Bring on the Retrofit!

Award Winning
Progressive Design Build Project

Associated Builders & Contractors
Excellence in Construction

Florida Design Build Institute of America
Honor Award

City of Venice: Len Bramble, P.E.
Haskell: Cheryl Robitzsch, P.E.
McKim & Creed, Phil Locke, P.E.

Venice
City on the Gulf

Presentation Outline

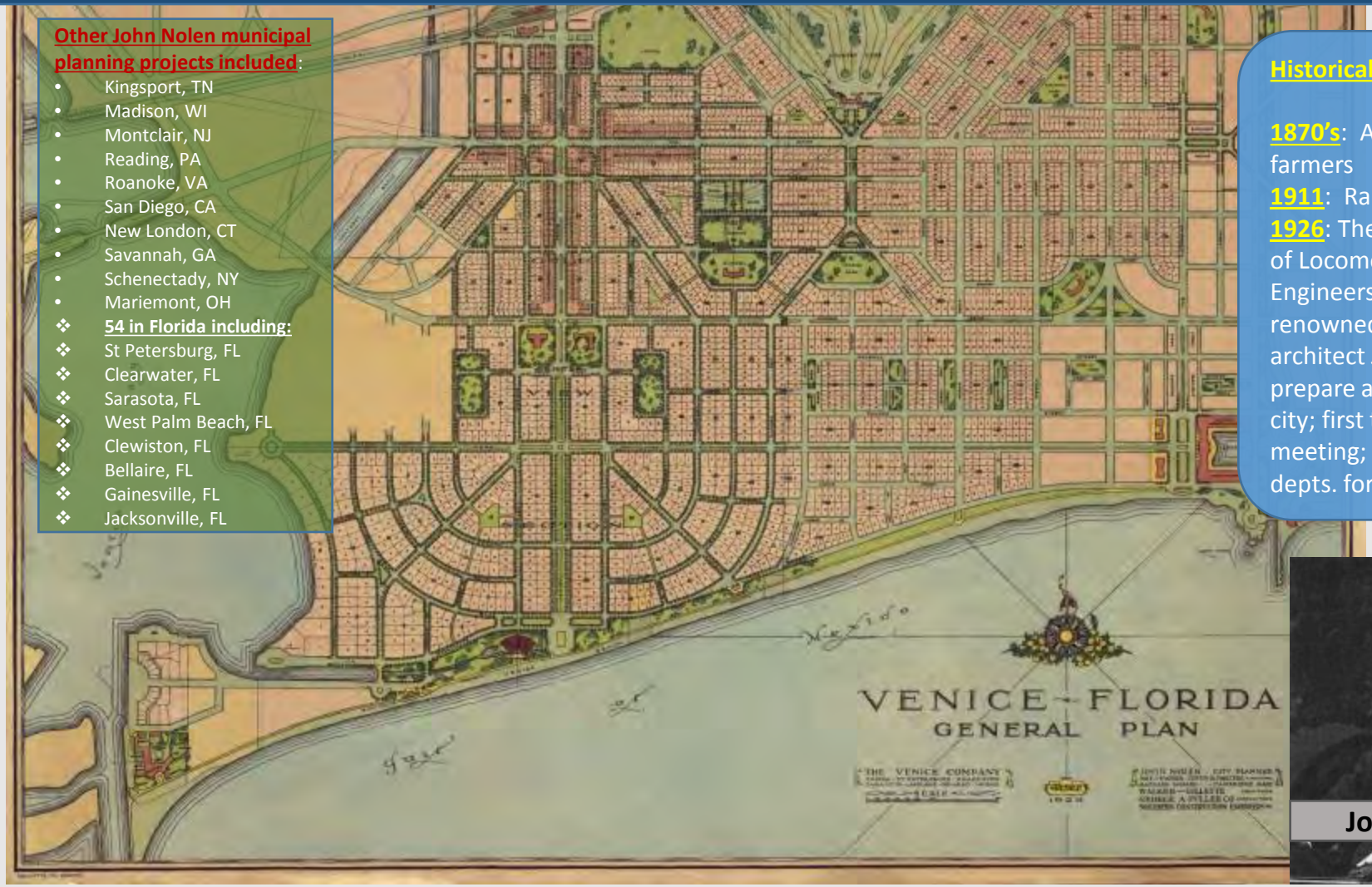
- Historical Overview of the City of Venice
- City of Venice Project Decisions
- City of Venice Chooses Progressive Design Build
- City of Venice Selects a Team
- Project Critical Success Factors
- Technical Project Overview
- Wellfield Water Quality and Flows
- Early Selection of ROEM
- RO Process Components
- Facility Layout
- Construction Sequencing
- Lessons Learned

