Maintaining Service During Water Reclamation Facility Upgrades

David Nowak

Date

Project Background

Long Island, New York

Project Background

Environmental

- **Improve water quality**
  - Depleting oxygen in Western Bays
- **Utilizing existing infrastructure**
  - Slip line existing aqueduct

Project Map Overview

Project Background

Hydraulics

- **Flow diversion**
  - Divert 75 MGD from Bay Park to Cedar Creek plant
  - Up to 150 MGD combined at Cedar Creek
  - Wet weather
  - 2-Mile-long ocean outfall

Project Map Overview

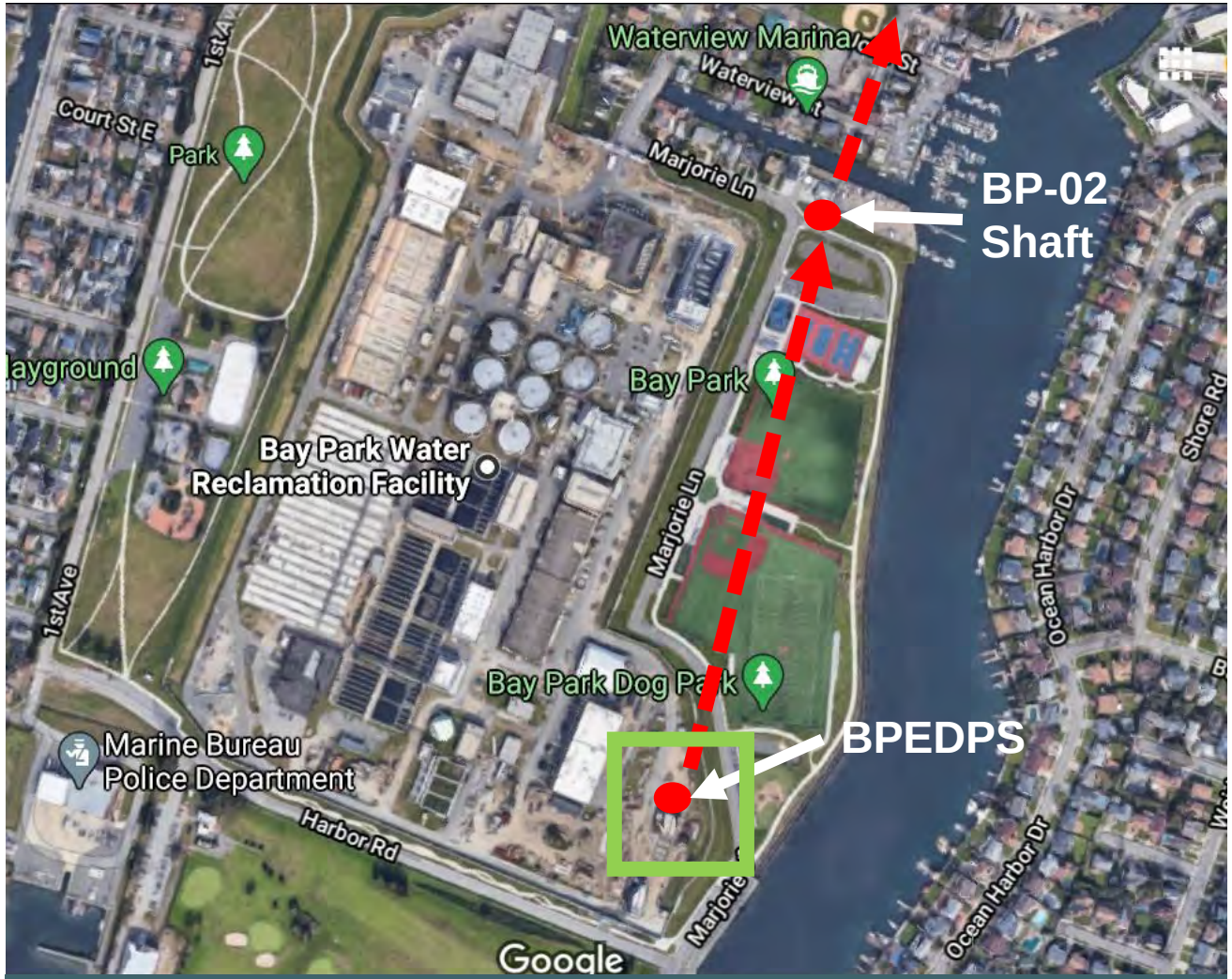
Bay Park Water Reclamation Facility

Bay Park, New York

Bay Park Water Reclamation Facility

Facility Overview

- **New pump station**
  - Located adjacent to existing effluent conduit
  - Divert flow from existing effluent conduit
  - Pump effluent to new force main (BP-01 to BP-02)
  - Location of first shaft (BP-01)

