MINIMIZE YOUR FOOTPRINT AND YOUR MAINTENANCE HEADACHES

SELF CLEANING TRENCH TYPE WET WELL DESIGNS

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AGENDA

1. Presentation Objectives
2. Project Background
3. Pump Station Evaluation
4. Trench Type Wet Well
5. Construction Updates
6. Acknowledgements / Questions
PRESENTATION OBJECTIVES

- Introduction to Trench Type Wet Wells
- Introduction to Self Cleaning Operation
- Why Factor?
PROJECT SCOPE

- Trinity River Authority
  - CRWS Treatment Plant

- Design and Construction of Pump Station 13B

- Fluid of Interest: Return Activated Sludge
  - Final Clarifiers – Traveling Bridge Suction Clarifiers

- Firm Capacity - 50 MGD
  - PS-13 – 50 MGD (North Plant, Trains 1-3)
  - PS-13B – 50 MGD (North Plant, Trains 4-6)
  - PS-13A – 100 MGD (South Plant, Trains 7-12)
HISTORY OF THE PROJECT

YEAR 2005
FEASIBILITY REPORT

YEAR 2006
PRELIMINARY DESIGN REPORT

YEAR 2007
FINAL DESIGN

YEAR 2007 to 2009
CONSTRUCTION PHASE
1. Presentation Objectives
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PUMP STATION EVALUATION

- **Dry-Pit/Wet-Pit**
  - Horizontal Non-Clog Centrifugal Pumps (PS-13 and PS-13A)
  - Vertical Non-Clog Centrifugal Pumps (PS-6 and 6A)

- **Wet-Pit**
  - Vertical Turbine Solids Handling Pumps (VTSH)
Pump Station 13A – Horizontal Non-Clog Centrifugal Pumps (Wet Pit/Dry Pit)
Pump Station 13A

Horizontal Non-Clog Centrifugal Pump (PS-13A)

Vertical Non-Clog Centrifugal Pumps (PS-6 and 6A)
City of Phoenix, 23rd Ave. WWTP
(36-inch VTSH Pumps)
LIMITATIONS AT PS-13B SITE

- 60-inch Final Clarifier Effluent line
- 84-inch Primary Clarifier Effluent line
- Electrical Duct Bank
- Caustic Soda Tank
- 2-inch to 12-inch Lines
- 12-foot Roadway

Existing Structures and Utilities
DRY PIT VERSUS WET PIT

Relocated Pavement

Relocated 60-inch FCE Line

Relocated Caustic Soda Building

Footprint of Dry-Pit/Wet-Pit (Horizontal Non-Clog Pumps)

Relocated 84-inch PCE Line
Footprint of Wet-Pit Wetwell (VTSH Pumps)

Existing Caustic Soda Storage Facility, 84-inch PCE Line, 60-inch FCE Line and Pavement Remains Unchanged
## DRY PIT VERSUS WET PIT

<table>
<thead>
<tr>
<th>Pump Station Type</th>
<th>Length/Width</th>
<th>Depth</th>
<th>Pump Cost ($)*</th>
<th>OPCC ($)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horizontal Non-Clog Centrifugal Pump Station (Wet Pit/Dry Pit)</td>
<td>67’/65’</td>
<td>26’</td>
<td>$915,000</td>
<td>$10.9 million</td>
</tr>
<tr>
<td>Vertical Non-Clog Centrifugal Pump Station (Wet Pit/Dry Pit)</td>
<td>59’/54’</td>
<td>~ 35’</td>
<td>$945,000</td>
<td>$11.4 million</td>
</tr>
<tr>
<td>VTSH Pump Station (Wet Pit)</td>
<td>49’/43’</td>
<td>29’</td>
<td>$1,718,000</td>
<td>$9.5 million</td>
</tr>
</tbody>
</table>

* Total Pump Cost for 3 Pumps  
** OPCC: Opinion of Probable Construction Cost
1. Presentation Objectives
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6. Acknowledgements / Questions
- Suitable for Design Flows > 3 MGD
- Pump Intakes, Confined in a Deep, Narrow Trench
- Pump Intakes, Substantially Lower Than Upstream Inlet Pipe
- Suitable for Different Pump Types/Arrangements
Advantages
- Hydraulic Environment for Pump Intakes
- Minimum Footprint Size
- Small Floor Area (Minimum accumulation of sludge or grit)
- Ease and Quickness of Cleaning

Disadvantages
- Compact, Minimal Storage Capacity
- Increased Depth
- Clogging if Pumps Not Used
TRENCH TYPE WETWELL

- Invented by D.H. Caldwell (1964)

- 1998 Breakthrough
  - 2nd Edition of Pumping Station Design
  - ANSI/HI 9.8 Pump Intake Design
Illustrative View of Kirkland Pump Station (Washington)
1:1 scale model of portion of a trench floor

- Result: >5fps requirement

1:3.3 scale model of the Kirkland Pump Station

- Result: Only a small portion of the sand was ejected at pump down until equilibrium
# Wet Pit versus Trench Type Pump Station

<table>
<thead>
<tr>
<th>Pump Station Type</th>
<th>Length/Width</th>
<th>Depth (Feet)</th>
<th>Pump Cost ($)</th>
<th>OPCC ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Pit Pump Station</td>
<td>49’/43’</td>
<td>30’</td>
<td>$1,718,000</td>
<td>$9.5 Million</td>
</tr>
<tr>
<td>Trench Type Wet Well Pump Station</td>
<td>57’/18’</td>
<td>38’</td>
<td>$1,718,000</td>
<td>$8.5 Million</td>
</tr>
</tbody>
</table>

* Total Pump Cost for 3 Pumps
** OPCC: Opinion of Probable Construction Cost
Wet Well Plan Elevation at 415.00'

Wetwell Trench

Flow Splitter
SECTION VIEWS

- Trench
- Water Guide
- Sloping Walls
- Flow Splitter
- Fillet
4 fps (wet pit)
3 fps (dry pit)

1 fps max above trench

Illustrative Section of Pump Station 13B – Normal Operation
Mixes sludge and scum into a mass that is ejected by the last pump.
Illustrative Section of Pump Station 13B – Cleaning Cycle (Pump Down)
Illustrative Section of Pump Station 13B – Cleaning Cycle (Pump Down)
Illustrative Section of Pump Station 13B – Cleaning Cycle (Pump Down)
**Scenario 1**
- 1 clarifier
- 16 MGD
- Sluice gate for proper flow rate
- Use last pump

**Scenario 2A**
- 2-3 clarifiers
- 32-50 MGD
- 2 pumps at full speed, let turbulence do the cleaning

**Scenario 2B**
- 2-3 clarifiers
- 32-50 MGD
- Sluice gate for proper flow rate
- Use last pump
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CONSTRUCTION UPDATE

March 12, 2008
1. Presentation Objectives
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