Historical Over View of the City of Venice

Historical Over View of the City of Venice

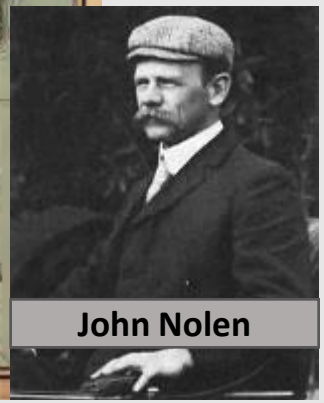
Other John Nolen municipal planning projects included:

- Kingsport, TN
- Madison, WI
- Montclair, NJ
- Reading, PA
- Roanoke, VA
- San Diego, CA
- New London, CT
- Savannah, GA
- Schenectady, NY
- Mariemont, OH
- ❖ **54 in Florida including:**
- ❖ St Petersburg, FL
- ❖ Clearwater, FL
- ❖ Sarasota, FL
- ❖ West Palm Beach, FL
- ❖ Clewiston, FL
- ❖ Bellaire, FL
- ❖ Gainesville, FL
- ❖ Jacksonville, FL



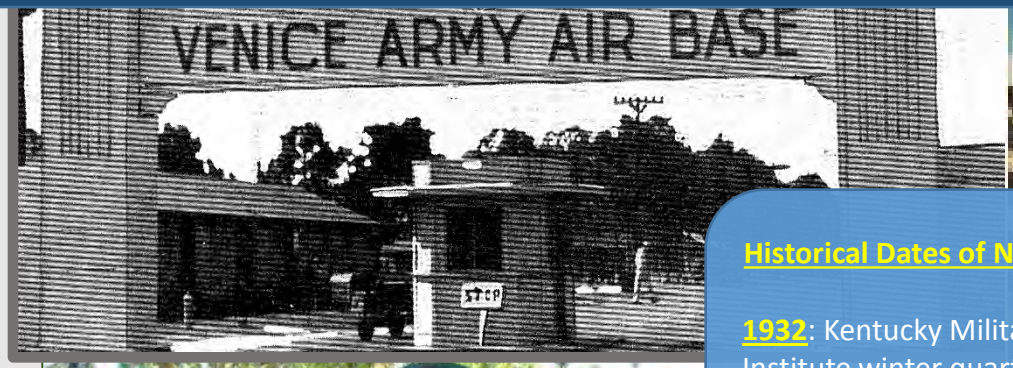
Historical Dates of Note

1870's: Area settled by farmers
1911: Railroad arrived
1926: The Brotherhood of Locomotive Engineers retain renowned landscape architect John Nolen to prepare a plan for the city; first town council meeting; police & fire depts. formed



John Nolen

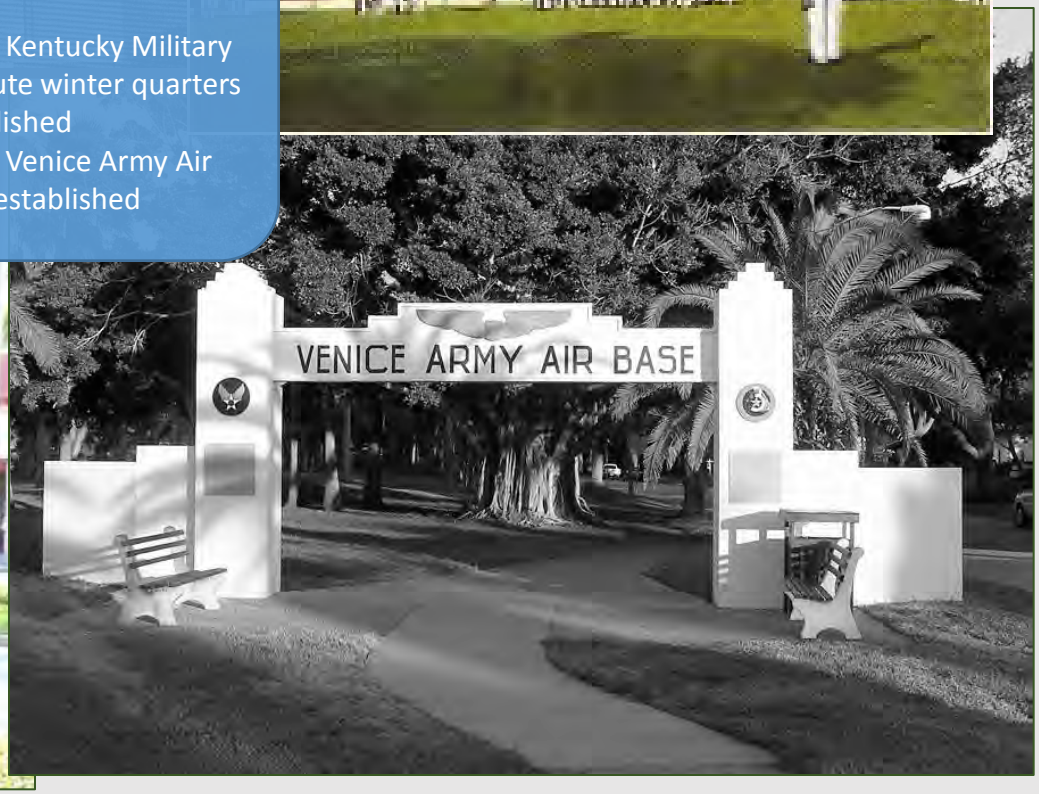
Historical Over View of the City of Venice



