Building a Pump Station on the Water

**Design and Construction Challenges for a Raw Water Intake at Lake Conroe**

April 20th 2016
Agenda

• Introductions
• Project Overview
• Design Challenges Encountered
• Construction Challenges Encountered
• Q&A
Surface Water Facilities Program
Project Overview

- Supply 24 MGD Surface Water to Montgomery County
- $480 Million Total Cost
  - $191 Million for SWF
- Treated Surface Water Delivery by January 1, 2016
Surface Water Facilities Program
Project Overview

• Lake Conroe Surface Water Facilities
  – Raw Water Intake and Pump Station
  – Surface Water Treatment Plant
  – High Service Pump Station
Surface Water Facilities Program

Project Overview

- Successful SWF Project Team
  - SJRA
  - Three Engineers
  - Construction Manager at Risk
  - Construction Inspection
  - 36 Contractors
  - 350 Peak Workforce
Raw Water Intake and Pump Station

Project Overview

- Located near the dam
- 300 feet long bridge
  - Access deep water
- Initial Capacity of 47 MGD
  - Planned expansion of 3 pumps
Design Challenges Encountered Under-Slab Items

- **Pump Room Challenge**
  - Open floor plan, accessible for O&M equipment
  - Exposed platform over lake, vulnerability to weather and vandalism

- **Solution**
  - Hardened electrical conduit
Design Challenges Encountered Under-Slab Items
Design Challenges Encountered Under-Slab Items
Design Challenges Encountered Under-Slab Items
Design Challenges Encountered Pump/Barrel Design

• **Vertical Turbine Pumps Challenges**
  – Variable Intake Elevations
  – Wave Forces on Pump Columns

• **Solution**
  – Enclosed Barrels with Three Gates
Design Challenges Encountered
Pump/Barrel Design
Design Challenges Encountered
Pump/Barrel Design
Design Challenges Encountered
Pump/Barrel Design
Construction Challenges Encountered
Pump/Barrel Installation

• **Construction Challenge**
  – Installation of Pumps and Barrels

• **Solution**
  – CMAR involvement/input during design phase
  – Pre-work planning with CMAR
Construction Challenges Encountered Pump/Barrel Installation
Construction Challenges Encountered
Pump/Barrel Installation
Construction Challenges Encountered
Pump/Barrel Installation
Construction Challenges Encountered Drilled Shafts over Water

• Construction Challenge
  – Drilled shaft installation over water

• Solution
  – Work from inland “flexi-float” barges
  – Extensive pre- and post-installation testing
Construction Challenges Encountered
Drilled Shafts over Water
Construction Challenges Encountered
Drilled Shafts over Water
Construction Challenges Encountered Drilled Shafts over Water
Construction Challenges Encountered Drilled Shafts over Water
Construction Challenges Encountered
Installing Pipes through Dam

• Construction Challenge
  – Install raw water line, fire protection line, sample/chemical lines, electrical duct bank through dam embankment

• Solution
  – Work with CMAR to schedule work outside of hurricane season
  – Extensive planning and contingencies
Construction Challenges Encountered Installing Pipes through Dam
Construction Challenges Encountered Installing Pipes through Dam
Construction Challenges Encountered
Installing Pipes through Dam
Construction Challenges Encountered
Installing Pipes through Dam
Construction Challenges Encountered Installing Pipes through Dam
Construction Challenges Encountered
Pump Startup

• Construction Challenge
  – Starting up pumps without treatment plant online

• Solution
  – Bypass flows to lake
Construction Challenges Encountered
Pump Startup
Contacts

• Shane Porter, PE
  – sporter@sjra.net

• Sam Meisner, PE
  – Sam.Meisner@freese.com

• Jason Ward, PE
  – Jason.Ward@freese.com