



Creating a Resilient and Cybersecure SCADA System

- Medford Water Case Study -

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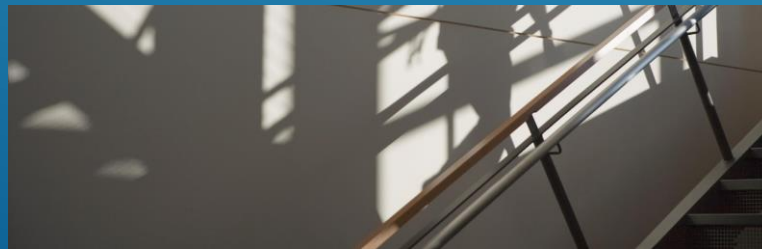
Medford Water - Creating a Resilient and Cybersecure SCADA System

AGENDA

- Utility background and existing system condition
- Problem statement / challenges
- Project approach
- Project status
- Lessons learned



Utility background and existing system condition



SCADA -

Medford Water SCADA Modernization – Medford Water history



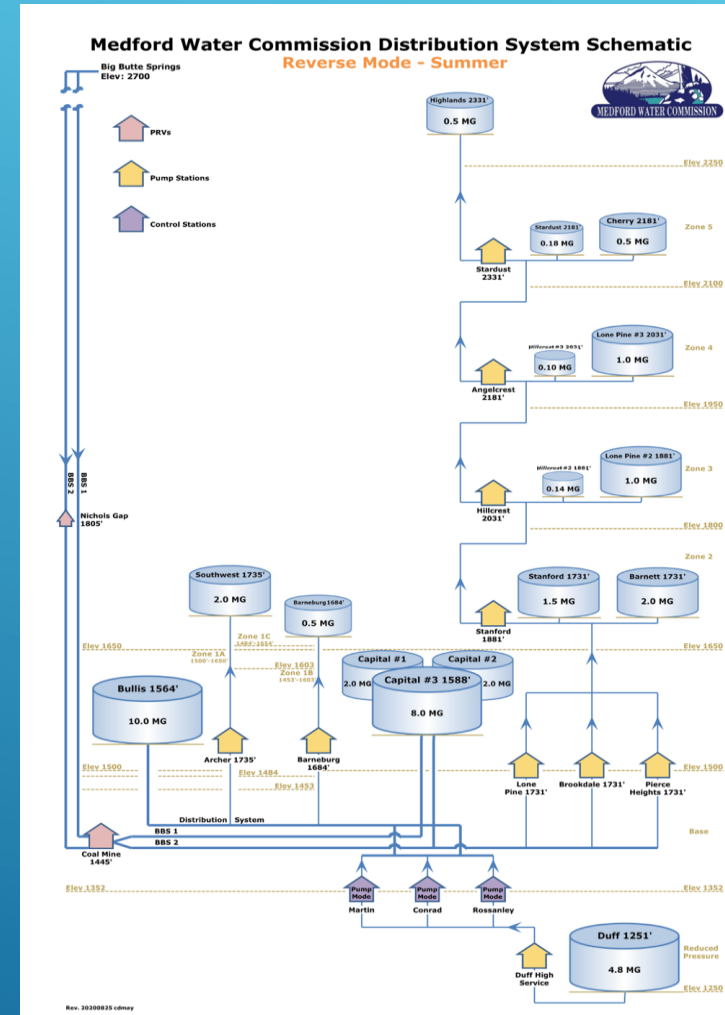
- City of Medford formed Medford Water Commission by vote of citizens in November 1922
- The vote included authorization of a \$1 million dollar bond
- Finished project delivered spring water 30 miles to City of Medford



SCADA -

Medford Water SCADA Modernization – Current Condition

- Medford Water current conditions:
 - 2 sources of supply – Big Butte Springs and Robert A. Duff Water Treatment Plant
 - 40 Remote Stations
 - 13 reservoirs
 - 13 pump stations
 - 5 pressure reducing stations
 - 9 master meter sites
 - Operations facility
 - Business office



SCADA -

Medford Water SCADA Modernization – Medford Water history



DUFF SOURCE



BBS SOURCE

MW
INTEGRATED SCADA
VISION



DISTRIBUTION



BUSINESS
CENTER



- Medford Water control strategy had resulted in 4 distinct silos.
- These silos do not communicate efficiently.
- Does not support integrated data management.
- Does not provide flexibility in operations.

