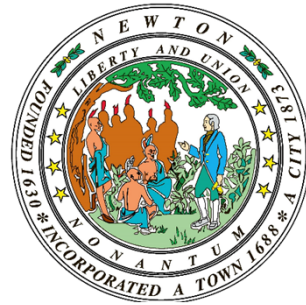


# System-Wide Pump Station Assessment

For Effective Prioritization and CIP Development In Newton, MA

BY: NICK STEVENS, P.E & ADRIAN D'ORLANDO



## Presentation by:



Nick Stevens, P.E.



Adrian D'Orlando



# Presentation Agenda

- Newton, MA and System Overview
- Why Perform A System-Wide Assessment
- Assessment Methodology Overview
- Condition and Performance
- Consequence of Failure
- Prioritizing and Packaging
- Important Takeaways
- Questions

# Newton, MA

11 Sanitary  
Pump Stations

2 Stormwater  
Pump Stations

3 Potable Water  
Pump Stations



# Why Perform a System-Wide Assessment?



- System-Wide Prioritization



- Comprehensive Capital Planning



- Programmatic Approach

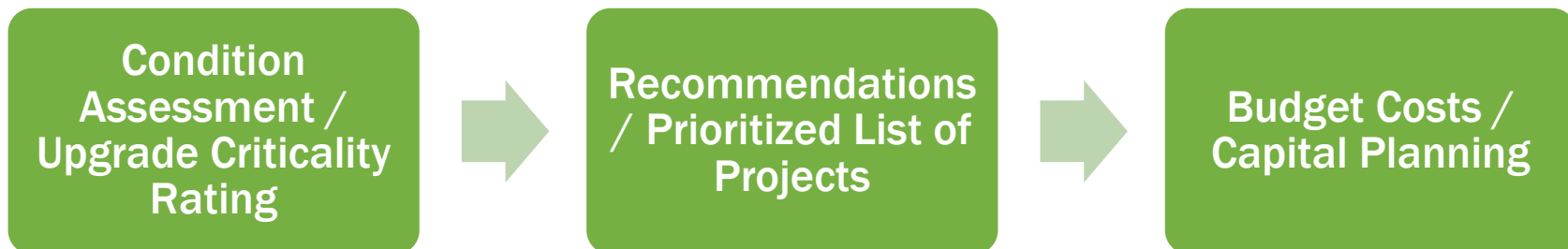


- Best Value



# Overall Project Objectives

- Perform a condition assessment of all pump station assets and identify issues present
- Provide recommendations and prioritized list of projects to meet regulatory standards and best practices
- Develop budgetary costs for each project to assist in capital planning



# Assessment Methodology

1. Historical Data Review



2. Assign Consequence of Failure



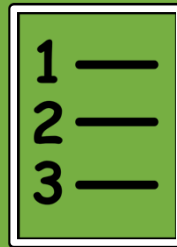
3. Computerized Database



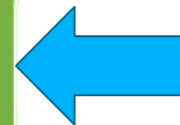
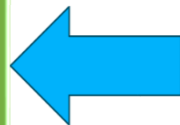
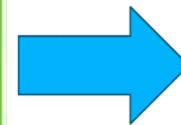
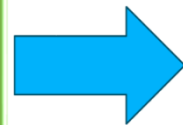
6. Projects/Costing/Recommendations