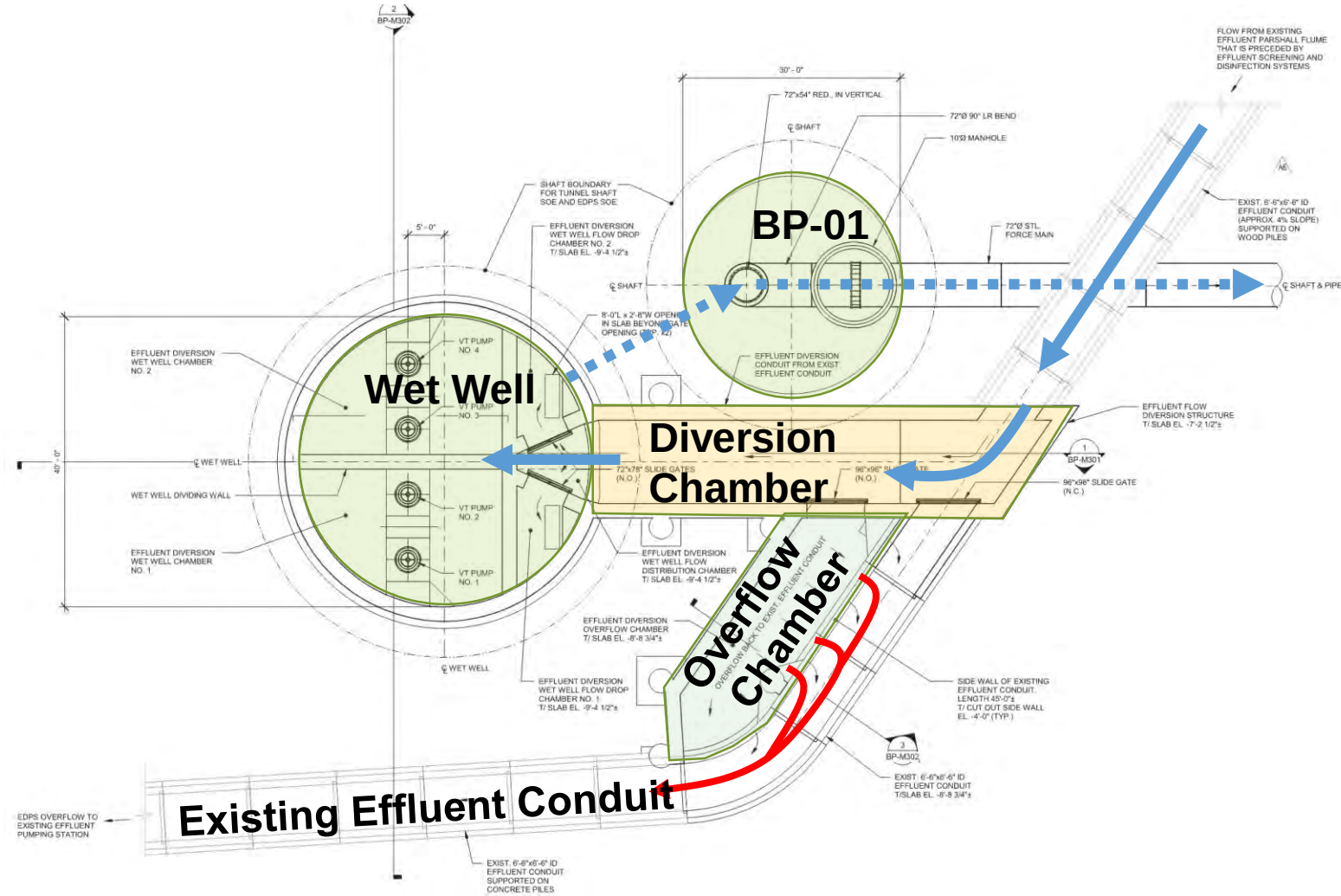


Bay Park Water Reclamation Facility Overview

Bay Park Water Reclamation Facility

Pump Station

- **Below grade structures**
  - Divert flow from existing effluent conduit (up to 75 MGD)
  - Flow in excess of 75 MGD will be directed to overflow structure and continue to existing Effluent Pump Station that discharges to Reynolds Channel/Western Bays
  - Majority of the dry weather flow will be diverted to Cedar Creek Ocean outfall

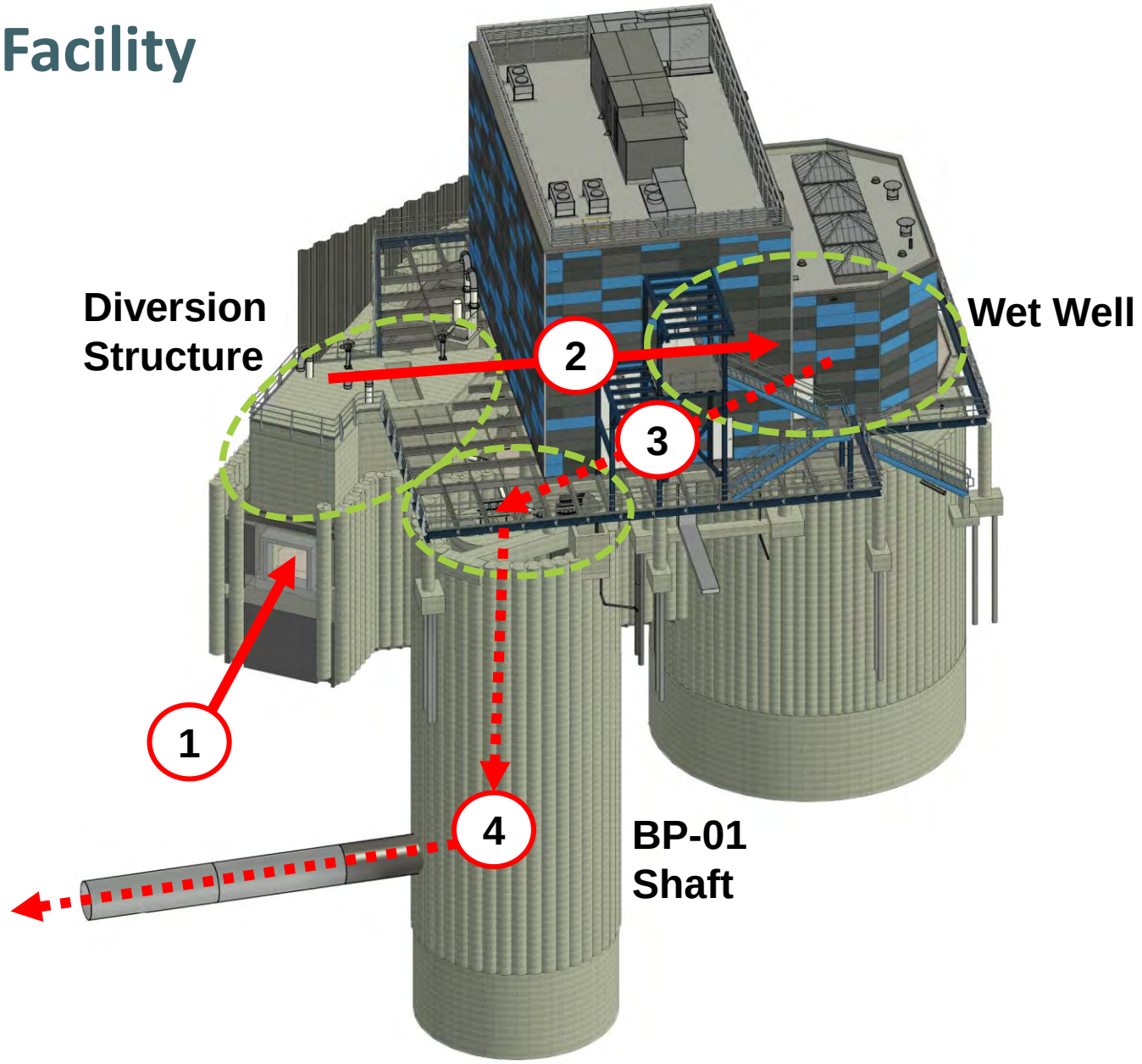


Pump Station Site Overview

Bay Park Water Reclamation Facility

Pump Station

- **Diversion Structure**
  - Built around existing 6.5-ft x 6.5-ft effluent conduit built in 1951
- **Wet Well**
  - 4 Vertical turbine pumps
  - Double sided for maintenance
- **BP-01 Shaft**
  - Drop shaft to force main
- **Pump Station Building**
  - Houses turbine pumps and supporting equipment

