Process Control Systems Upgrades Study Project No. SP-196 Information Item
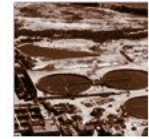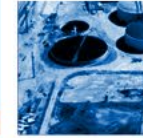
Mike Dorman, Engineering Manager

Operations Committee

September 4, 2019
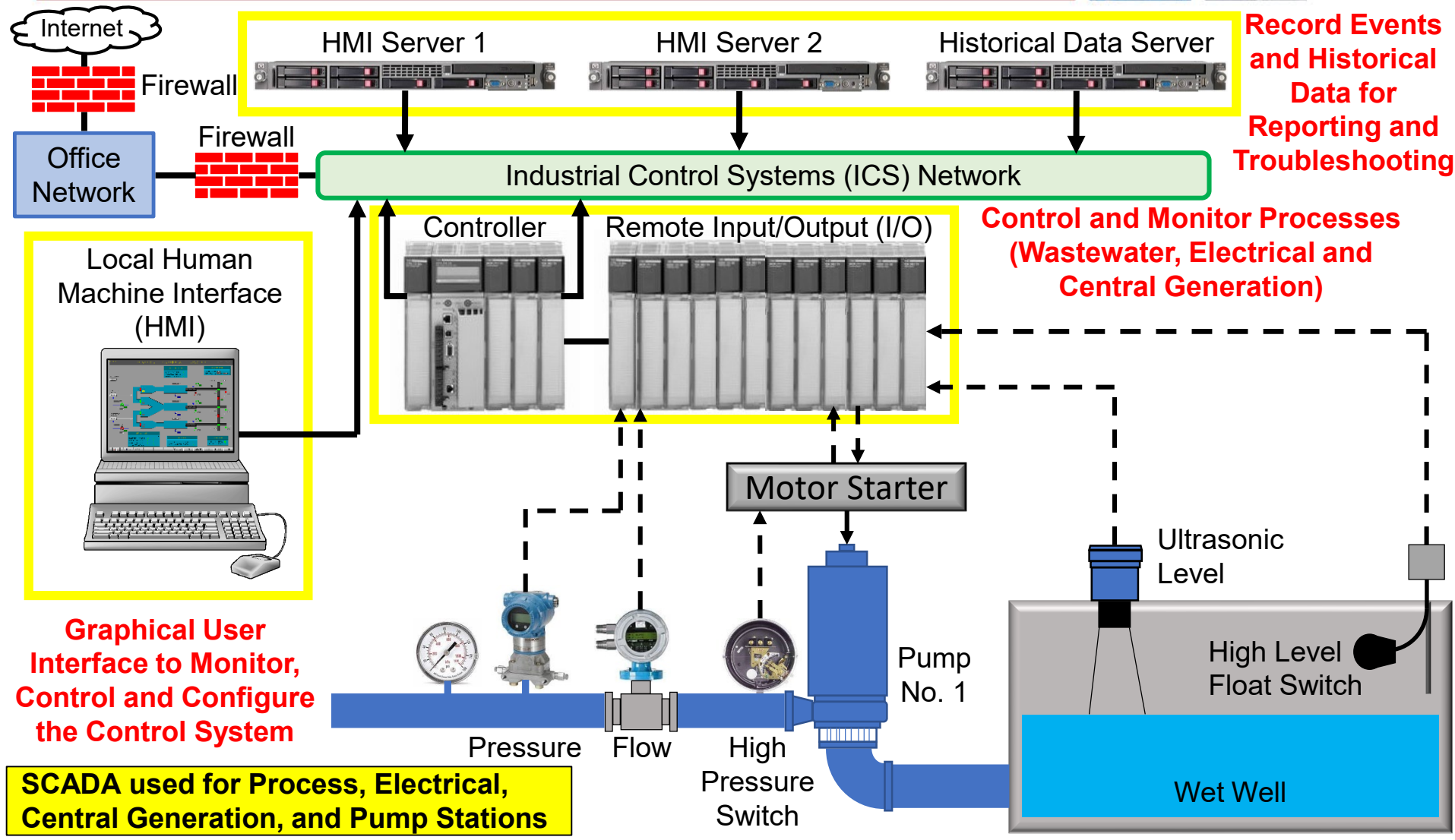

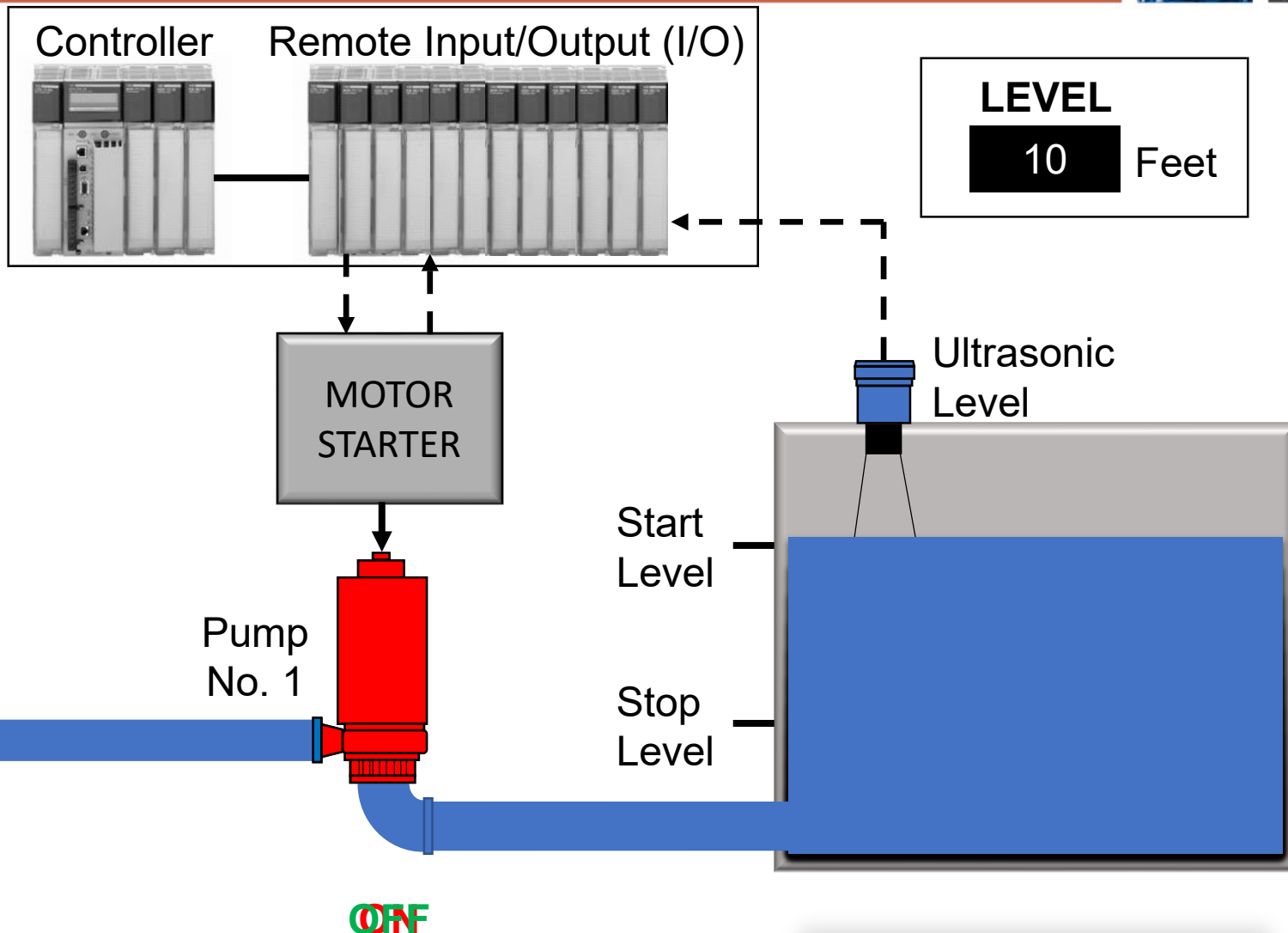CELEBRATING 65 YEARS
ORANGE COUNTY SANITATION DISTRICT

Agenda

Update on where we are since we started Project SP-196, Process Control Systems Upgrades Study