SCADA -

Medford Water SCADA Modernization – Current Condition

- **Obsolete components / outdated platforms**
- **Little standardization – harder to maintain**
- **Insufficient resiliency**
- **Communication network too slow to support needs**
- **Outdated OT infrastructure approaches is a serious cyber risk**
- **Data is not easily accessible by users**
- **Inadequate facilities to protect major systems**

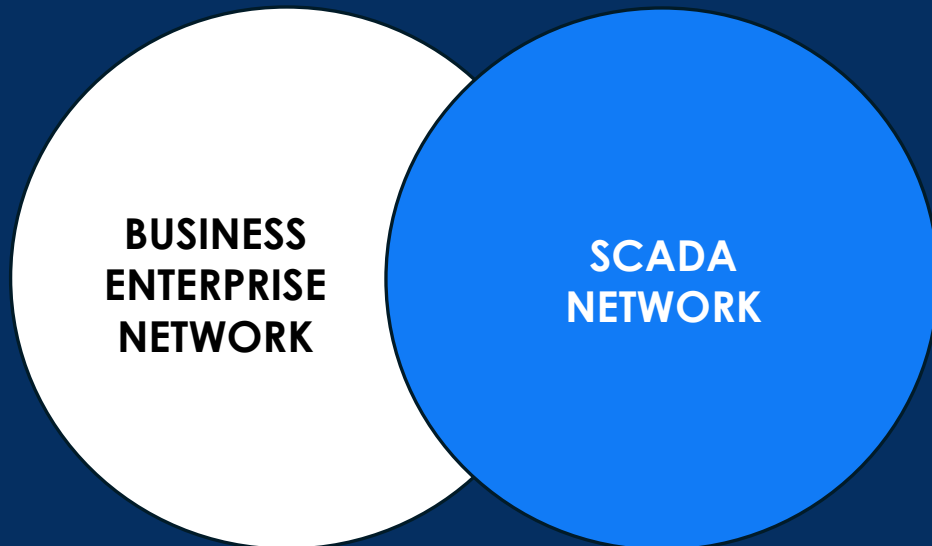


SCADA Master Plan Update

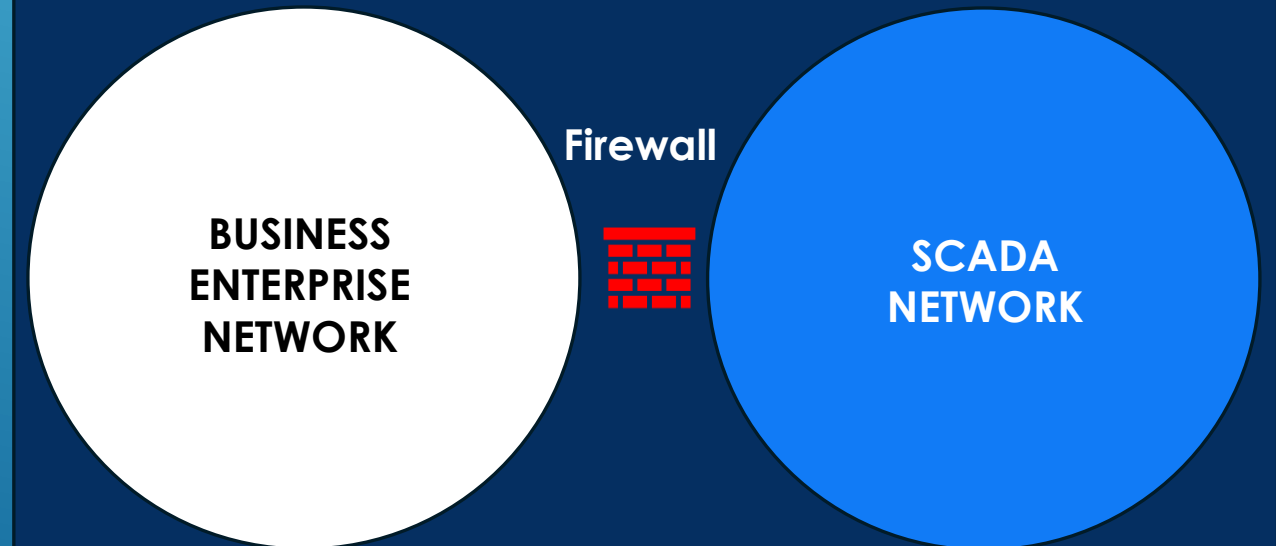
Steps Taken So Far

- In recent years Medford Water has taken a proactive approach to our IT and OT security posture including:
 - Network isolation of both SCADA systems.
 - Upgrading the server hardware and operating systems running the SCADA HMI graphics

BEFORE