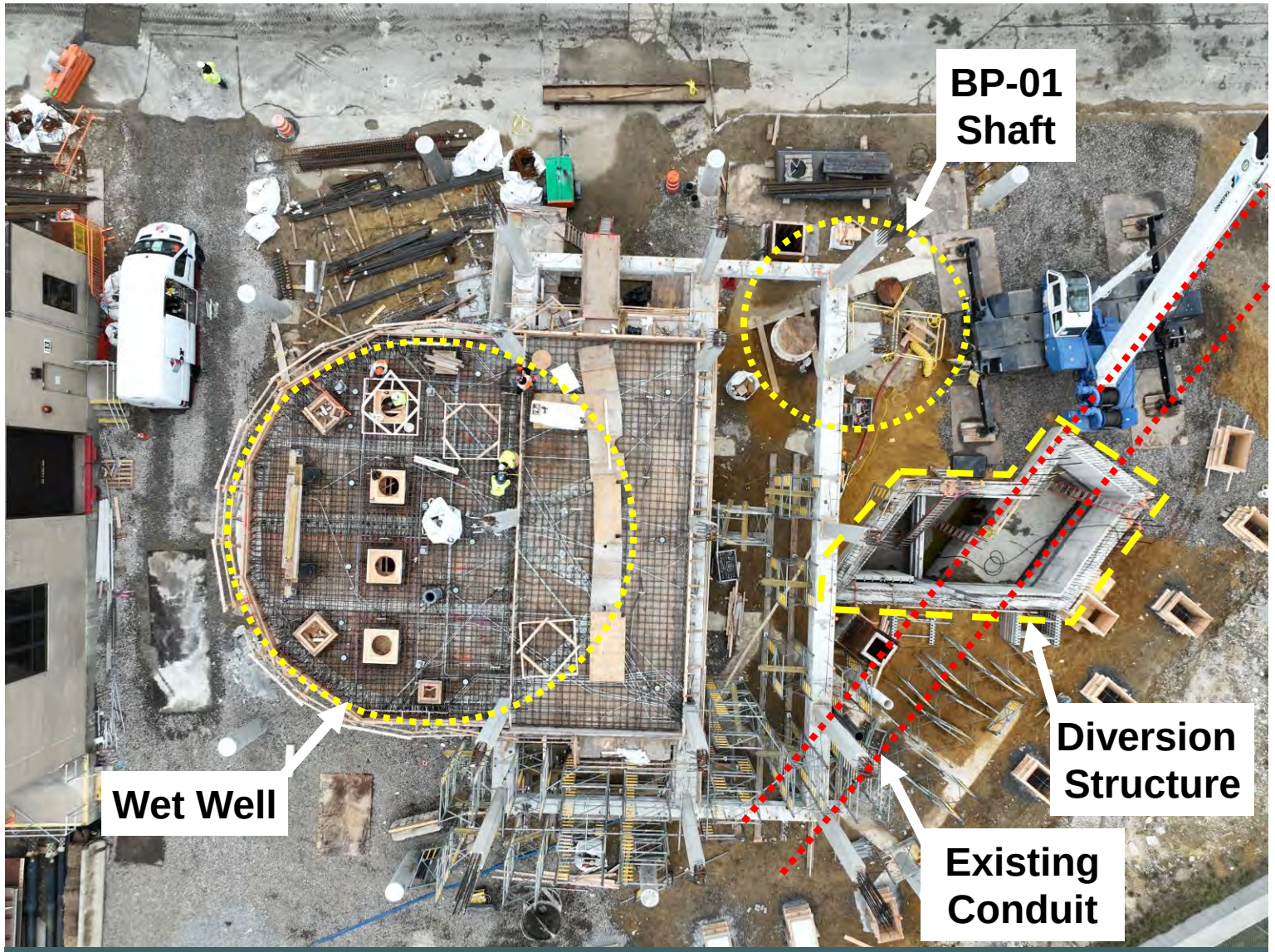


Pump Station Overview

Bay Park Water Reclamation Facility

Site Overview

- **Site congestion**
- **Located within operating facility**



Sire Overview

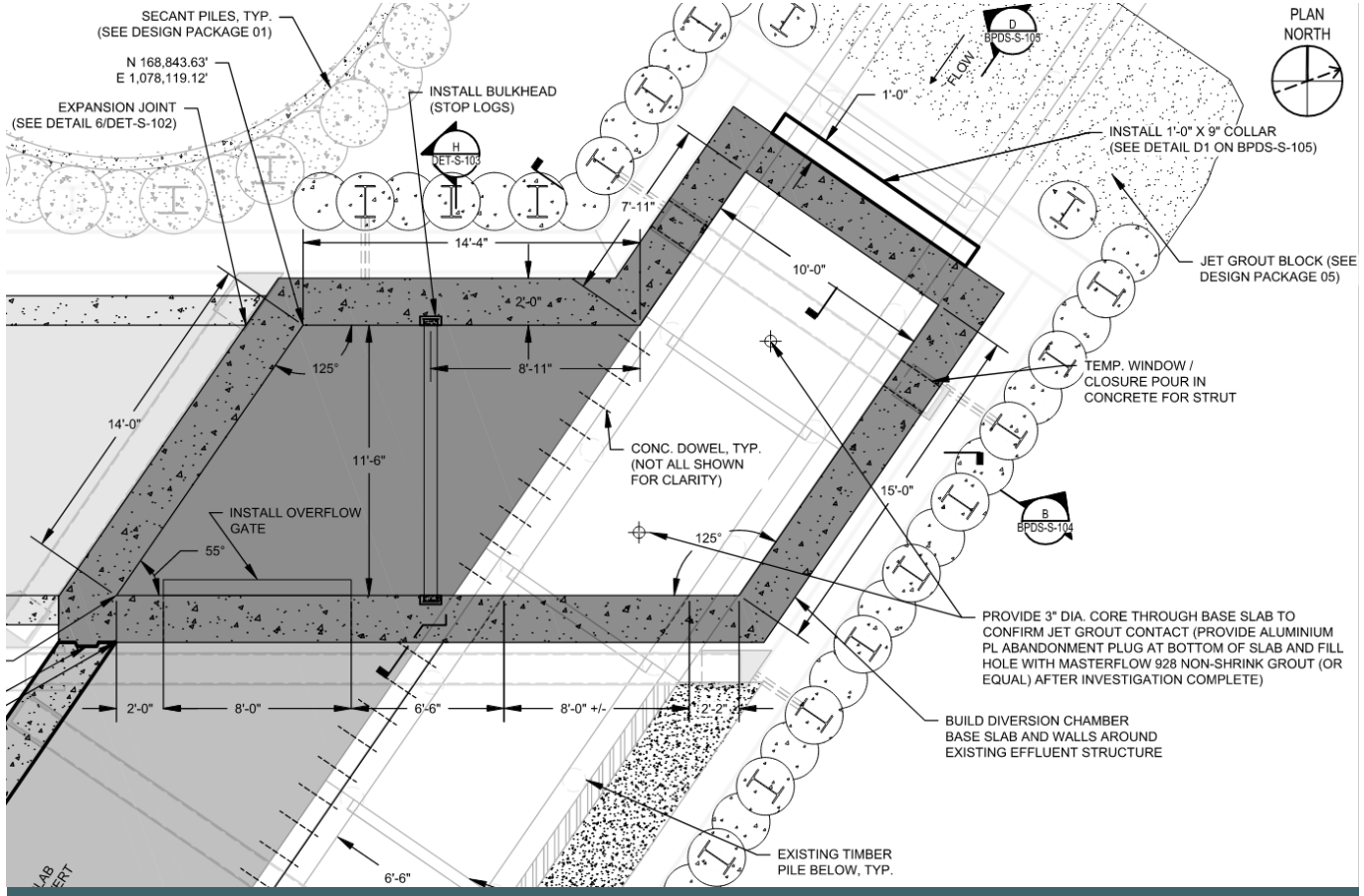
Diversion Structure Design

Structural Design and Leveraging BIM

Diversion Structure Design

Diversion Structure

- **Design Considerations**
  - Diversion structure construction must not interrupt plant operation
  - Built around existing structure that is in an unknown condition
  - Only approximate location was known, test pit revealed that conduit was in a different location