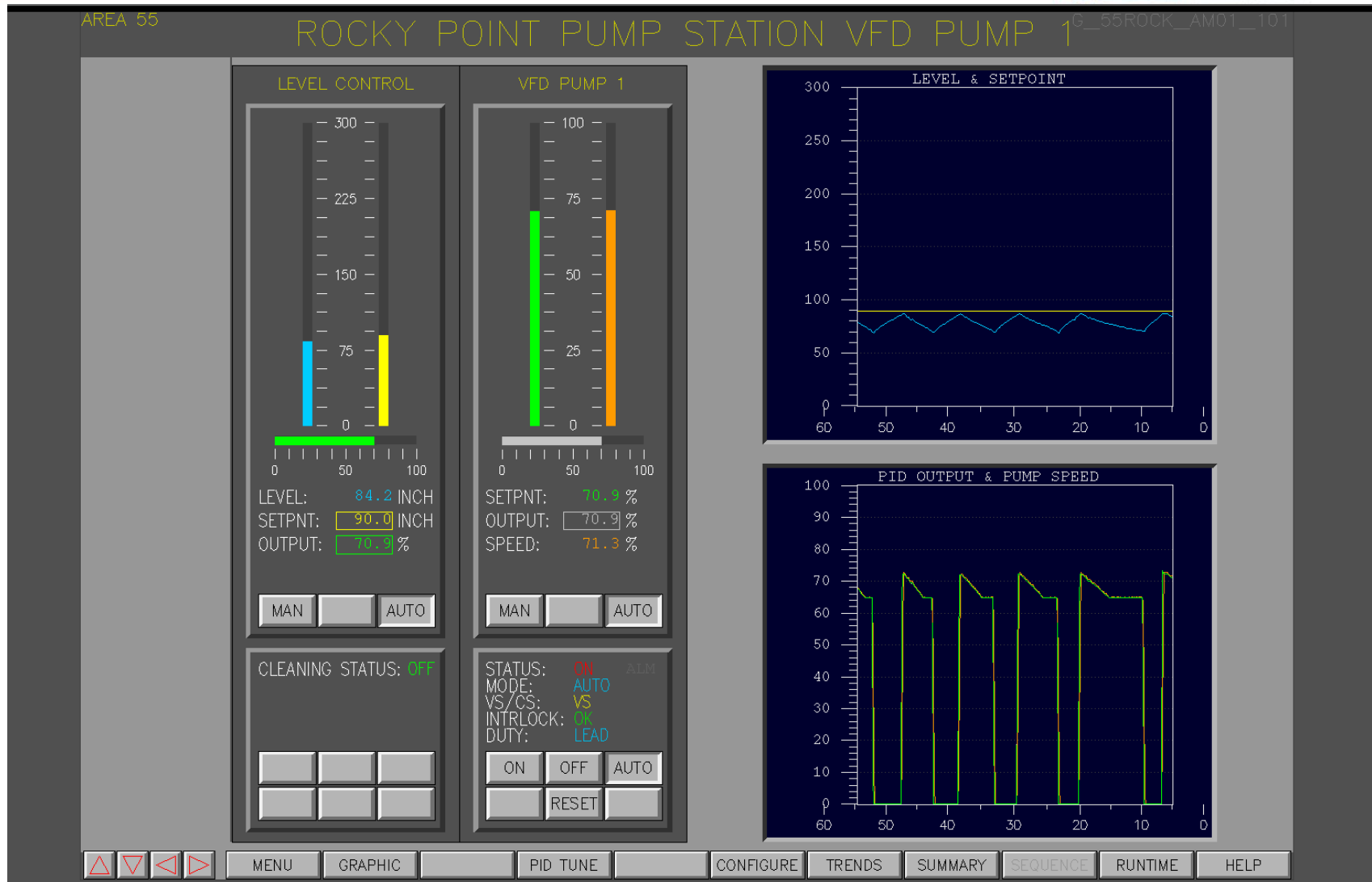# Supervisory Control and Data Acquisition (SCADA)

Internet

Firewall

Office Network

Firewall

HMI Server 1

HMI Server 2

Historical Data Server

Record Events and Historical Data for Reporting and Troubleshooting

Industrial Control Systems (ICS) Network

Control and Monitor Processes (Wastewater, Electrical and Central Generation)

Controller

Remote Input/Output (I/O)

Local Human Machine Interface (HMI)

Graphical User Interface to Monitor, Control and Configure the Control System

Motor Starter

Pump No. 1

Ultrasonic Level

High Level Float Switch

Pressure

Flow

High Pressure Switch

Wet Well

SCADA used for Process, Electrical, Central Generation, and Pump Stations

Pump Level Control

Controller   Remote Input/Output (I/O)