Historical Dates of Note

1932: Kentucky Military Institute winter quarters established

1942: Venice Army Air Base established



Historical Over View of the City of Venice

1945: Venice Army Air Base vacated with end of WWII, and the City of Venice finds itself suddenly in the water business; 12,000 GPD from shallow wells

1954: 400,000 GPD Lime Softening

1975: 1 MGD Dupont Polymetrics Hollow Fine Fiber (HFF) RO (largest brackish water RO in world at the time). 96 8-inch permeaters in a 2-stage array; 50% recovery; 415 PSI feed pressure; high sulfates (1500 mg/l) in raw water.

1982: expanded by another 1 MGD with slightly different HFF technology; 52 permeaters in 1-stage array; 240 PSI

1989: CDM study led to replacement of HFF with spiral wound membrane RO; 2x1 MGD trains by Harn RO Systems;

1996: add 2 more 1 MGD trains bringing capacity to 4.64 MGD

2007: Aging membranes and deteriorating skids, vessels, piping, controls system, etc made upgrading the RO works a top priority; rate study results in cessation of borrowing from general fund by utilities fund topping out at about $9 million

2010: Financial Plan and Rate Study create department's (and city's) first true CIP

2012: Presentation to rating agencies for $20 million revenue bond to fund first 2 years of utilities CIP

City of Venice Project Decisions

Project Development

- Aging Assets
- Need for sustainable funding
- Facility assessment (new greenfield plant vs. retrofit)

Objectives

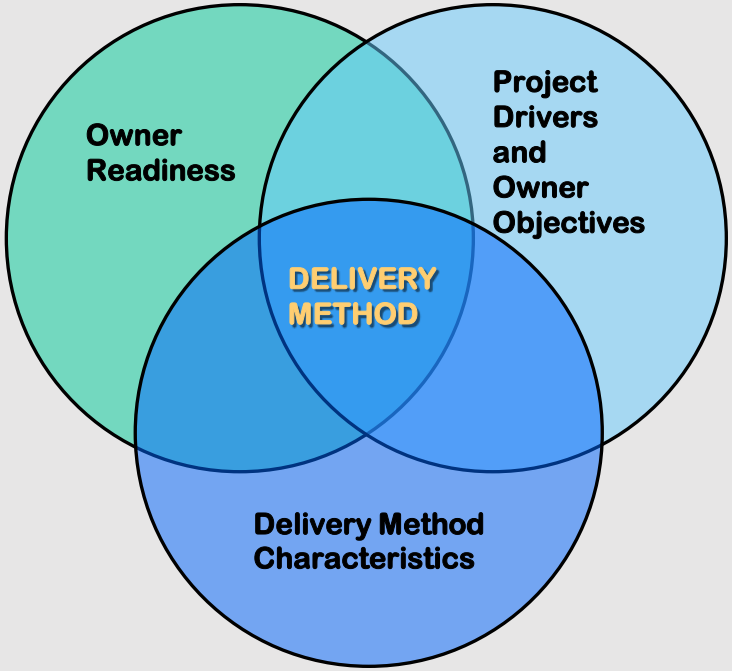
- Reduce the effort for project approvals
- Risk evaluation and assignment
- Limit the scope of work to RO system and SCADA system
- Must be able to provide flexibility in dealing with unknowns
- Must maintain continuous operations
- Collaborative selection of quality components

Delivery Method

- Traditional design-bid-build vs. alternative delivery methods (progressive design-build, lump sum design build, CMAR, etc.)

Delivery Method Considerations

Owner Readiness
- Procurement policies and contracts
- Staff familiarity and education
- Collaboration mindset
- Availability of resources



Owner Objectives / Project Drivers
- Cost
- Schedule
- Complexity
- Quality
- Risk Allocation

Delivery Methods
- Design-Bid-Build
- Construction Management at Risk
- Design-Build

Progressive Design-Build Chosen for:

- **Single point of responsibility**
- **Design innovation with the City**
- **Collaboration between the designer and builder**
- **Owner can specify equipment, as well as pre-purchase equipment**
- **Owner could reject the GMP without significant project delays**
- **Owner could design to budget**

City of Venice Selects a Team

Early 2012: Venice retains MWH as the owner's representative

- Owner's first Design-Build project
- Limited availability of project management staff
- Developed qualification based procurement, shortlist followed by interviews

Late 2012: Venice selects the team of Haskell and McKim & Creed as the Design-Build Team