  - Wood pile supported (condition unknown)

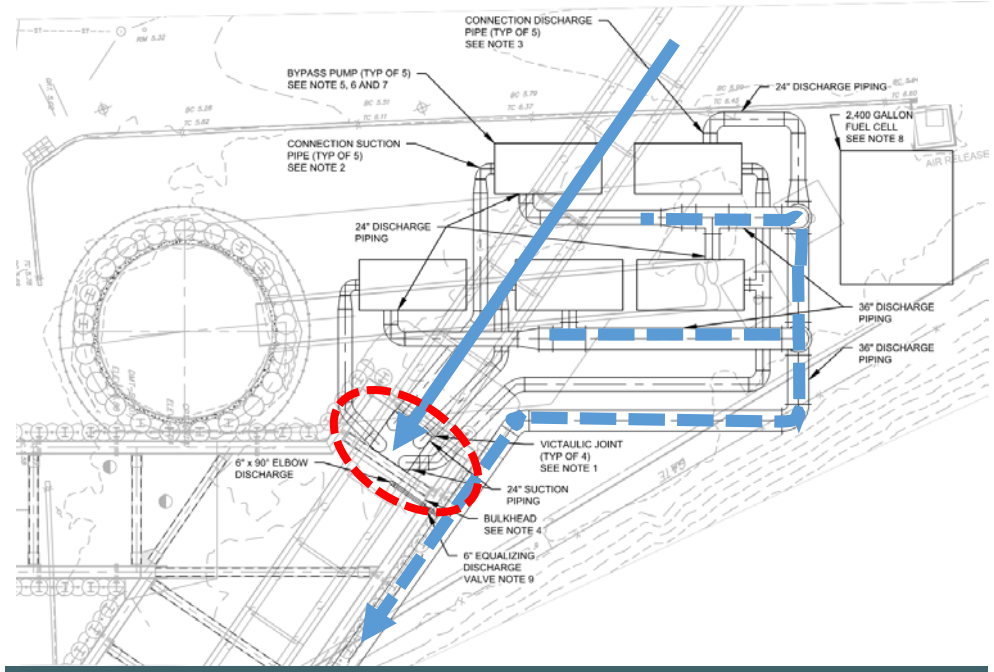


Diversion Structure Plan View

Diversion Structure Design

Pump Around

- **Pump around with five temporary pumps**
  - Temporary bulkheads
  - Majority of work done around existing conduit to construct the Diversion Structure while the existing conduit remains in service
  - Pump around required for completion of construction to demolish portions of the existing conduit, install new gates at the existing conduit and create overflow weir opening in the existing conduit



