Managing the Largest Extended Wet Weather Event on Record at TRA CRWS

April 21, 2016

Julia J. Hunt – Trinity River Authority of Texas
David R. Jackson, P.E., BCEE – Freese and Nichols, Inc.
TRA CRWS Treatment Plant

- Permitted for 162 MGD Average Day, 405 MGD Peak 2-hr Flow (189 MGD Permit Application in Process)
- Advanced secondary treatment
- Winner of numerous EPA, WEF, WEAT, TNRCC/TCEQ, and AMSA/NACWA awards
TRA CRWS Treatment Plant

- Located on over 300 acres
- Constructed in 4 phases
- Preliminary, Primary, Secondary, Tertiary, Disinfection, and Solids Handling Capabilities
Mountain Creek Relief Interceptor Segment 30MC-1: Not scheduled to go to construction until late 2016, early 2017.
Project Background and Drivers

- Permitted for 405 MGD peak 2-hr flow rate
- Renewed EPA effort on SSO elimination
- 2008 Collection System Modeling
  - Year 2020 peak 2-hr flow projection = 623 MGD
- Options for PF Handling

<table>
<thead>
<tr>
<th>Alternative</th>
<th>Cost (2010 U.S. dollars)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-rate clarification with conventional expansion</td>
<td>$98,414,000</td>
</tr>
<tr>
<td>High-rate clarification with blending</td>
<td>$55,082,000</td>
</tr>
<tr>
<td>On-Site Storage System</td>
<td>$43,443,850*</td>
</tr>
</tbody>
</table>

* Actual project cost in 2014 U.S. dollars
System Sizing

Maximum Total Storage Volume = 160,000,000 gallons

- 51.0 MG – Additional Mixed Storage
- 35.8 MG Pumped/Raw Sewage
- 49 MG Gravity/Raw Sewage
- 24.2 MG Secondary Effluent

West Basin

East Basin
System Overview

200 LF of 114-Inch Tunnel Under Plant Levee

2,000 LF of 114-Inch Tunnel Adjacent to Sludge Landfill

3,100 LF of 96-Inch Piping

3,000 LF of 48-Inch Piping

2,500 LF of 72-Inch Piping

160 MG On-Site Storage Basin

50 MGD Multi-Purpose Pump Station

220 MGD Fine Screen Structure

3,100 LF of 96-Inch Piping

2,000 LF of 114-Inch Tunnel Adjacent to Sludge Landfill

200 LF of 114-Inch Tunnel Under Plant Levee

Influent Junction Box (Raw Influent)

Isolation/Coarse Screening

Peak Flow Piping Connection (Preliminary and Primary Influent)

Post-Secondary Diversion (Secondary Influent)

160 MG On-Site Storage Basin

50 MGD Multi-Purpose Pump Station

220 MGD Fine Screen Structure

3,000 LF of 48-Inch Piping

2,500 LF of 72-Inch Piping

3,100 LF of 96-Inch Piping

2,000 LF of 114-Inch Tunnel Adjacent to Sludge Landfill

200 LF of 114-Inch Tunnel Under Plant Levee
System Flexibility - Diversion

- Raw Sewage
  - Gravity Diversion
  - Up to 220 MGD

Junction Box 15
Minimizing Solids – Isolation Structure

• Provides Isolation from the Collection System
• Inside Plant Levee
• 2.5”-Opening Coarse Screen to Remove Large Debris

Trolley
Gripper
Monorail
Dumpster

Emergency
Bypass
Overflow

96”x96” Isolation Gate

Gripper

2.5”-Opening Screen Field
Minimizing Solids – Screening Structure

- 2 Continuous Belt Element Fine Screens (1/4” Opening)
- 8-ft Wide and 40-ft Deep
- 110 MGD Each + Bypass Channel
System Pumping

- 50 MGD (nominal) Submersible Pump Station
  - Fill the OSSB during Wet Weather Storage Event
  - Drain the OSSB after Wet Weather Storage Event
  - Supplemental Influent Pumping during Dry/Wet Weather Emergency Conditions

Pumps:
- 9-ft Tall, 5-ton
- 11,576 gpm each
- 20” Discharge
- 300 hp
- 4160 volt – reduces cable weight
- 875 rpm – constant speed
SURVIVING THE BIG EVENT!
Neither Rain, Sleet, nor Snow shall keep us from our appointed rounds!
City of Dallas Pumping Over the Levee
CRWS Outfall
Primary and Secondary Processes

- Pump Station 6A out of service.
- Only 5 of 7 pumps at PS 6 running
- Primaries 1-4 on-line, but with major mechanical problems
- Primaries 6 & 8 brought on-line on May 16 to help
- Primaries 5 & 7 off-line
- AB’s and Final Clarifiers 4-6 off line
- 25% of Primary Treatment Capacity out of Service
- 25% of Secondary Capacity out of service
Rainfall and Effluent Flow

19.8 Inches Rain Total at CRWS

22 BG Treated at CRWS
Estimated 600 MG Total Stored in OSSB during this event
Process Results

Process Data During Event:
Influent  BOD AVG. 148.8  TSS AVG. 167.6  O-P 1.5  NH3-17.5
Effluent  BOD.AVG. 1.34  TSS AVG. 2.89  O-P .43  NH3- 0.21

Total Stored and Subsequently Treated – 600 MG Estimated

Total Treated – 22 Billion Gallons

Total Permit Violations during Event - 0
Cleaning Efforts - Flushing

- Five, 72”x60” Rectangular Butterfly Valves
- Automated Flushing Sequence
- Not fully operational during event
Cleaning Efforts – Water Cannons

- 18 High Pressure Water Cannons
- 180°-Vertical and 360°-Horizontal Articulation
- Plant Service Water
What Worked Well? – Comments from Operations

• Worked as designed during the wet weather event
• Able to gravity flow from the collection system until we got about 50 MG in the basin then it had to be pumped.
• Able to gravity a large portion back out without pumping
• With three aeration basins down, they were only able to push around 250 MGD through the plant, but because of OSSB, they were able bring in over 450 MGD (250 through the plant /200 to OSSB).
Lessons Learned – Comments from Operations

• With the extended rains, we were not able to pump the OSSB back into the plant for quite some time, this caused some odor issues.
• Mechanical issues with screen conveyor has since been fixed.
• Flushing from West Basin to East Basin not fully operable due to actuator problems that are being repaired. This causes a little more cleanup work than hoped.
• More small gates or larger pump station would avoid the backwater issues that limit flushing.
Climbing the Peak

QUESTIONS & DISCUSSION