- Preconstruction and construction services contract early 2013
- Evaluate membrane alternatives and SCADA systems
- 60% Design for the new membranes, pumps, filters, chemical feed pumps, clean-in-place systems, and upgrade the SCADA system

Fall 2013 GMP Awarded by City Council

- GMP $6,700,000
- Final contract value $6,489,538
- Returned unused contingency $114,570.00

Critical Success Factors

Critical Success Factors

- **Provide a Continuous High Quality Water Service to the City's Customers**
- **Develop a schedule for construction that reduces risk during the high season for winter residents**
- **Reduce the risk of unknown conditions on an existing phased facility**
- **Provide the City with a high quality state of the art facility**

Technical Project Overview

- Existing 4.2 mgd RO Facility
- Replacement of 4 Existing RO Skids, While Maintaining Three Skids Online at All Times
- Replacement and Installation of 4 New Cartridge Filters
- Replacement and Installation of 4 New High Pressure RO Feed Pumps
- Upgrade Plant SCADA System
- Upgrade Communications with Wells and Storage Tanks (New Radios and Fiber Optics)
- Upgrade and/or Replacement of CIP System, Sodium Hypochlorite Pumps, Anti-scalant Systems, Trench Piping, Repair of Pipe Trenches, Painting, Roof Hatches, New Control Consoles and Electrical Upgrades

Water Quality & Design Criteria

- City Operates 14 Wells; 6 or 7 Typically in Operation
- Significant Variation in Water Quality (TDS, Chlorides and Sulfates)
- Develop Operational Scenarios for Best and Worst Case Blends
- Compare to Permeate and Concentrate Requirements
- Single Stage System to Produce 4.4 mgd at 50% Recovery
- Ability to Add Future Second Stage to increase Recovery to 75%, while Maintaining Current Groundwater Withdrawal Rates

Water Quality and Flows

Projected Water Quality

Parameter	Units	Groundwater	Permeate	Raw Water Bypass	Finished Water	RO Concentrate
Flow	MGD	9.04	4.4	0.24	4.64	4.4
Calcium	mg/L	415	3	415	24	827
Magnesium	mg/L	178	2	178	11	355
Potassium	mg/L	9	1	9	1	17
Sodium	mg/L	265	10	265	23	521
Strontium	mg/L	14	0	14	1	29
Chloride	mg/L	528	15	528	42	1,042
Fluoride	mg/L	2	1	2	1	4
Sulfate	mg/L	1,315	8	1,315	76	2,624
TDS	mg/L	3,008	41	3,008	194	5,975