5. Determine Asset Criticality/Prioritization



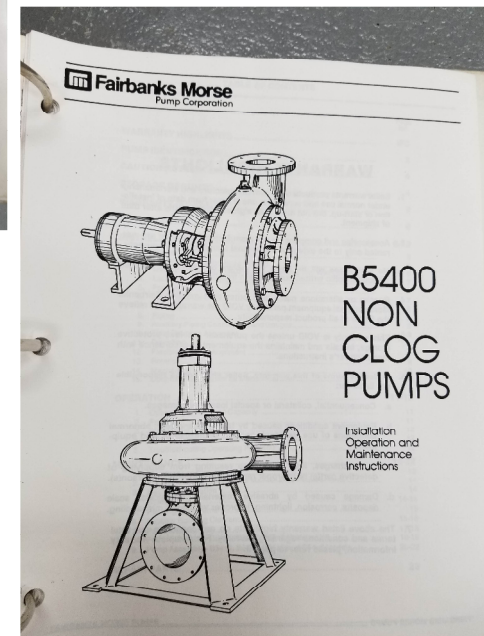
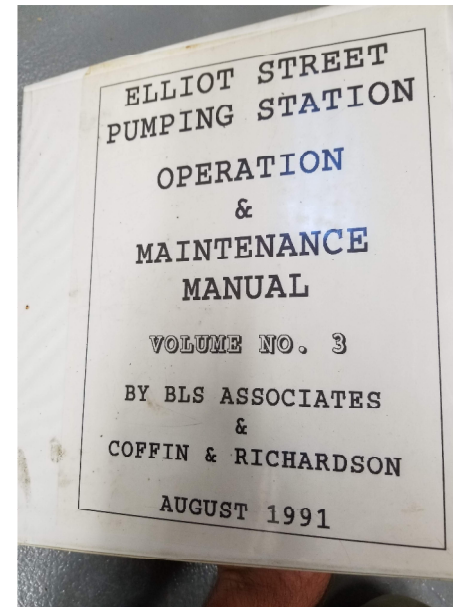
4. Field Visits






# Historical Data Review

1. CMMS or Asset Lists
2. As-Built Drawings
3. Pump Information
4. SCADA Data
5. Operation and Maintenance Logs
6. Control Strategies
7. Engineering Reports



# Asset Consequence of Failure

|                                      | <u>Score</u> |  |                     |
|--------------------------------------|--------------|--|---------------------|
| Civil/Site Assets:                   | 1            | 1: Low Consequence   |                     |
| Buildings and Structures:            | 3            |  |                     |
| SCADA:                               | 3            |  |                     |
| Standby Power Systems:               | 3            |  |                     |
| Instrumentation and Control Systems: | 3            |  |                     |
| Piping and Valves:                   | 4            |  |                     |
| HVAC:                                | 5            |  |                     |
| Electrical Systems, VFDs:            | 5            |  |                     |
| Pump, Motors, and Equipment:         | 5            |  | 5: High Consequence |