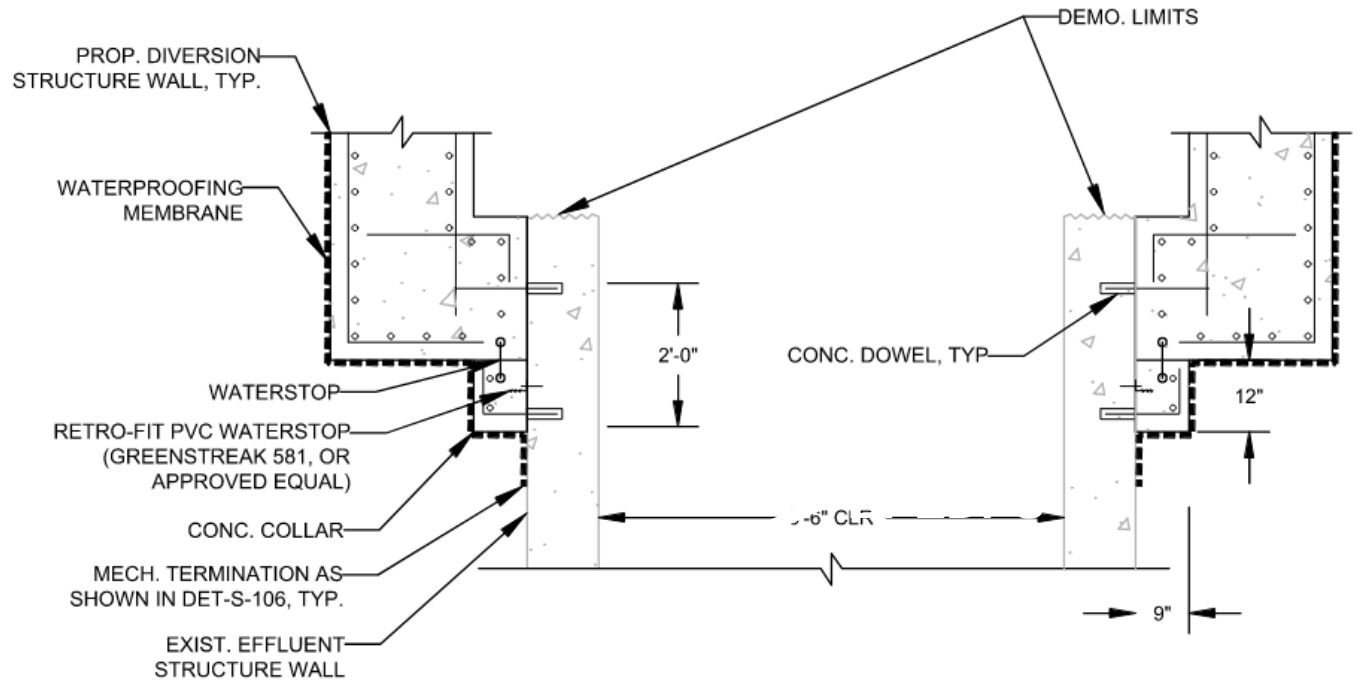
Plan View of Pump Around

Temporary Bulkhead In Place

Diversion Structure Design

Structural Design

- Concrete collars with post-installed waterstops
- Base slab of existing conduit used in final diversion structure design
- 3D Finite element analysis performed for structural design

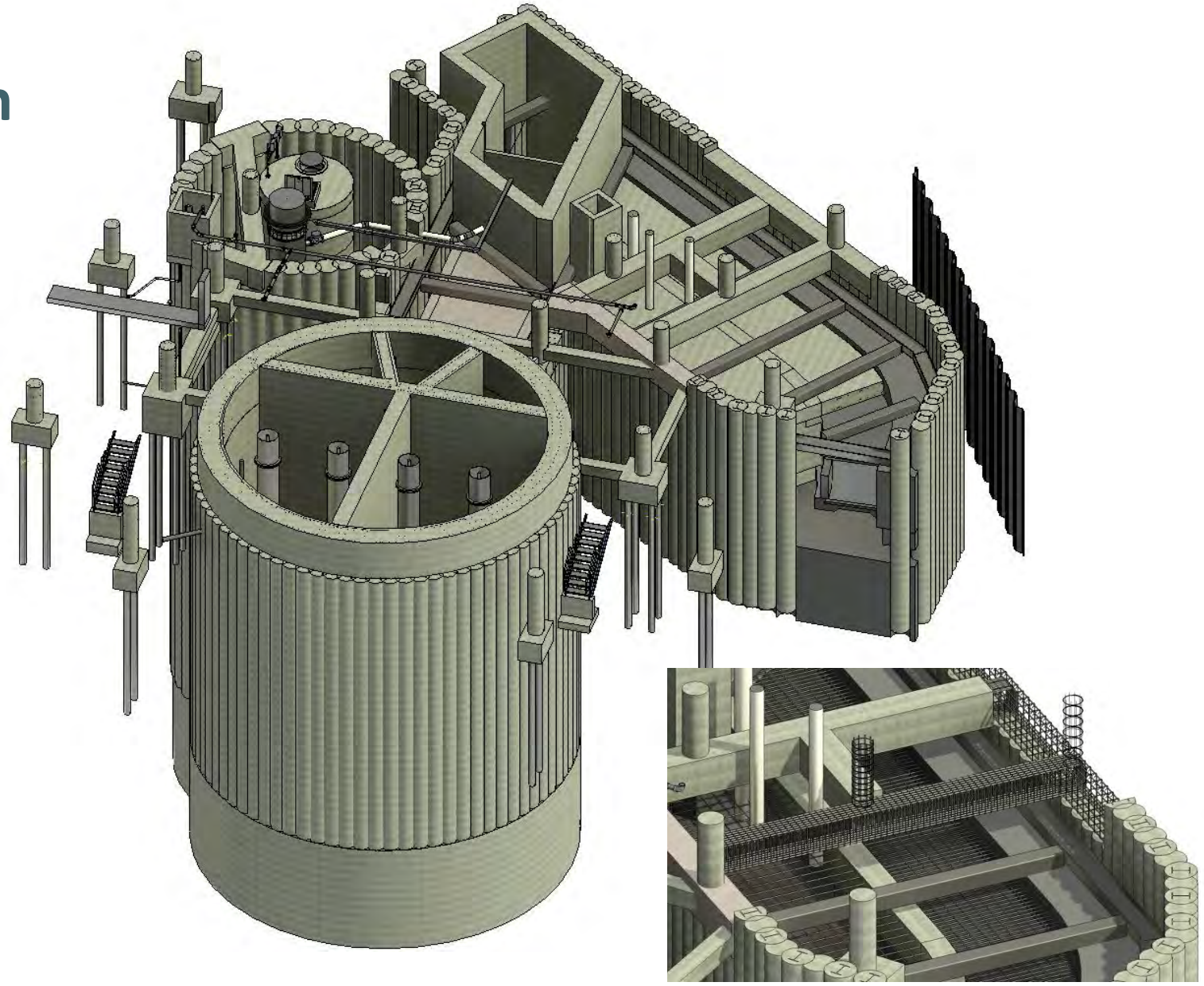


Section Through Collar

Diversion Structure Design

Diversion Structure

- **Design Tools**
  - Revit modeling
  - Staged 3D models leveraged during preliminary design
  - Existing conduit used in permanent structure
  - SOE used for permanent building foundation
  - Reinforcement modeling