LEVEL

10   Feet

MOTOR STARTER

Ultrasonic Level

Pump No. 1

Start Level

Stop Level

ON OFF

Human Machine Interface

Human Machine Interface

Human Machine Interface

OPERATING & ALARM SETPOINTS

	CURRENT VALUE	
LEAD START / STOP LEVELS:		
LEAD START (0-190):	86	INCH
LEAD STOP (0-190):	71	INCH
LAG START / STOP SPEED:		
LAG1 START (65-90):	90	%
LAG1 STOP (65-90):	65	%
LAG2 START (65-90):	90	%
LAG2 STOP (65-90):	65	%
FORCEMAIN PRESSURE ALARM:		
HI HI ALARM (0-50):	50.00	PSI
HI ALARM (0-50):	30.00	PSI
LO ALARM (0-50):	0.00	PSI
LO LO ALARM (0-50):	0.00	PSI
WETWELL LEVEL ALARM:		
HI HI ALARM (0-190):	110	INCH
HI ALARM (0-190):	100	INCH
LO ALARM (0-190):	48	INCH
LO LO ALARM (0-190):	36	INCH
LEL ALARM:		
HI HI ALARM (0-100):	20	%
HI ALARM (0-100):	10	%

PUMP DUTY SEQUENCE SELECTION

LEAD	LAG1	LAG2	STDBY		SEQ
1	2	3	4	✓	1
2	3	4	1	☐	2
3	4	1	2	☐	3
4	1	2	3	☐	4

EQUIPMENT SERVICE SELECTION

	IN SERV	OUT SERV
VFD PUMP 1:	✓	☐
VFD PUMP 2:	✓	☐
VFD PUMP 3:	✓	☐
VFD PUMP 4:	✓	☐
SONIC 1 LEVEL SENSOR:	✓	☐
SONIC 2 LEVEL SENSOR:	✓	☐
SUPPLY FAN:	✓	☐
EXHAUST FAN:	✓	☐

LEVEL SOURCE SELECTION

			ACTIVE
SONIC 1 LEVEL:	81.2	IN ALM	✓
SONIC 2 LEVEL:	81.7	IN ALM	☐

△ ▽ ◁ ▷ | MENU | GRAPHIC | | | CONFIGURE | TRENDS | SUMMARY | SEQUENCE | RUNTIME | HELP

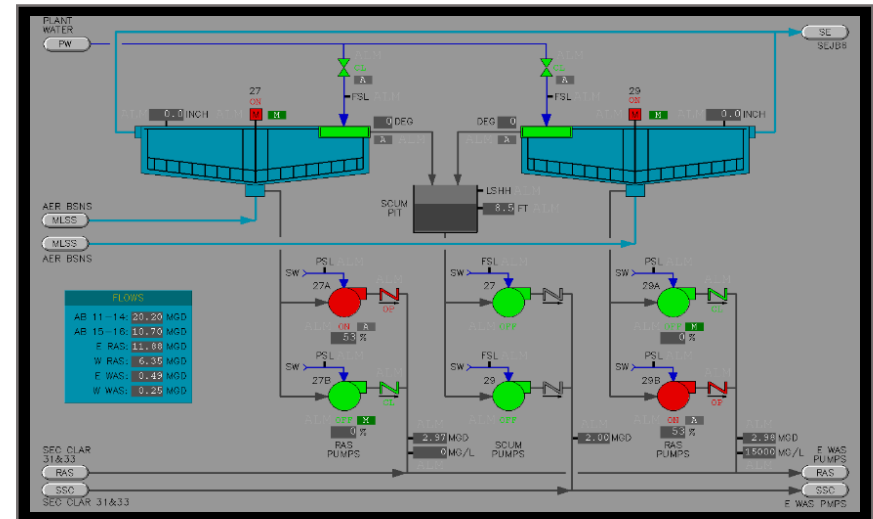# Plant 1 Control Center

SCADA system allows 24-hour operation from 1 location at each plant

Why Replace the Human Machine Interface?

- HMI System – CRISP (Process, electrical and pump stations)
  - 100 HMI Workstations
  - ~850 Graphics Screens
  - 33 Servers
  - 25 years old
  - Uses VAX workstation and VAX emulation software
  - OCSD owns the software code
  - Added features over the years to meet our needs
  - CRISP programmers reaching retirement age

- HMI System – Wonderware (Central Generators)

Why Replace the Programmable Logic Controllers?