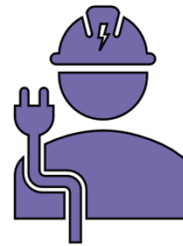
# The Field Team



**Structural**



**Team Lead/  
Process  
Mech/  
Generalist**



**Electrical/  
I&C**



**Project  
Engineer**



REMOTE MULTI-DISCIPLINE  
RESOURCES

# Assessment Forms

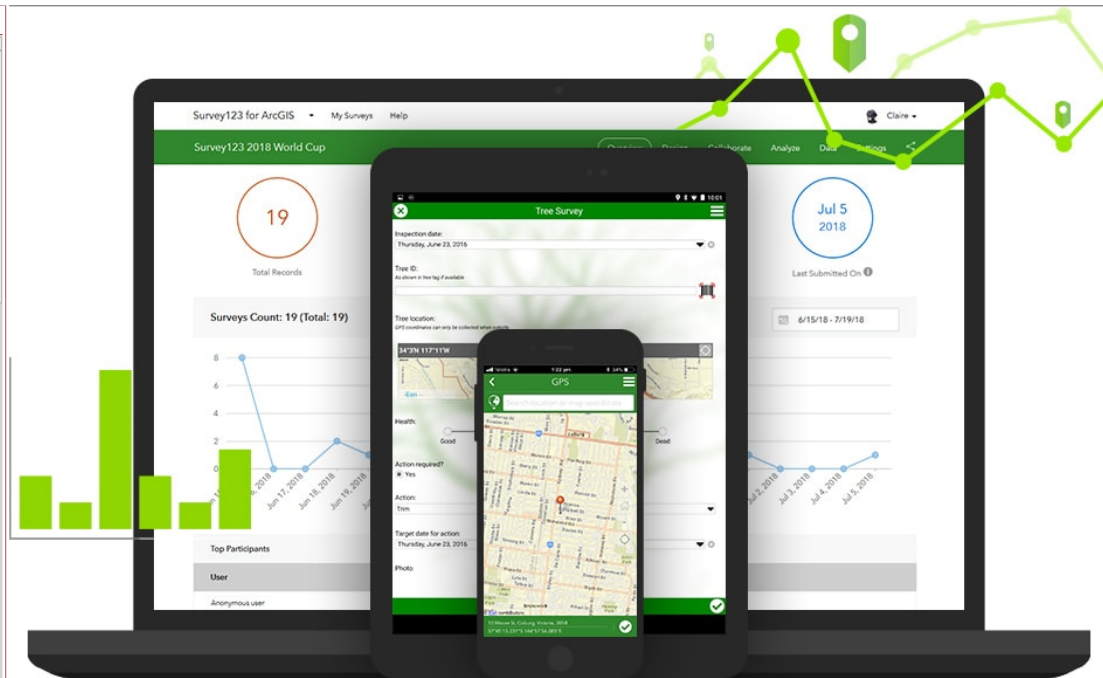
Structure and Wetwell  
CITY OF NEWTON  
LIFT STATION CONDITION ASSESSMENT DATA

Main Page | Site Imprint | Structures | HVAC | Electrical | Generators | Instruments | SCADA | VFD | Motors | Cent Pumps | Sub Pumps | Piping | WW Measure

Select Pump Station:  Go

PUMP STATION # 1 NAME Guinobequin Road (Sanitary) ADDRESS   
 ASSET CLASS STRUCTURE AND WETWELL CODE PST