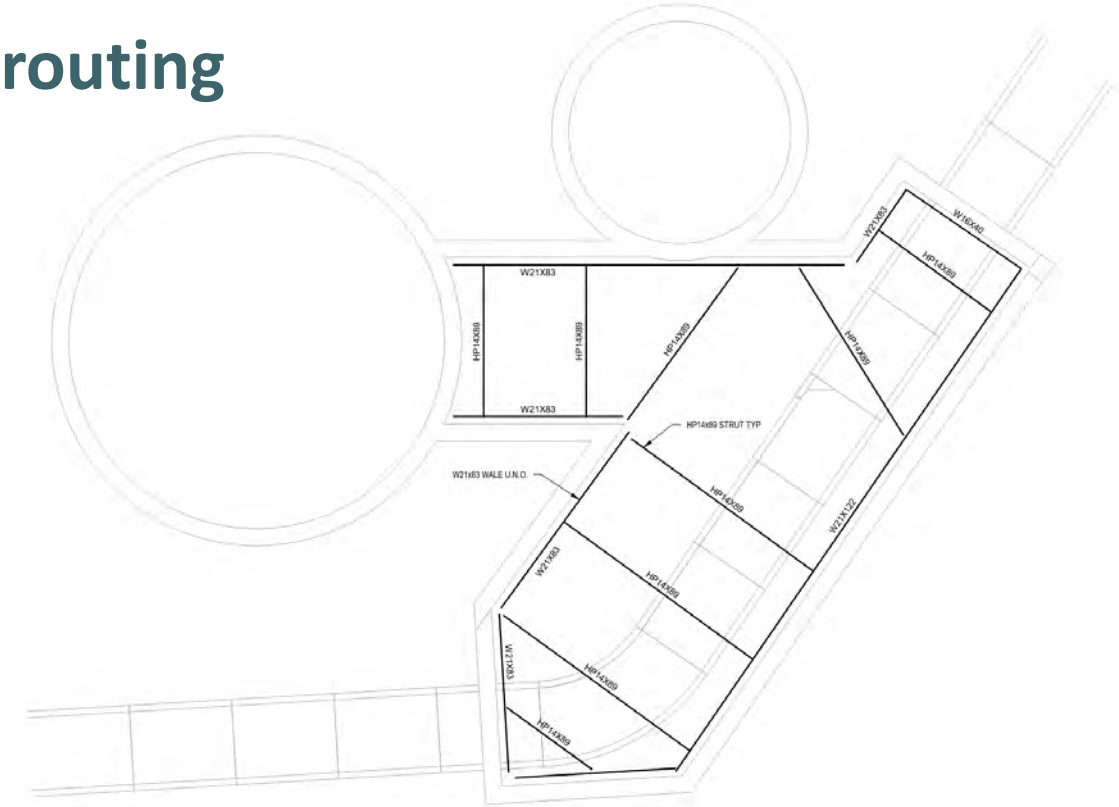


Revit Model of Below Grade Structures

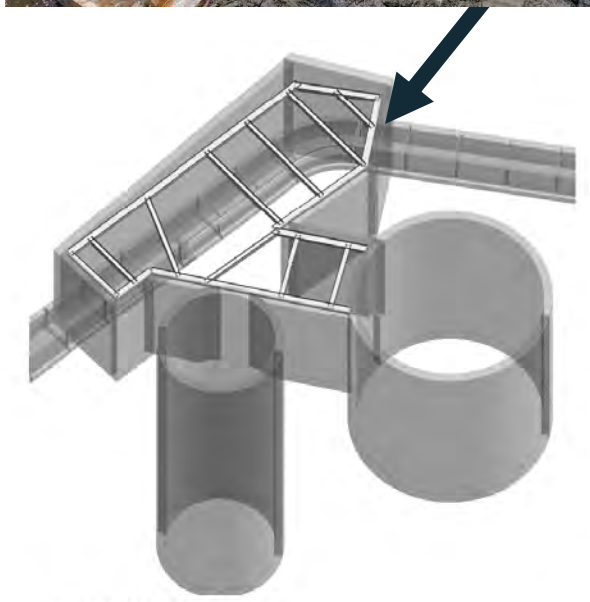
Diversion Structure Design

Phase 2

- **Secant pile SOE and bracing**
- **Jet grouting**



EXCAVATION AND BRACING OF SOE



3D VIEW PHASE 2

Diversion Structure Design

Phase 3

- **Temporary conduit support**
  - Not utilized after existing base slab analysis
  - Several options proposed