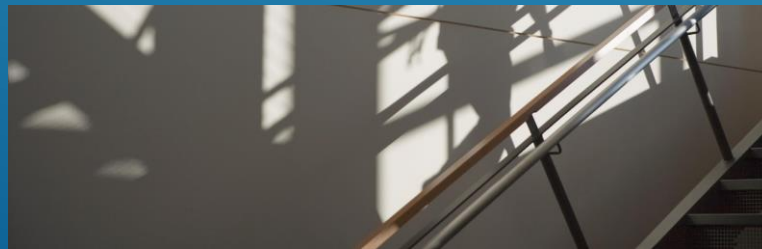
AFTER



SCADA Master Plan RFP

“The work associated with this project provided Medford Water with a clear roadmap providing direction and standardization throughout the system to manage the ongoing development of the SCADA network. This plan includes, but is not limited to:”

- **Cybersecurity**
 - **Standardization**
 - **Resiliency/Redundancy**
 - **Efficiency**
 - **Schedule/Prioritization**
 - **Visibility**
 - **Cost Planning**



SCADA Master Plan Update

Project Approach

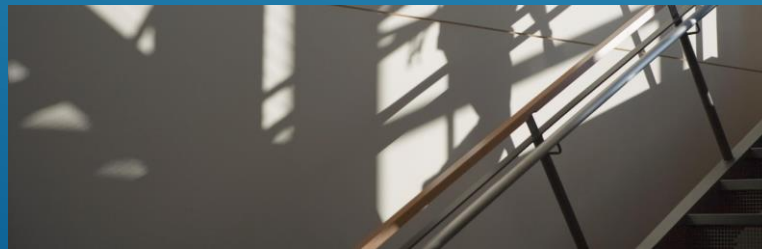


SCADA MASTER PLANNING



Provides a ROADMAP

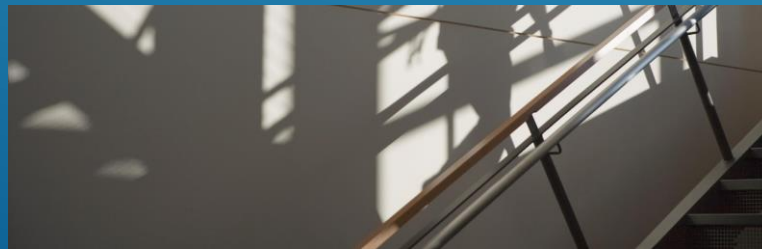
- Assess Entire System
- Recommended Improvements
- Implementation Planning
- Budgetary Estimates
- Phasing / Cash Flow Planning