| CMMSCode  | Present?                            | C | P | U | Year Installed | Field Observations  |
|---|-------------------------------------|---|---|---|----------------|---|
| Building 1  | <input checked="" type="checkbox"/> | 3 | 3 |   | 1958           | Some of the shingles broken on the roof, operators mentioned some leaking. Roof C. 4, P. 3. |
| Building Structures <input type="checkbox"/> None <input checked="" type="checkbox"/> Concrete Walls <input checked="" type="checkbox"/> Concrete Floor <input checked="" type="checkbox"/> Brick Walls <input checked="" type="checkbox"/> Roof/Type <input type="text"/> Slate <input type="checkbox"/> Windows <input type="checkbox"/> Doors<br>Total Floor Area: <input type="text"/> Plan Floor Area: 1796 <input type="checkbox"/> Ground Floor <input checked="" type="checkbox"/> Intermediate Floor <input checked="" type="checkbox"/> Lower Floor Level<br>Field Observations <input type="checkbox"/> Good <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Roof Degraded <input checked="" type="checkbox"/> Windows Cracked <input checked="" type="checkbox"/> Doors and Security Failing <input checked="" type="checkbox"/> Needs Paint <input checked="" type="checkbox"/> Cracks on the Wall <input type="checkbox"/> Cracks on the Floor<br>Add Additional Building <input type="checkbox"/> Other <input type="text"/> Approx 36'-6" x 49' one story above ground pump station with dry and wet well (two levels) below grade. Operator room and diesel generator at intermediate lev |                                     |   |   |   |                |   |
| <b>Bar Screen</b>   |                                     |   |   |   |                |   |
| System Description <input checked="" type="checkbox"/> None <input type="checkbox"/> Manual Rake <input type="checkbox"/> Mechanical Rake <input type="checkbox"/> Screen Bypass Provided?  |                                     |   |   |   |                |   |
| Mechanical Bar Screens <input checked="" type="checkbox"/> N/A Manufacturer: <input type="text"/> Model: <input type="text"/> Serial Number: <input type="text"/> Power requirements (hp): <input type="text"/>   |                                     |   |   |   |                |   |
| Other information No bar rack needed with grinder in use. Operators note no issues with grinder and grease it every 6 months. Grinder installed in 2017 with existing Grinder from Elliot St  |                                     |   |   |   |                |   |
| Field Observations <input type="checkbox"/> N/A <input type="checkbox"/> Screens need frequent cleaning <input type="checkbox"/> Short Response Time <input type="checkbox"/> Odor or fly nuisance <input type="checkbox"/> Screens Not In Use <input type="checkbox"/> Other <input type="text"/>  |                                     |   |   |   |                |   |
| <b>Flow Meter</b>   |                                     |   |   |   |                |   |
| Type <input type="checkbox"/> N/A <input checked="" type="checkbox"/> Magnetic Manufacturer: Foxboro Model: <input type="text"/> Serial: <input type="text"/> Unable to access equipment. Score based on age of equipment   |                                     |   |   |   |                |   |
| Field Observations <input checked="" type="checkbox"/> Operational <input type="checkbox"/> Other <input type="text"/>  |                                     |   |   |   |                |   |
| <b>Influent Valves</b>  |                                     |   |   |   |                |   |
| Valve 1 <input type="checkbox"/> N/A Type: Slide Gate Manufacturer: <input type="text"/> Model: <input type="text"/> Serial Number: <input type="text"/> Guide bracket is broken, unable to fully close   |                                     |   |   |   |                |   |
| Valve 2 <input type="checkbox"/> N/A Type: Stop Log Manufacturer: <input type="text"/> Model: <input type="text"/> Serial Number: <input type="text"/>  |                                     |   |   |   |                |   |
| Field Observations <input type="checkbox"/> Good <input checked="" type="checkbox"/> Fair: Operates but does not close fully <input type="checkbox"/> Poor: Does not operate <input type="checkbox"/> Other <input type="text"/> Stop log is held raised in bracket by rust   |                                     |   |   |   |                |   |