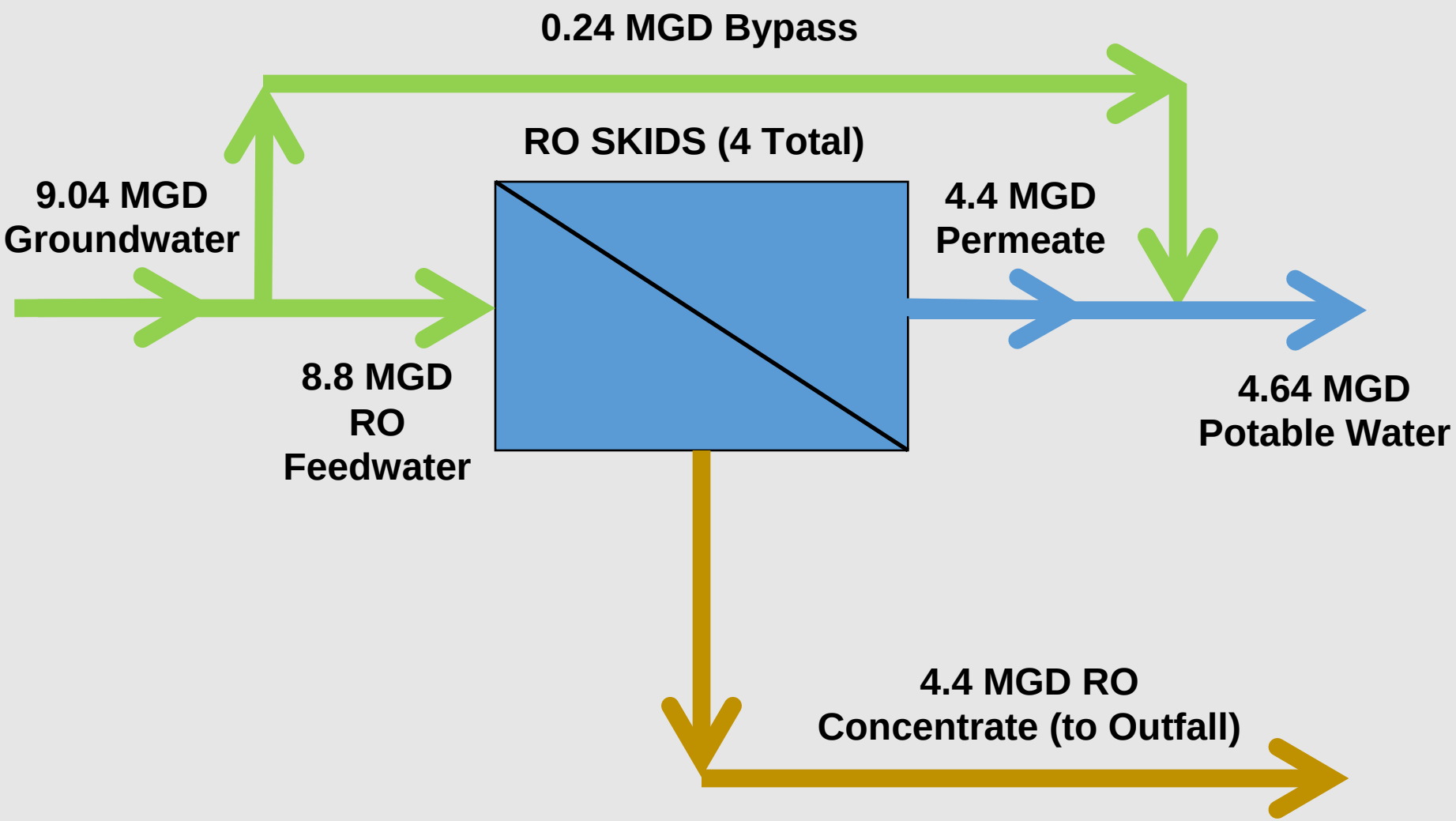
Early Selection of ROEM

- Allowance in the Preconstruction Services
- Prequalification Process
- Request for Bids
- Services During Preconstruction Phase
  - Design Review
  - Submittals

RO Process Components

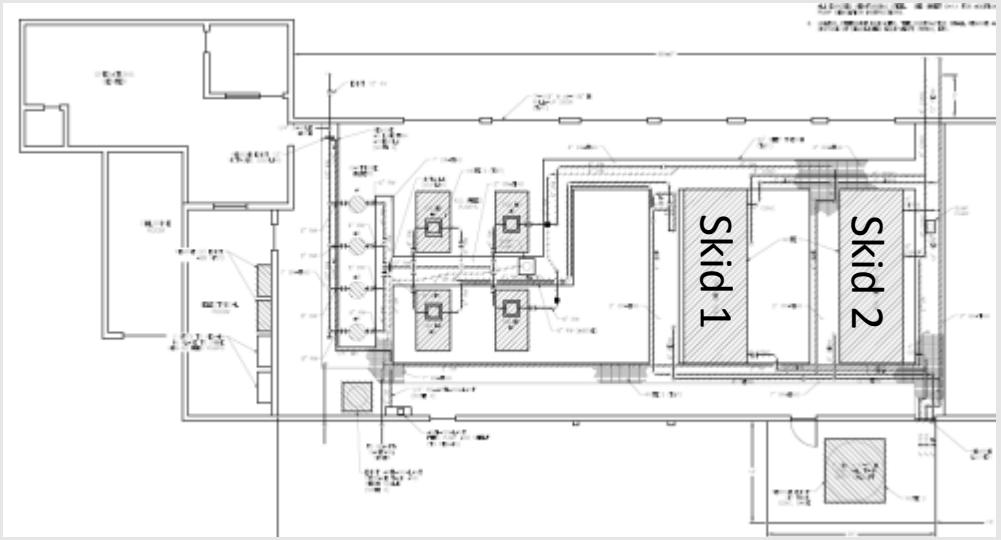
- 4 - 1.1 mgd RO Skids (50% Recovery)
- 36 Pressure Vessels Per Skid
- 7 RO Membranes Per Vessel (Toray Membranes)
- High Pressure RO Feed Pumps
- 5 Micron Cartridge Filters
- CIP system