SCADA MASTER PLANNING SYSTEMS EVALUATED



- PLCs
- HMI
- Networks / Communication
- OT Systems
- Server and Control Rooms
- Documentation



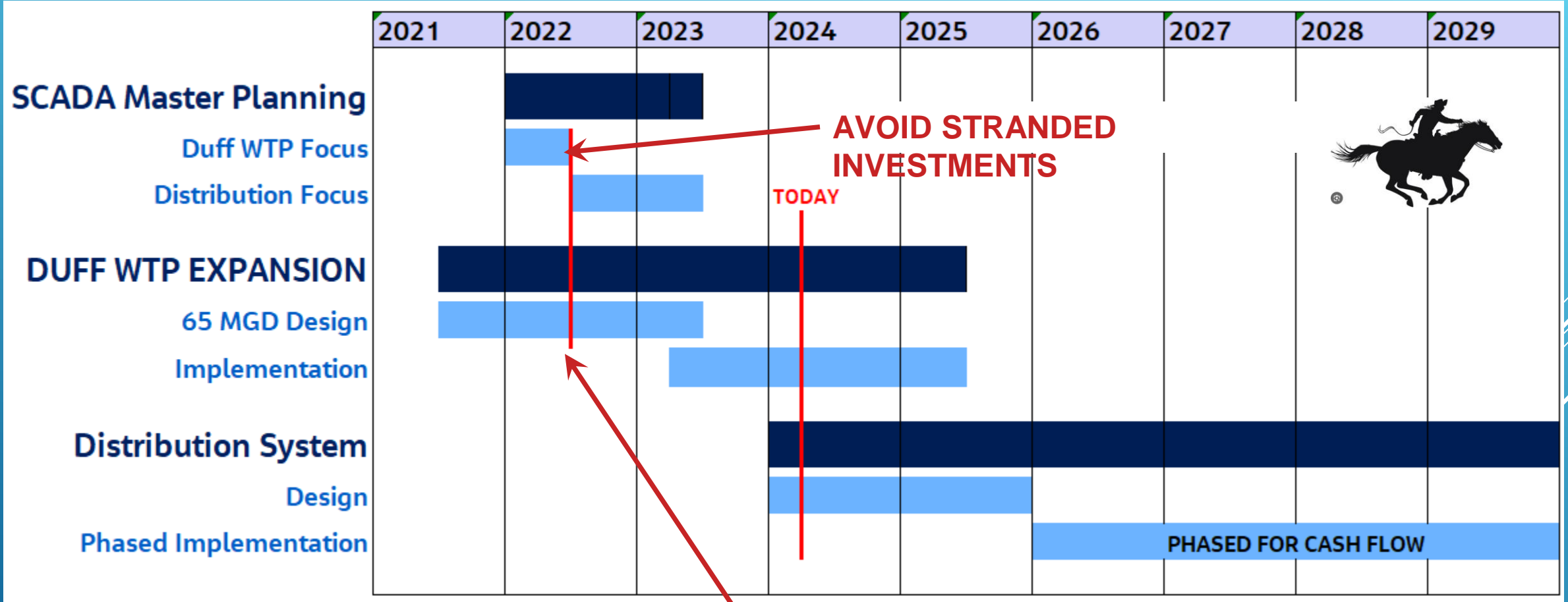
SCADA MASTER PLANNING INDUSTRY UPGRADE DRIVERS

- Federal Presidential Directive
 - DHS, Water is Critical Infrastructure
 - National Infrastructure Protection Plan
 - Federal Funding - Infrastructure / Jobs Act
- Increased Cyber Security & Resiliency
- Aging Systems / Obsolete Components
- Dedicated Server & Control Rooms
- Data Analytics / Digital Transformation
- Maintenance and Support