# Field Assessment

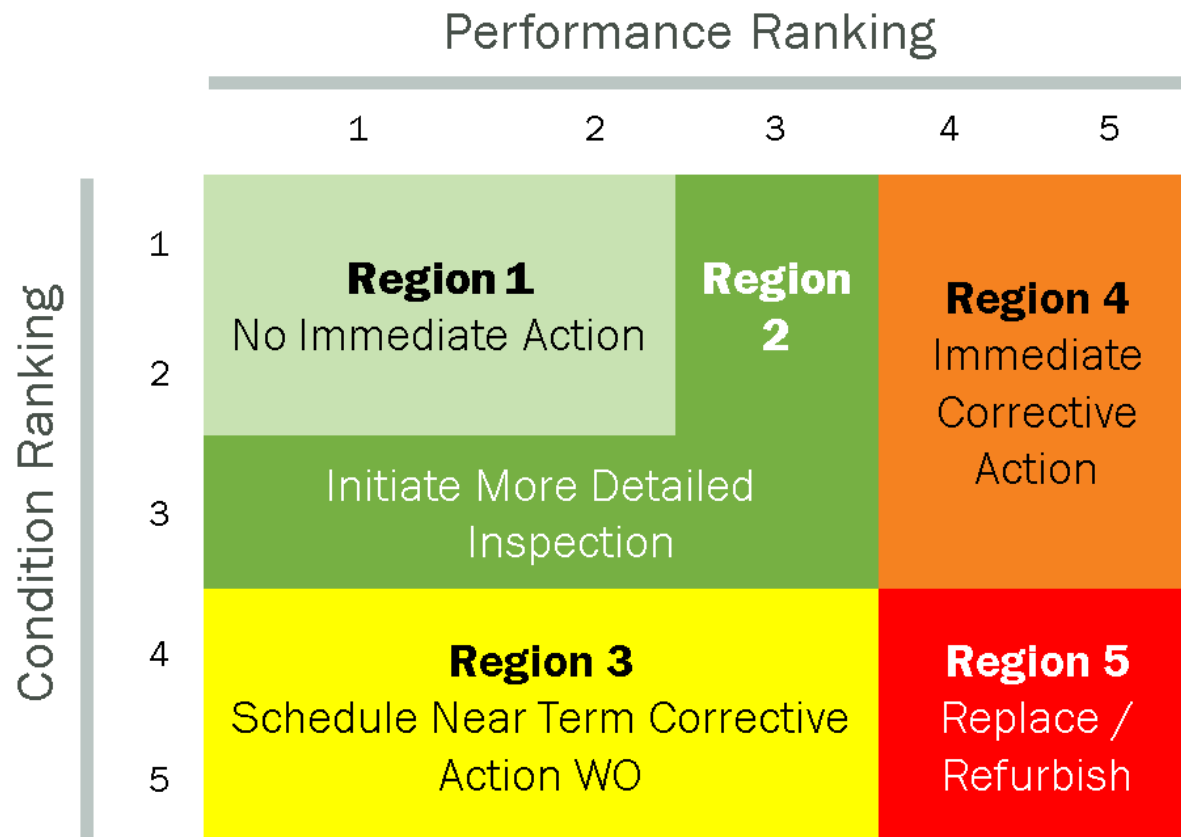
## Condition

- 1 Excellent
- 2 Slight visible degradation
- 3 Visible degradation
- 4 Integrity of component moderately compromised
- 5 Integrity of component severely compromised

## Performance

- 1 Component functioning as intended
- 2 In-service, but higher than expected O&M
- 3 In-service, but function is impaired
- 4 In-service, but function is highly impaired
- 5 Component is not functioning as intended