Overall Flow Schematic

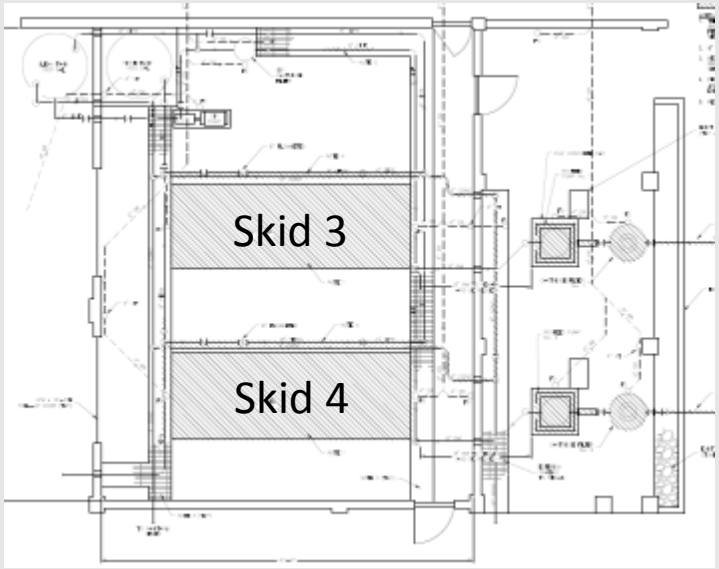


Facility Layout

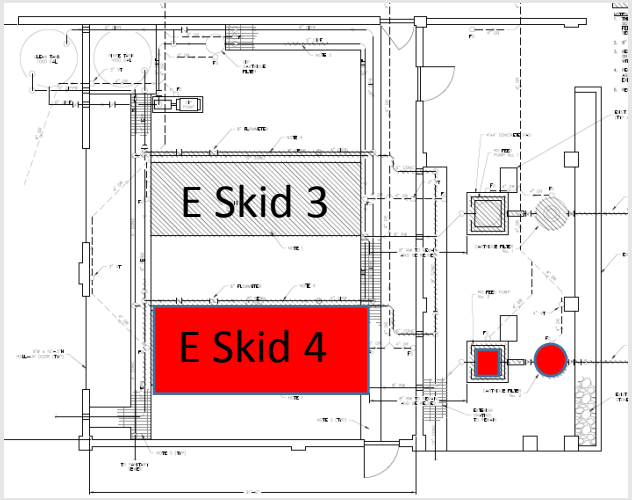
Building 1

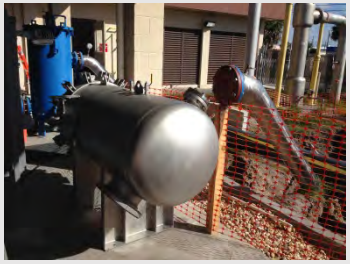


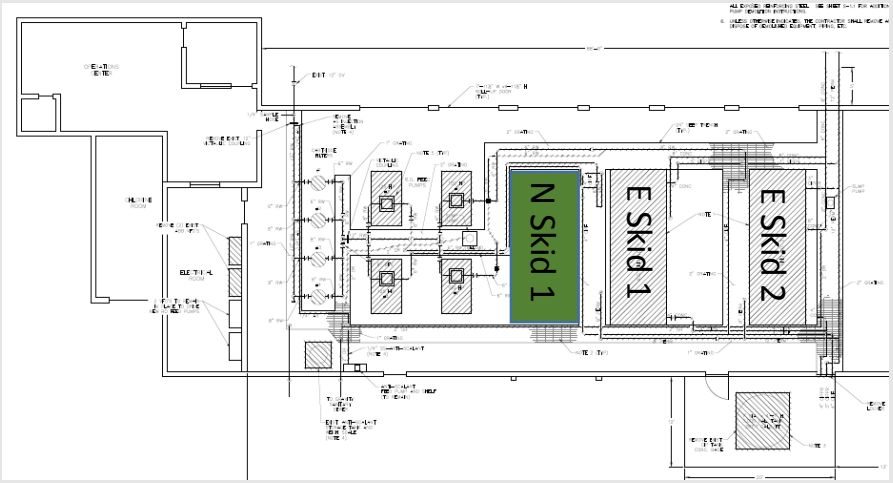
Building 2



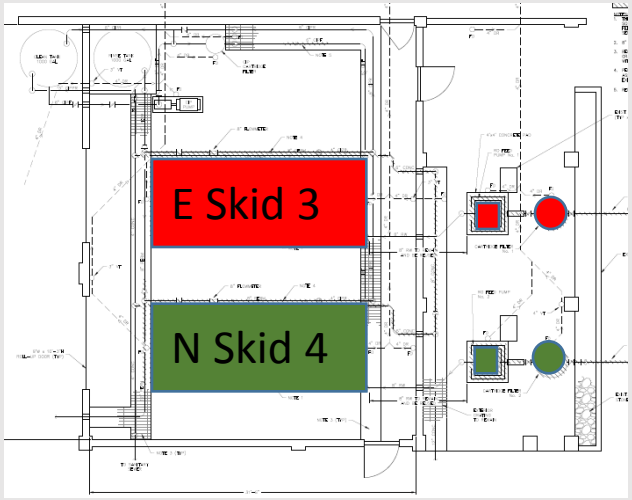
Construction Sequencing

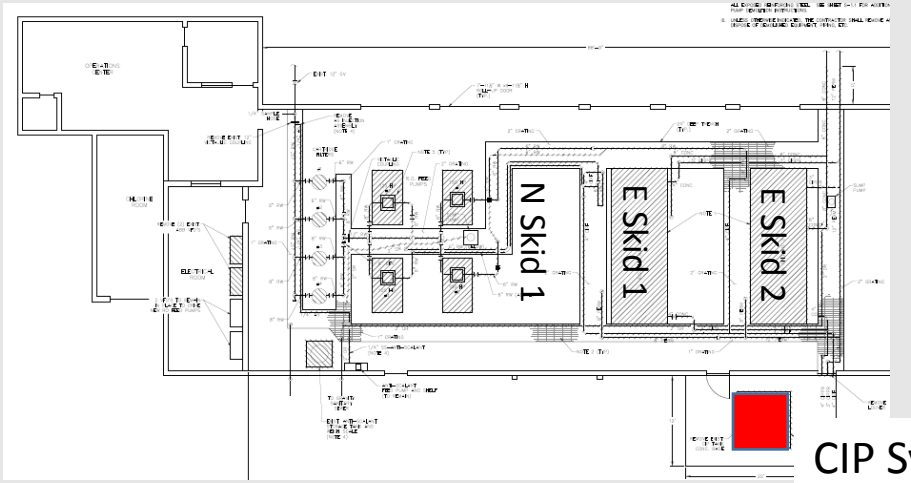






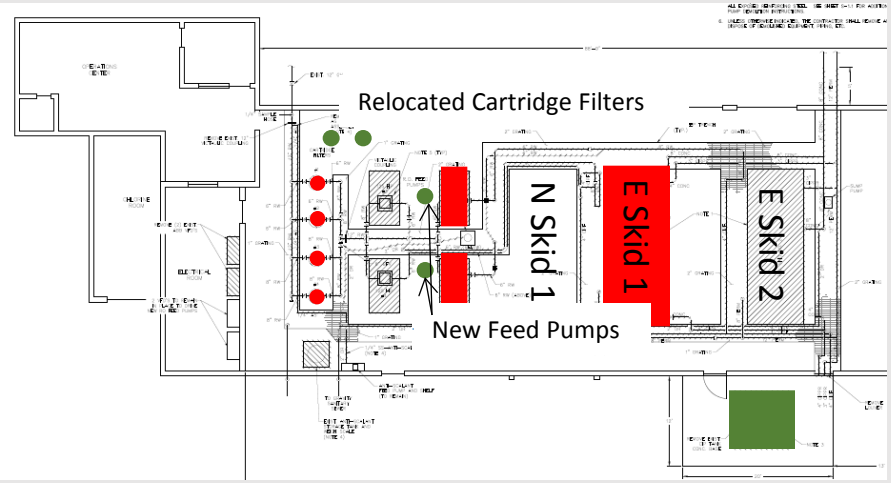
Construction Sequencing



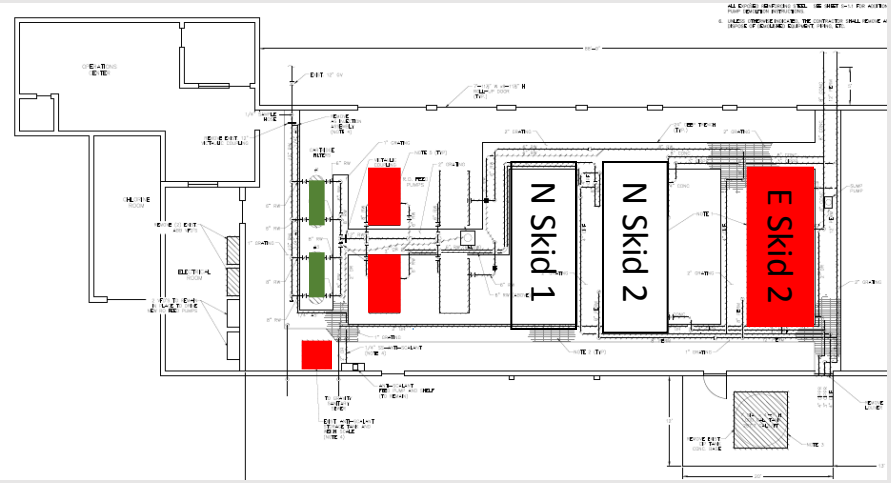


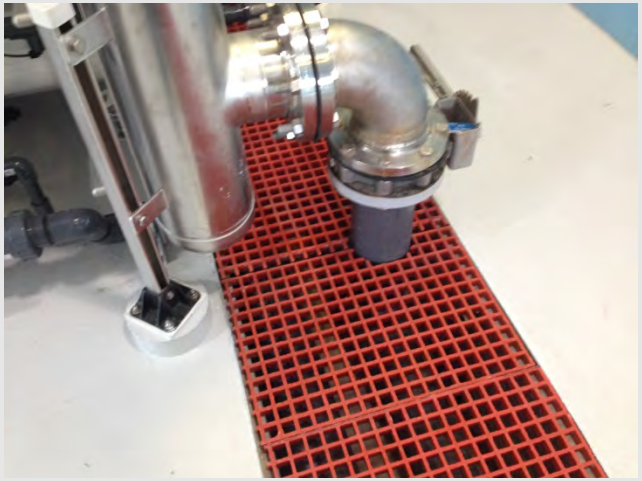
CIP System

Construction Sequencing

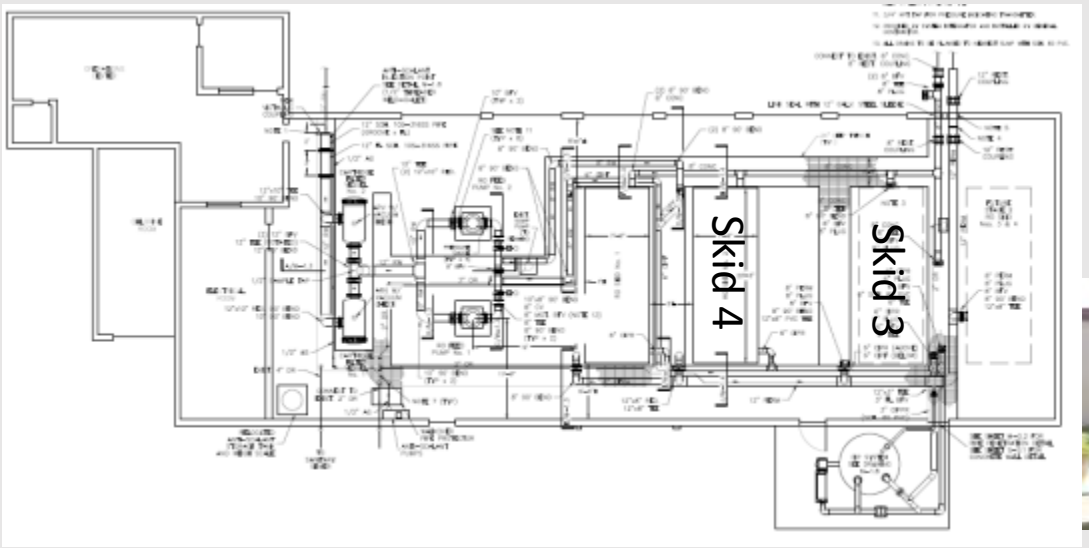


Construction Sequencing