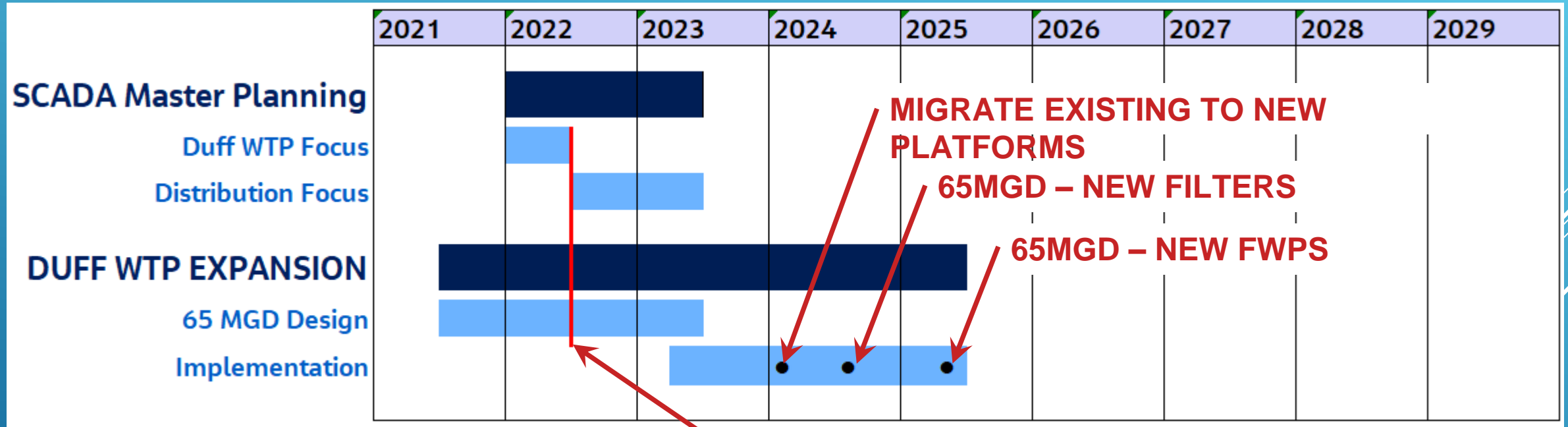
National Infrastructure Protection Plan
Water Sector

SCADA PROJECT - SCHEDULE CONCEPT



**NEW SCADA REQUIREMENTS
DEFINED**

SCADA PROJECT - SCHEDULE CONCEPT

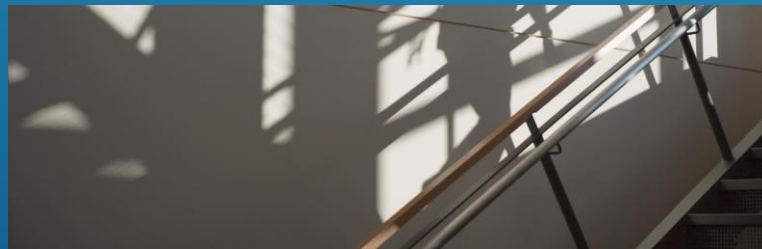


**NEW SCADA REQUIREMENTS
DEFINED**

SCADA MASTER PLANNING APPROACH



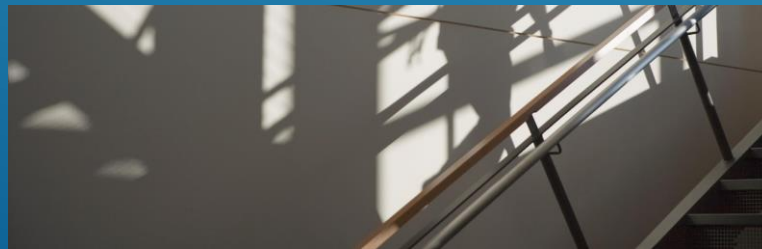
- Major Efforts:
 - Site Visits
 - 22 Workshops
 - Inform Board – Findings / Funding
- Order of Work:
 - Duff WTP (avoid stranded investments)
 - Distribution System
 - Implementation Planning
 - Budgetary Estimates
 - Phasing / Cash Flow Planning