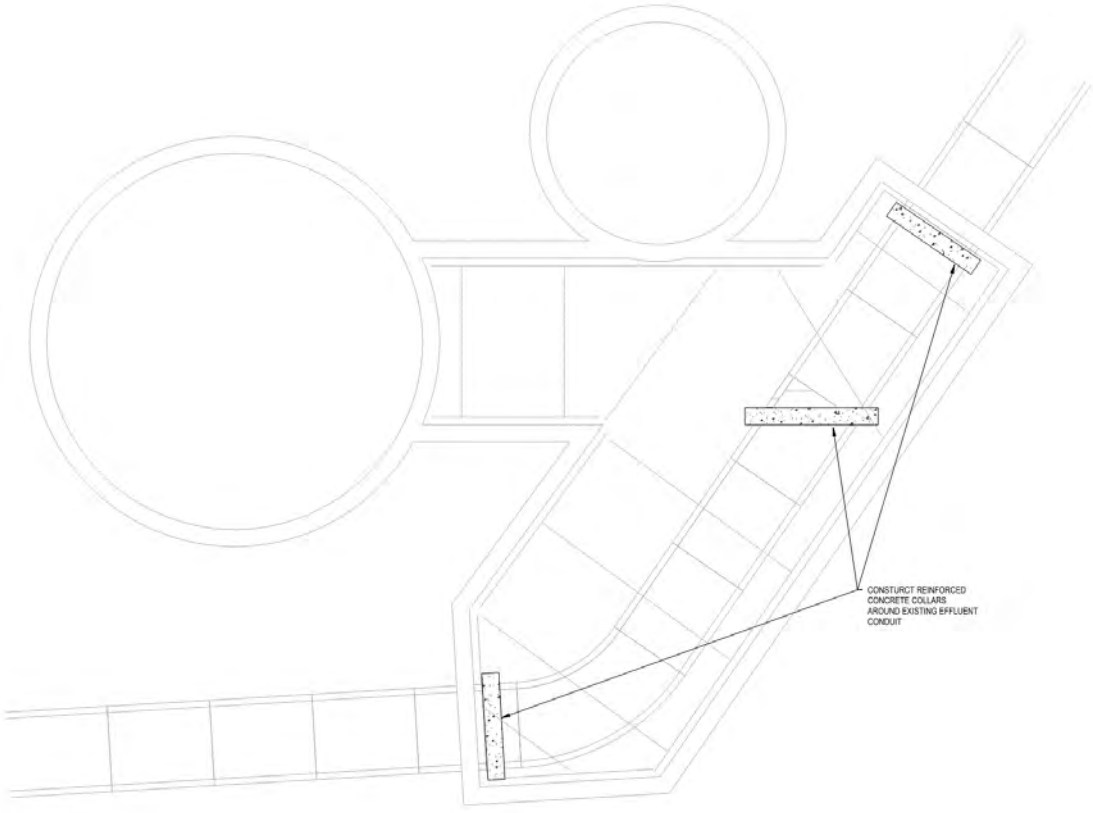
EXIST. EFFLUENT CONDUIT SUPPORT

3D VIEW PHASE 3

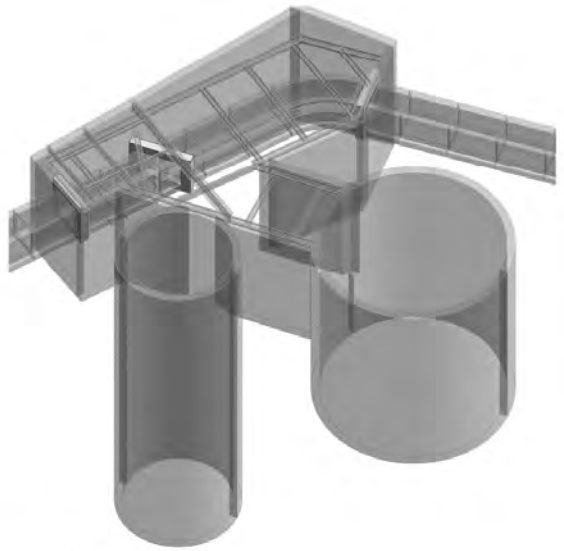
Diversion Structure Design

Phase 4

- **Concrete collars installed around existing conduit**



COLLAR CONSTRUCTION

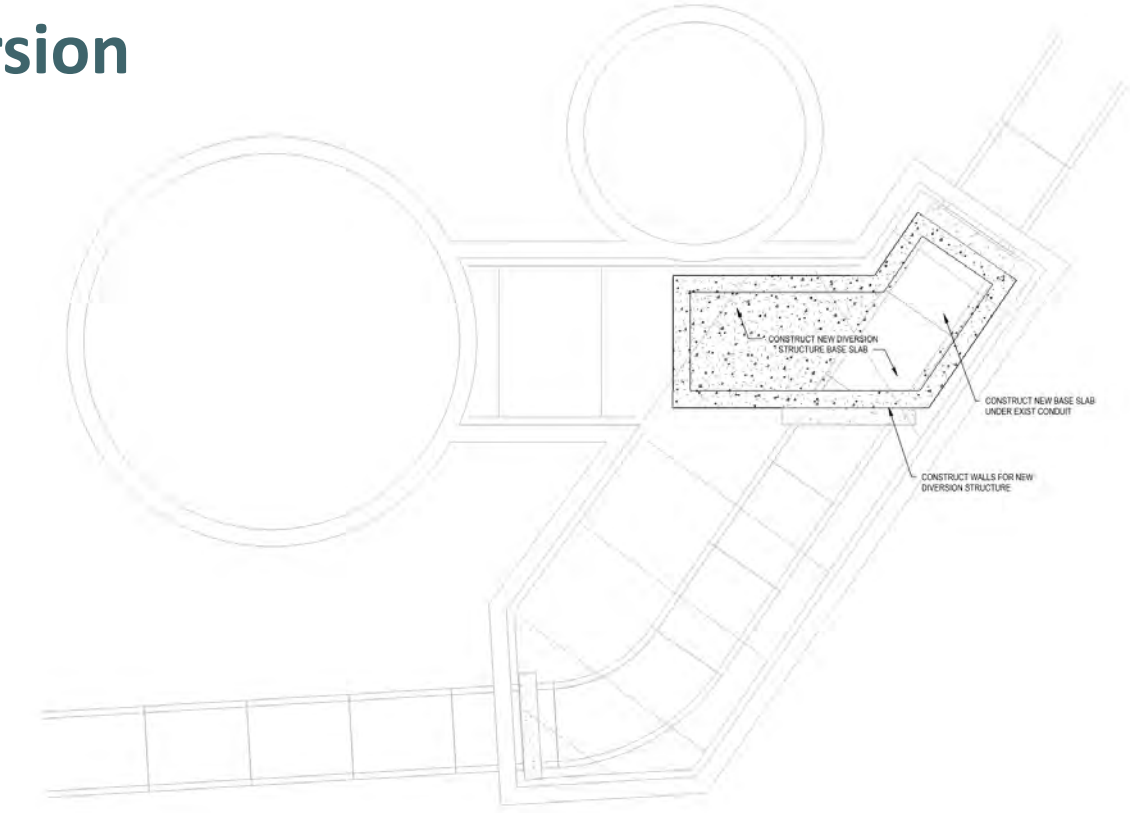


3D VIEW PHASE 4

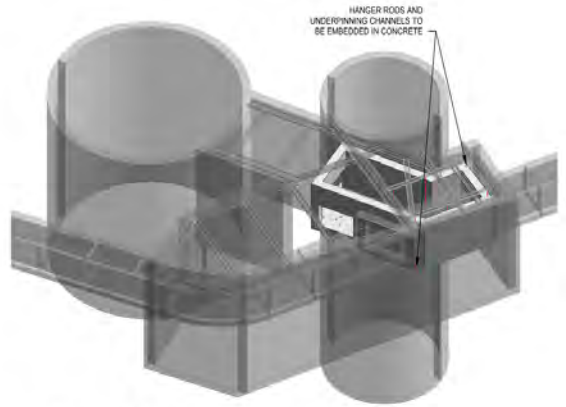
Diversion Structure Design

Phase 5

- **Construct diversion structure**
- **Bulkhead installation**



MAIN DIVERSION CHAMBER