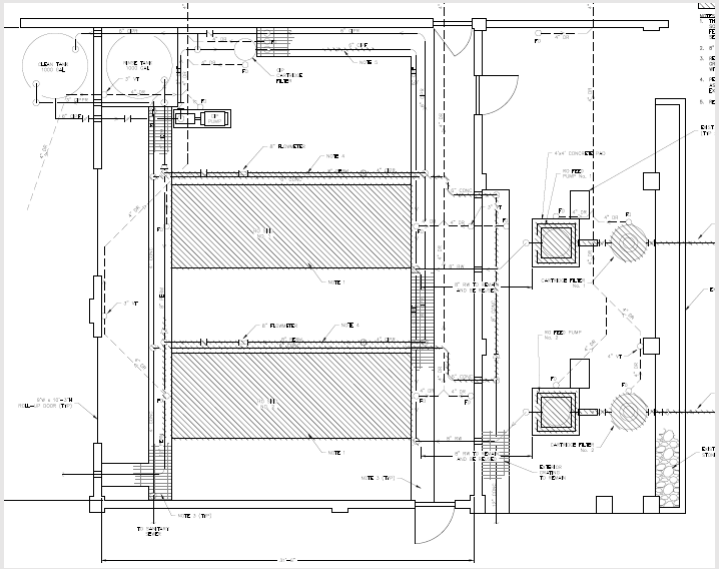


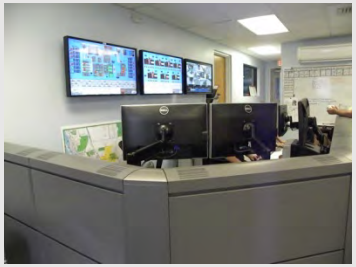
Building 1 Finished



Building 1 Finished

Building 2 Finished





Design Phase – Lessons Learned

Preconstruction Phase

- **Team understanding of project scope of work**
- **Encourage collaboration with operational staff**
- **Assess project risks and the potential for unknown conditions**
- **Understanding of existing operations**
- **Project team dynamics**
  - ✓ **Owner v. Design-Build team preferences**
  - ✓ **Understand Owner's expectations**
- **Don't miscalculate the importance of design efforts**

Construction Phase – Lessons Learned

During Construction:

- **Coordinate a smooth transition from pre-construction to construction services**
- **Provide sufficient project on-site representative to establish a decision-making process for the project to promote rapid decision-making and minimize risk**
- **Spend the time to have a well thought out sequencing plan with by-in from the owner, engineer and contractor**
- **Conduct appropriate site investigations**
  - ✓ **Phase I services don't eliminate design clarifications, RFIs, and coordination issues.**
  - ✓ **Record drawings don't always represent what's installed and/or differing site conditions**