SCADA MASTER PLAN RECOMMENDATIONS



- PLC – Standardize on AB Logix
- HMI – Rockwell FactoryTalk
- Plant Network
 - Single Mode Fiber Ring
 - Segregate SCADA
- OT
 - Complete Redesign
 - Cybersecure & Resilient
- Inter-Facility Communication
 - Replace Point-to-Point with Mesh
 - Backups via Fiber / Cellular / Starlink
- Server and Control Rooms



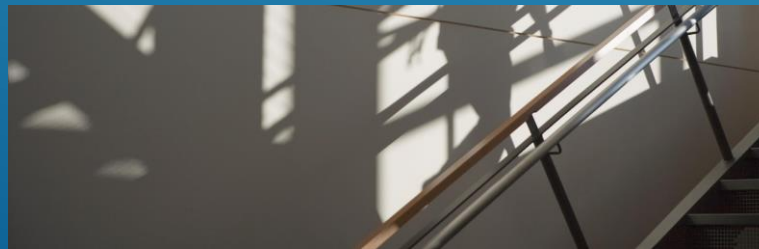
PROTECTING THE NATION'S WATER INFRASTRUCTURE

NIST Special Publication 800-82

Revision 2

Guide to Industrial Control Systems (ICS) Security

**Supervisory Control and Data Acquisition (SCADA) Systems, Distributed Control Systems (DCS),
and Other Control System Configurations such as Programmable Logic Controllers (PLC)**