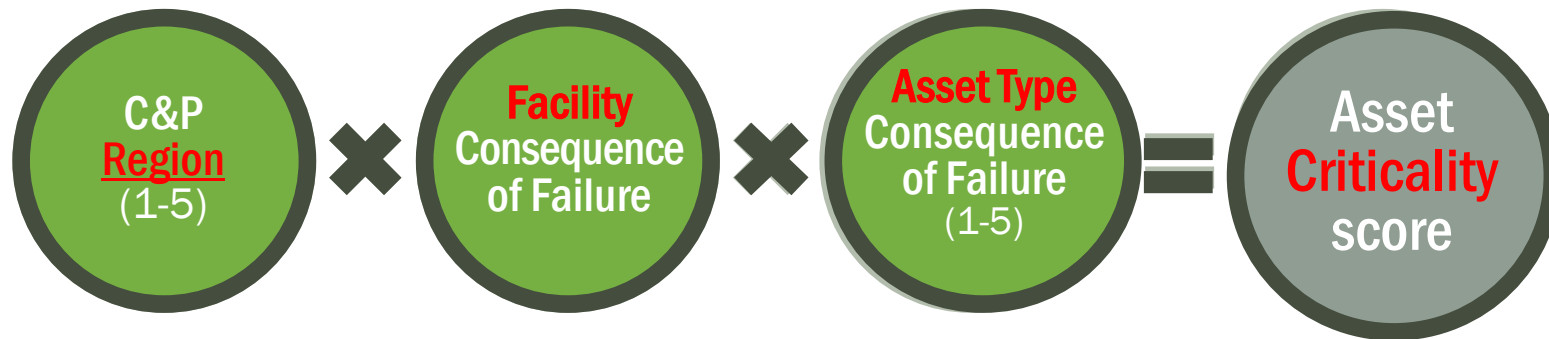
# Urgency Regions



# Facility Consequence of Failure

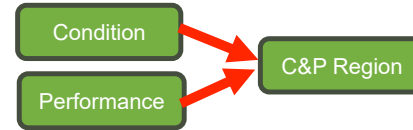
| Station Name     | Parameter 1    | Parameter 2        | Parameter 3                   | Parameter 4                      | Parameter 5  | Parameter 6                                 | Parameter 7  | Parameter 8      | Total Station Score |
|------------------|----------------|--------------------|-------------------------------|----------------------------------|--------------|---|--------------|------------------|---------------------|
|                  | Station Inflow | Critical Customers | Proximity to Sensitive Waters | Anticipated Difficulty of Repair | Growth Areas | Service Requirements: Response Time Allowed | Safety       | Emergency Bypass |                     |
|                  | (Weight 0.6)   | (Weight 1.0)       | (Weight 0.8)                  | (Weight 0.4)                     | (Weight 0.3) | (Weight 0.8)                                | (Weight 1.0) | (Weight 0.8)     |                     |
| Quinobequin Road | 10             | 10                 | 10                            | 3                                | 10           | 10  | 10           | 10               | <b>54.2</b>         |

# Criticality Score



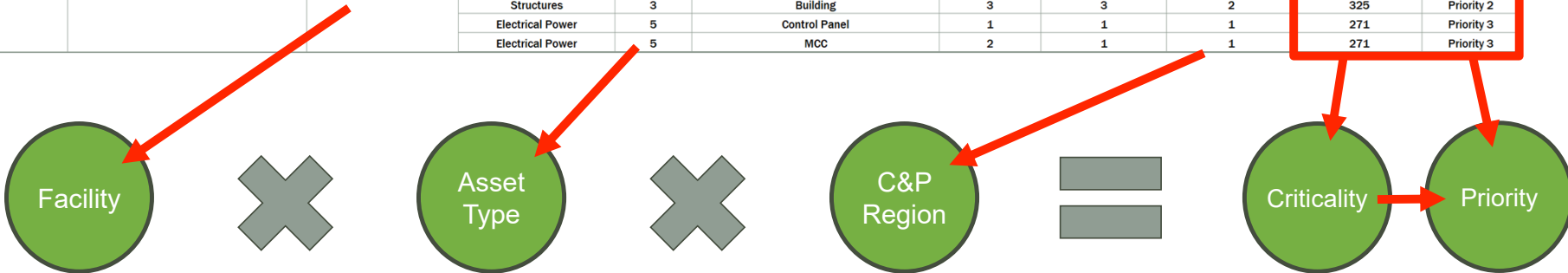
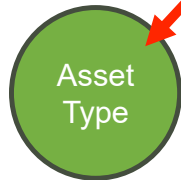