- PLC – Modicon Quantum
  - 150 Networked PLC's
  - 25+ Standalone PLC's
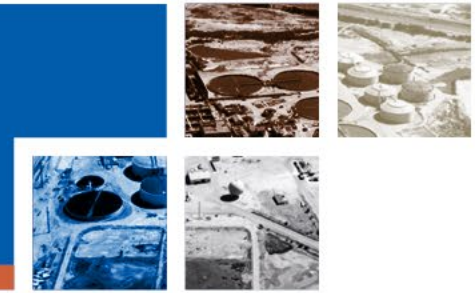 - ~44,000 input/output points

- 20 Years Old
  - Processors no longer manufactured
  - Input/output modules no longer manufactured in the near future

- Maintainability Plan
  - Spares in warehouse for replacement and near term future projects (purchased 38 spare processors)
  - Using next generation Modicon PLC (M580) for new projects (J-117B)
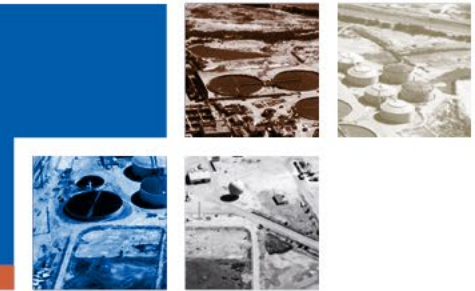
SP-196 Scope of Work

- Determine Requirements
  - Available SCADA technology
  - System requirements
  - Smart devices and instruments
  - Integration with business and maintenance systems
  - Predictive maintenance
  - Advanced control feature
  - Historian

- Select a Vendor
  - 20-Year agreement (software and hardware)
  - HMI replacement
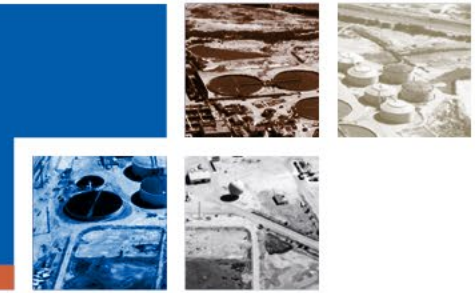
SCADA System Replacement

- Replace existing HMI software through Project No. J-120 (price included in proposal)
  - Develop new graphic standards
  - Develop new controller programming standards
- Replace controllers as part of future CIP projects over the next 20 years (costs for hardware and programming included in CIP budget)

Our SCADA system replacement project will be easier than other systems:
- **Excellent documentation of our system, programs and standards**
- **Not doing a gut and replacement of the controllers**

SP-196 Key Decision

Programmable Logic Controllers (PLC) versus Distributed Control System (DCS)

	HMI/PLC System	DCS System
HMI Software	HMI Vendor	X
Controller	PLC Vendor	X
Training	HMI and PLC Vendor	X
Control Panel	Panel Fabricator	X
Programming	In-House / Systems Integrator	In-House / X

DCS's traditionally more expensive. OCSD elected to compete DCS with HMI/PLC since DCS's are becoming more competitive. DCS offers a more integrated system.

We could have just extended the sole source, but we felt it was important to openly bid for the next 20 years

RFQ/RFP Process

QUALIFYING PHASE ← → **SELECTION PHASE**

Feb 2019 – August 2019

RFQ
Absolute Requirements to Work with Our Existing System

→ **Pass/Fail** →

Oct 2019 – Dec 2019

RFP Response
Scoring - **Proposal** - **Non-Disclosure Agreement (NDA)** - **Price**

→ **Jan 2020**

Ranking

↓

TOP QUALIFIED PROPOSERS

Feb 2020 – Jun 2020

Classroom Trials

↓

Vendor Interviews

→ **Jul 2020**

Ranking / Selection/ Negotiations

Progress

Finalized the SOQ Phase (6 Vendors Submitted 3 Vendors Qualified)

Pricing
- 20 year software licensing
- HMI replacement (Project J-120)
- Total cost to replace all controllers

SP-196 Scope of Work
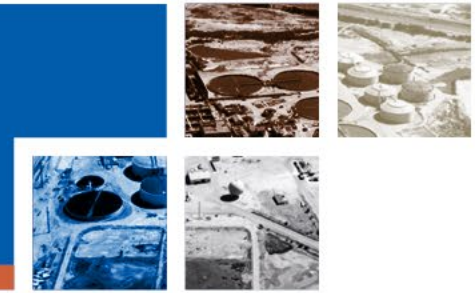
SOQ Proposers

- <u>DCS</u>
  - ABB ⬅
  - Emerson ⬅
  - Honeywell

- <u>HMI</u>
  - AVEVA – Wonderware ⬅
  - Rockwell Automation
  - Trihedral – VTScada

Future Board Action

Future Board Action

1. Approve a 20-year unit-price agreement Master Service Agreement
   1. Software licensing costs
   2. Equipment costs
   3. Programming hourly rates (DCS only)
   4. Control panel costs (DCS only)
2. Award Project J-120

Questions?