IMPROVEMENTS TO ADDRESS CYBERSECURITY / RESILIENCY

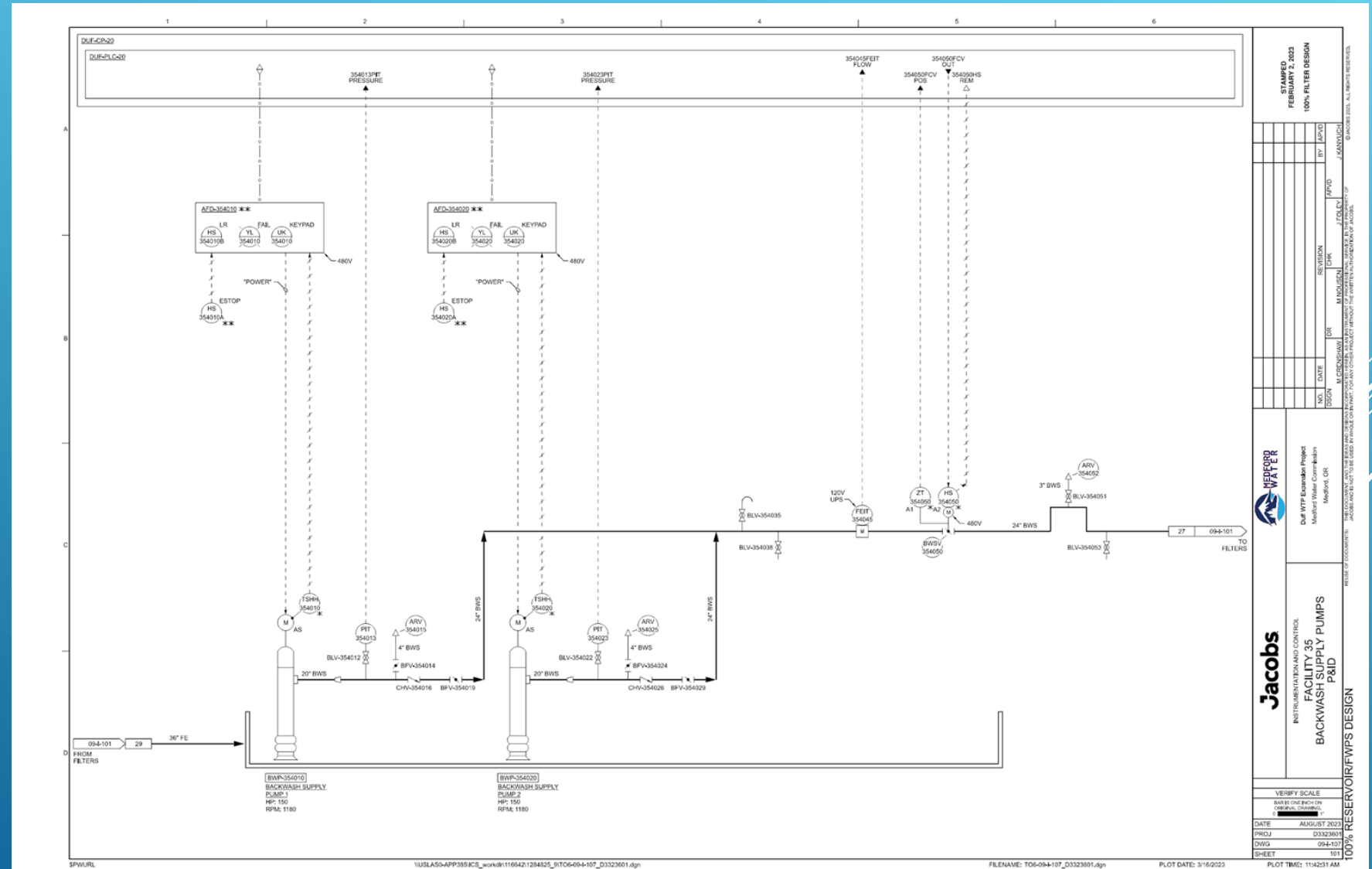


- Cybersecurity
 - Segregate Networks / DMZ
 - Automated Backups for Disaster Recovery
 - Secure Remote Access
 - Network Monitoring
 - Dedicated / Secure Server Rooms
- Resiliency / Redundancy:
 - HA Server Hosts / Virtualization
 - Ring Networks / Redundant Switches
 - Redundant Comms for Remote Stations