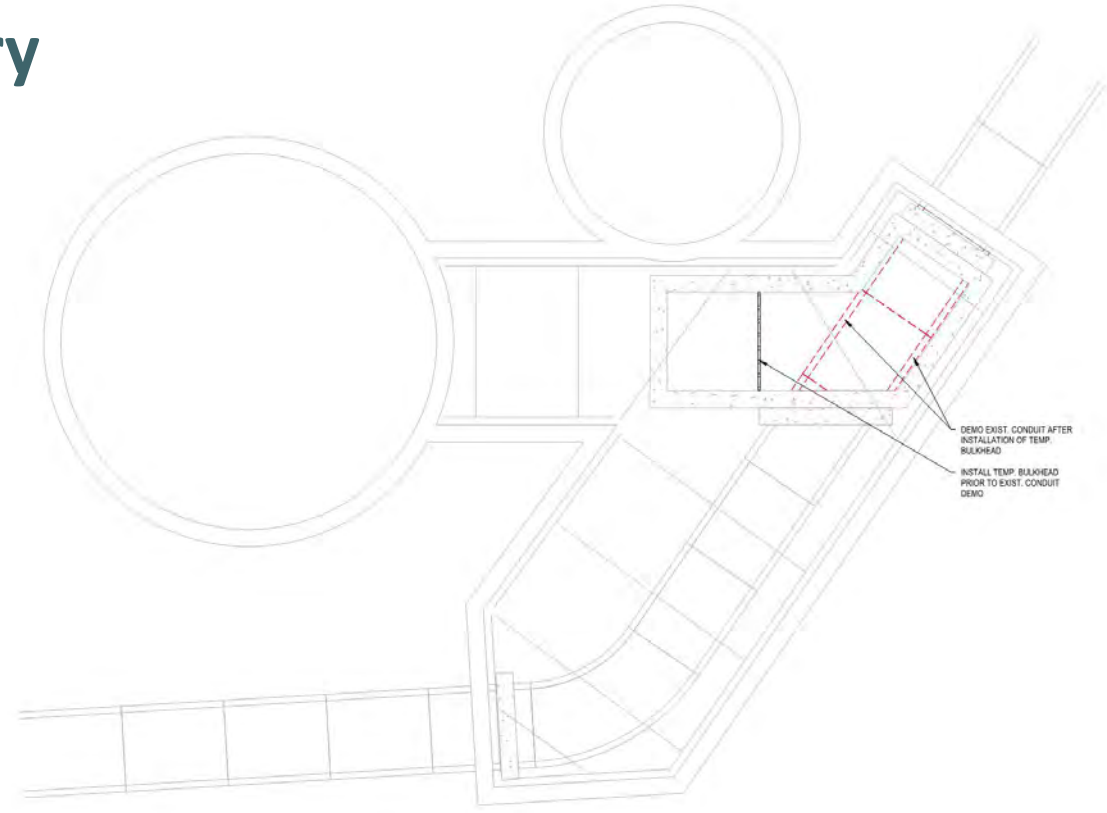


3D VIEW PHASE 5

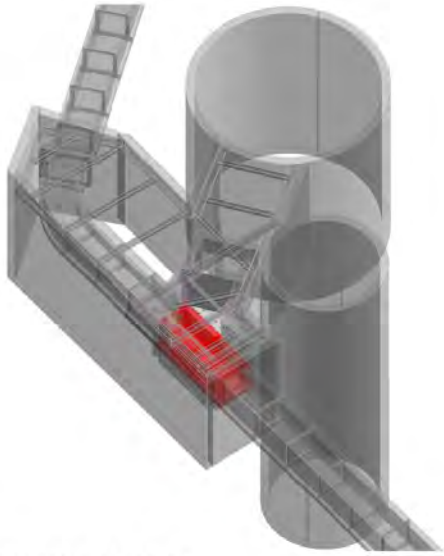
Diversion Structure Design

Phase 6

- **Install temporary bulkhead**
- **Demolition of existing conduit**



DEMO EXIST EFFLUENT CONDUIT

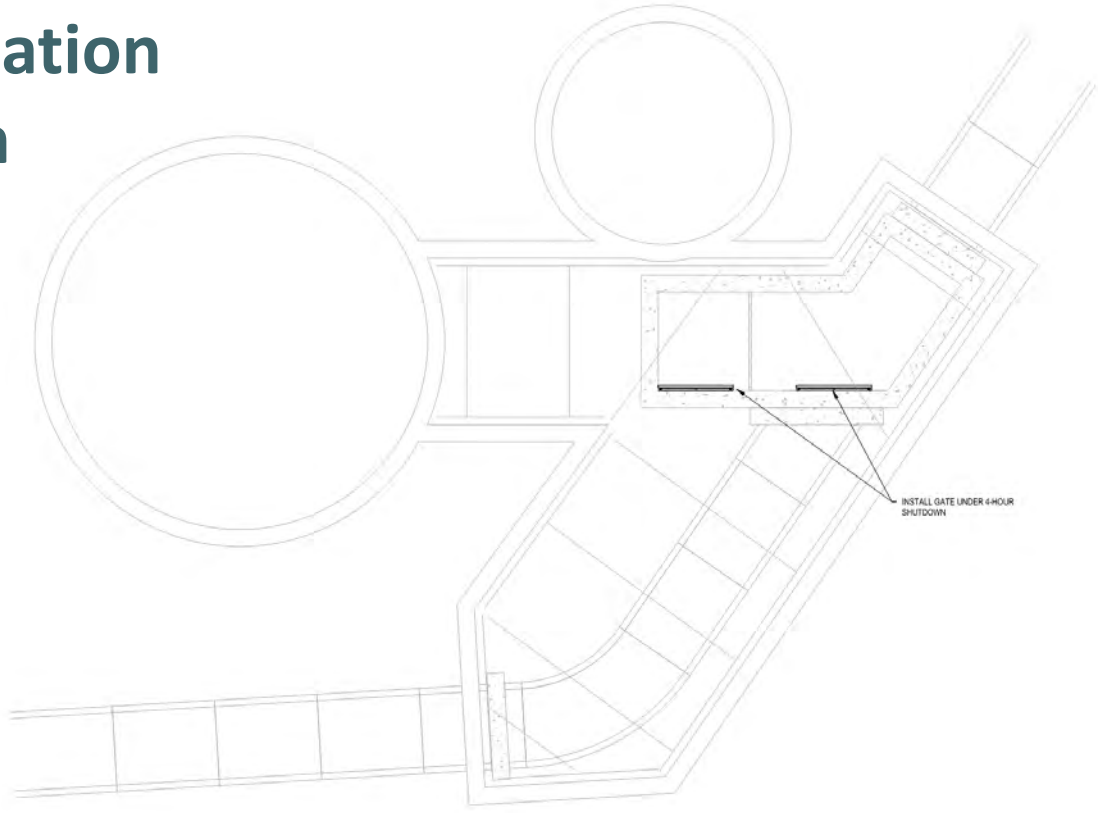


3D VIEW PHASE 6

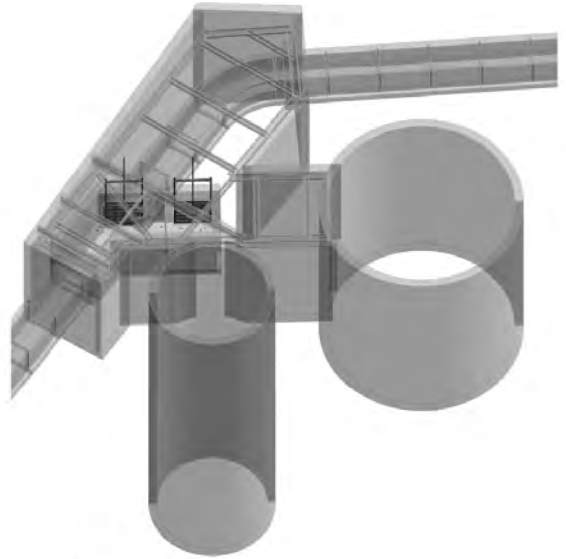
Diversion Structure Design

Phase 7

- **Slide gate installation under shutdown**



GATE INSTALLATION



3D VIEW PHASE 7

Questions?