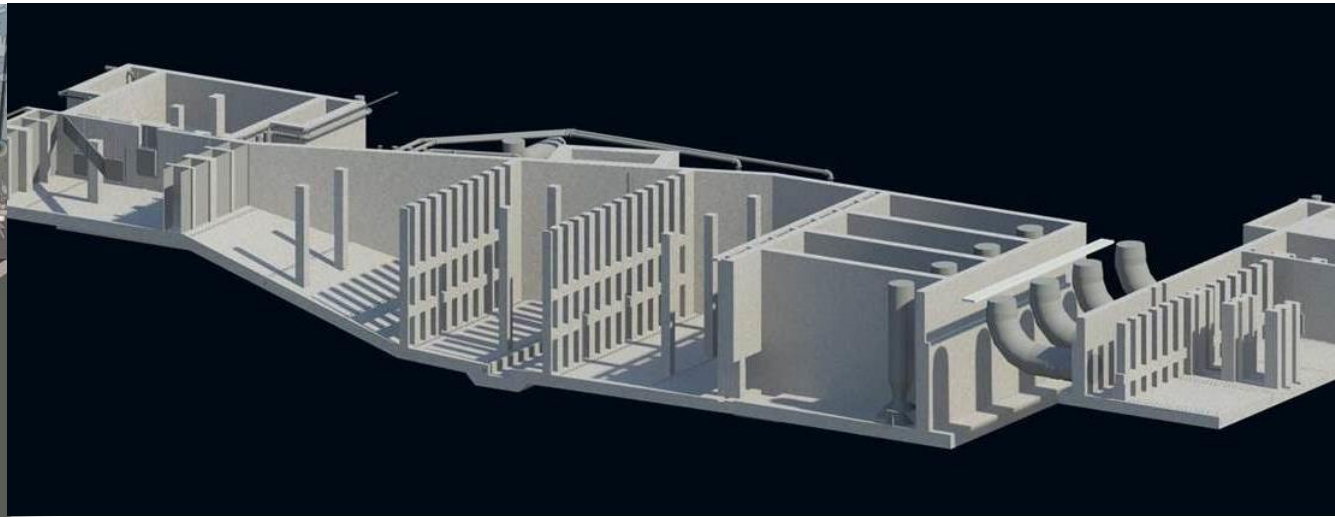
**Timely data is always a challenge. CM and Designer review of BIM as-built data keeps pressure on contractor and aids commissioning processes.**



## 07 Summary - Results

# EchoWater Project Progress and Results

- No unplanned operational impacts to date
- Program is on schedule for meeting discharge permit deadlines
- Program total cost \$1.7B versus initial \$2.1B estimate
- Future recycled water project in planning phase



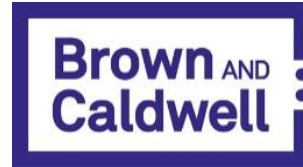


# Questions

## Presenter Contact Information

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**EchoWater**  
Project

Bringing Water Back