SCADA Improvements DOCUMENTATION

- P&IDs
- Network Diagrams
- Panel Drawings
- Wiring Diagrams
- O&M Manuals

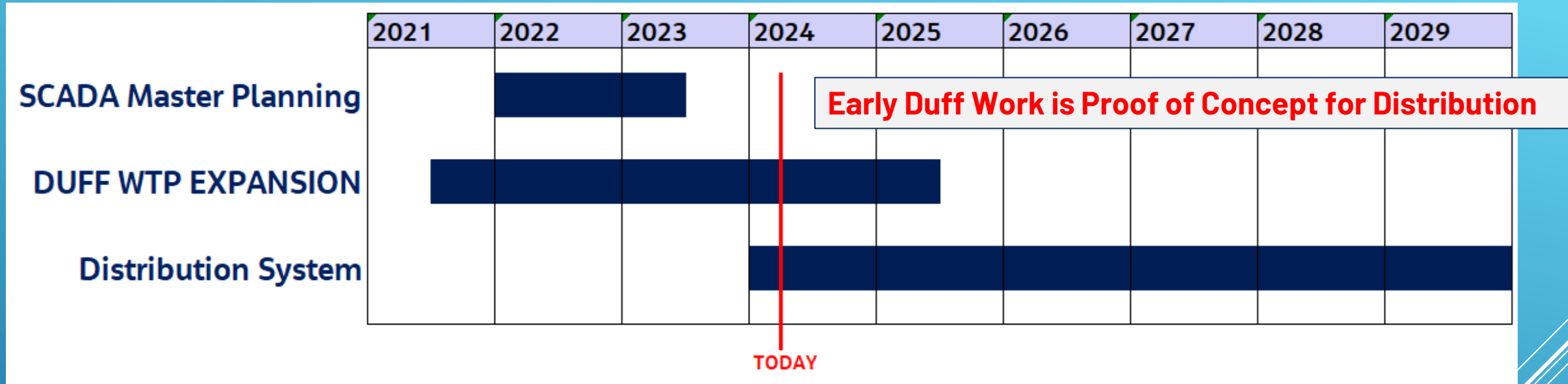


JACOBS INSTRUMENTATION AND CONTROL FACILITY 35 BACKWASH SUPPLY PUMPS P&ID		STAMPED FEBRUARY 2, 2023 100% FILTER DESIGN
NO. 1001 DATE 02/02/23 DESIGNER M. GREENSHAW CHECKER M. ROUSEAU PROJECT LEADER J. COLLEY	REVISION 1 01/11/23 2 01/11/23 3 01/11/23 4 01/11/23 5 01/11/23 6 01/11/23 7 01/11/23 8 01/11/23 9 01/11/23 10 01/11/23 11 01/11/23 12 01/11/23 13 01/11/23 14 01/11/23 15 01/11/23 16 01/11/23 17 01/11/23 18 01/11/23 19 01/11/23 20 01/11/23 21 01/11/23 22 01/11/23 23 01/11/23 24 01/11/23 25 01/11/23 26 01/11/23 27 01/11/23 28 01/11/23 29 01/11/23 30 01/11/23 31 01/11/23 32 01/11/23 33 01/11/23 34 01/11/23 35 01/11/23 36 01/11/23 37 01/11/23 38 01/11/23 39 01/11/23 40 01/11/23 41 01/11/23 42 01/11/23 43 01/11/23 44 01/11/23 45 01/11/23 46 01/11/23 47 01/11/23 48 01/11/23 49 01/11/23 50 01/11/23 51 01/11/23 52 01/11/23 53 01/11/23 54 01/11/23 55 01/11/23 56 01/11/23 57 01/11/23 58 01/11/23 59 01/11/23 60 01/11/23 61 01/11/23 62 01/11/23 63 01/11/23 64 01/11/23 65 01/11/23 66 01/11/23 67 01/11/23 68 01/11/23 69 01/11/23 70 01/11/23 71 01/11/23 72 01/11/23 73 01/11/23 74 01/11/23 75 01/11/23 76 01/11/23 77 01/11/23 78 01/11/23 79 01/11/23 80 01/11/23 81 01/11/23 82 01/11/23 83 01/11/23 84 01/11/23 85 01/11/23 86 01/11/23 87 01/11/23 88 01/11/23 89 01/11/23 90 01/11/23 91 01/11/23 92 01/11/23 93 01/11/23 94 01/11/23 95 01/11/23 96 01/11/23 97 01/11/23 98 01/11/23 99 01/11/23 100 01/11/23	BY J. COLLEY DATE 01/11/23 CHECKED M. ROUSEAU DATE 01/11/23 DESIGNED M. GREENSHAW DATE 01/11/23 PROJECT LEADER J. COLLEY DATE 01/11/23
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FILENAME: T06-094-101_03323601.dgn PLOT DATE: 3/16/2023 PLOT TIME: 11:42:51 AM		100% RESERVOIR/FWPS DESIGN

Project Status



SCADA PROJECT – SCHEDULE CONCEPT



Duff WTP

- Existing Systems on New Platforms
- Ready for Plant Startup
- New Filters Coming Online Summer 2024
- New FWPS Coming Online Summer 2025

Distribution System

- Pre-Design Activity Nearing Completion
- Kicking Off Final Design in June 2024
- Construction Start 2026

SCADA Improvements

LESSONS LEARNED

- Remember your goals (RFP)
- Utility participation is key
 - Significant effort
 - Include voice of all stakeholders
- Consider cash flow and construction constraints
- The whole process takes time
- Consider industry trends (lead times, escalation)
- Documentation is critical
- Work will impact operations – PLAN FOR IT
- System will require maintenance and support



QUESTIONS?

