Presentation Overview

- Project Framework and Timeline
- Water Treatment Options
- Design-Build Team Procurement
- Design and Permitting
- GMP Preparation
- Construction
- Startup and Operation
- Project Summary
Project Framework

- Progressive Design-Build Format
  - Criteria Engineer Preliminary Work
  - Facility Options
  - Treatment Options
  - Design-Build Team Selection
  - Guaranteed Maximum Price (GMP)
- Design, Permitting, Construction, and Startup Progressed Conventionally
Project Timeline

- Criteria Engineer Selection
  December 2014

- Preliminary Design Tasks
  - New WTP Features
  - Softening Process
  - RFQ/RFP Documents

- Design-Build Team Selection
  December 2015

- Design-Permitting-GMP Finalized
  March-August 2016

- Construction
  September 2016

- Commissioning and Startup
  January 2018
Groundwater Treatment Options

- Maintain Familiar Processes
  - Aeration
  - Deep Bed Filtration
  - Disinfection
- Manganese Removal
- Storage and Pumping
- Softening
  - Average hardness of 450 mg/L
  - Minimal water additives.
  - Minimal waste produced.
  - Cost-efficient from capital and operating standpoints
Pellet Softening

- Hardness (as CaCO$_3$)
  - Range of 275-553 mg/L
  - Calcium (300 mg/L)
  - Magnesium (150 mg/L)

- pH Adjustment to 9.2 with Sodium Hydroxide

- Upflow of water through expanded silica sand bed

- pH Adjustment to 8.0 with Carbon Dioxide

- Softer potable water retaining about half of ambient hardness (product water ranging between 180 and 240 mg/L)
Design-Build Team Procurement

- Two-Step Process
- 12 RFQ Respondents
- 4 Teams Shortlisted
- Two Proposals Submitted
- Committee of 6 Reviewers
- Evaluations Independently Produced
- Selection Value-Based
  - 60% Approach
  - 40% Cost
  - Interview
Design Documents

- Conventional design documents (drawings and specifications)
- Start with 30% complete package (schematic design)
- Progress to 60%, 90%, and construction documents
- Value-engineering throughout design
- 3D model
Design Features

- Redundancy
- Metering
- Instrumentation
- SCADA
- Laboratory
- Control Room/Office
- Sand Handling Room
Design Facilities

- Aeration, Chemical Conditioning, Retention Basin
- Softener Feed Pumps
- Softeners
- Deep Bed Filters
- Existing Clearwell, Finished Water Pumps, Backwash Pump
- Sodium Hydroxide, Sodium Hypochlorite, Carbon Dioxide
Permitting

- Conventional Ohio EPA PTI process and local building permits
- NPDES permit
- Septic tank and evapotranspiration field
- Project additions for arsenic removal (permanganate) and manganese (green sand)
GMP Preparation

- Detailed estimates and review at schematic (30%), detailed (60%), and contract document stages
- Allowances for lab equipment, forklift, raw water wells, permanganate system
- Contingency for DB’s use with shared savings
- Fee for design and construction services
Construction Approach

- Guaranteed Maximum Price tabulation used as Schedule of Values
- Construction task schedule integrated with 3D model
- Submittal schedule
- Monthly progress meetings
Construction Sequence

- Clear laydown and staging area
- Remove existing spent backwash water retention basin
- Excavate and install new building foundations
- Excavate lagoons
- Install equipment and erect new building
- Install new raw water well and upgrade three existing wells
Construction Challenges

- Access into site
- Proximity of new building to old building
- Maintaining existing plant in operation while commissioning the new water plant
- Phased raw water well reconstruction (four wells, and operating both old and new WTPs simultaneously)
Construction Management

- Prequalified subcontractors and suppliers
- Regulators and permitting
- SCADA and telemetry
- Coordination with Village operations and distribution staff
Operator Involvement

- Full participation in preliminary design and design-build team procurement
- Daily inspection during construction
- Monthly meeting and pay application review
- Regular interaction with mechanical, electrical and instrumentation contractor staff
- Training with equipment manufacturers and engineers (design and criteria)
Operation Transition

- Maintained daily demands through old plant with two wells in operation
- Used other two wells to operate new plant (discharging to backwash lagoons)
- While operating the new plant, practiced multiple laboratory analyses dialing in treatment plant processes
- Optimized sodium hydroxide, carbon dioxide, and sodium hypochlorite feed rates
Treatment Performance

- Operating performance from January-June 2018
- Iron and manganese removal
  - Iron: 0.08 mg/L or BDL
  - Manganese: 0.024 mg/L
- Pellet Softening
  - Adjusted pH of 8.5
  - Final pH of 7.8
  - Total Alkalinity: 312 mg/L
  - Total Hardness: 229 mg/L
Project Performance

- Finished water production started January 2018
- GMP of $7.2M
- Construction cost of $5.6M
- Contingency of 3.7% (GMP)
- Final cost to Village of $6.9M
- Two deductive change orders
- Shared savings (60% Village, 40% Design-Builder)
- Overall project cost of $7.3M
Questions and Comments