# Criticality Prioritization

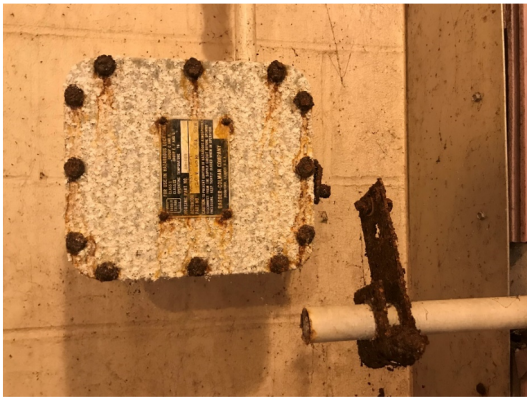


Appendix D. Summary of Assets Condition Assessment by Pump Station

| Asset Review No. | Pump Station No. | Pump Station Name | Pump Station Score | Asset Type            | Asset Type Score | Asset Name          | Asset Condition Score (1-5) | Asset Performance Score (1-5) | Asset C&P Region (1-5) | Asset Overall Score | Costing Priority |
|------------------|------------------|-------------------|--------------------|-----------------------|------------------|---------------------|-----------------------------|-------------------------------|------------------------|---------------------|------------------|
| 1                | 1                | Quinobequin Road  | 54                 | Electrical Power      | 5                | Main Switch         | 3                           | 4                             | 4                      | 1084                | Priority 1       |
| 2                |                  |                   |                    | HVAC                  | 5                | HVAC Dry Well       | 3                           | 5                             | 4                      | 1084                | Priority 1       |
| 3                |                  |                   |                    | Structures (Wet Well) | 4                | Influent Valve      | 5                           | 4                             | 5                      | 1084                | Priority 1       |
| 4                |                  |                   |                    | Centrifugal Pumps     | 5                | Pump 4              | 4                           | 3                             | 3                      | 813                 | Priority 1       |
| 5                |                  |                   |                    | Structures (Wet Well) | 4                | Wet Well            | 4                           | 3                             | 3                      | 650                 | Priority 1       |
| 6                |                  |                   |                    | Centrifugal Pumps     | 5                | Pump 1              | 3                           | 3                             | 2                      | 542                 | Priority 1       |
| 7                |                  |                   |                    | Centrifugal Pumps     | 5                | Pump 2              | 3                           | 3                             | 2                      | 542                 | Priority 1       |
| 8                |                  |                   |                    | Centrifugal Pumps     | 5                | Pump 3              | 3                           | 3                             | 2                      | 542                 | Priority 1       |
| 9                |                  |                   |                    | Electrical Power      | 5                | Junction Box        | 3                           | 3                             | 2                      | 542                 | Priority 1       |
| 10               |                  |                   |                    | HVAC                  | 5                | HVAC Wetwell        | 3                           | 1                             | 2                      | 542                 | Priority 1       |
| 11               |                  |                   |                    | Motors                | 5                | Motor 1             | 3                           | 1                             | 2                      | 542                 | Priority 1       |
| 12               |                  |                   |                    | Motors                | 5                | Motor 2             | 3                           | 1                             | 2                      | 542                 | Priority 1       |
| 13               |                  |                   |                    | Motors                | 5                | Motor 3             | 3                           | 1                             | 2                      | 542                 | Priority 1       |
| 14               |                  |                   |                    | Motors                | 5                | Motor 4             | 3                           | 1                             | 2                      | 542                 | Priority 1       |
| 15               |                  |                   |                    | VFD                   | 5                | VFD                 | 3                           | 1                             | 2                      | 542                 | Priority 1       |
| 16               |                  |                   |                    | Piping and Valves     | 4                | Discharge Valve 1   | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 17               |                  |                   |                    | Piping and Valves     | 4                | Discharge Valve 2   | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 18               |                  |                   |                    | Piping and Valves     | 4                | Discharge Valve 3   | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 19               |                  |                   |                    | Piping and Valves     | 4                | Discharge Valve 4   | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 20               |                  |                   |                    | Piping and Valves     | 4                | Suction Valve 1     | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 21               |                  |                   |                    | Piping and Valves     | 4                | Suction Valve 2     | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 22               |                  |                   |                    | Piping and Valves     | 4                | Suction Valve 3     | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 23               |                  |                   |                    | Piping and Valves     | 4                | Suction Valve 4     | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 24               |                  |                   |                    | Structures (Wet Well) | 4                | Flow Meter          | 3                           | 1                             | 2                      | 434                 | Priority 2       |
| 25               |                  |                   |                    | Generators            | 3                | Emergency Generator | 3                           | 1                             | 2                      | 325                 | Priority 2       |
| 26               |                  |                   |                    | Structures            | 3                | Building            | 3                           | 3                             | 2                      | 325                 | Priority 2       |
| 27               |                  |                   |                    | Electrical Power      | 5                | Control Panel       | 1                           | 1                             | 1                      | 271                 | Priority 3       |
| 28               |                  |                   |                    | Electrical Power      | 5                | MCC                 | 2                           | 1                             | 1                      | 271                 | Priority 3       |



# Assessment Results



# Developing a CIP that is Practical

**CIP PROJECT 1  
ENGINEERING  
ACTIVITIES**

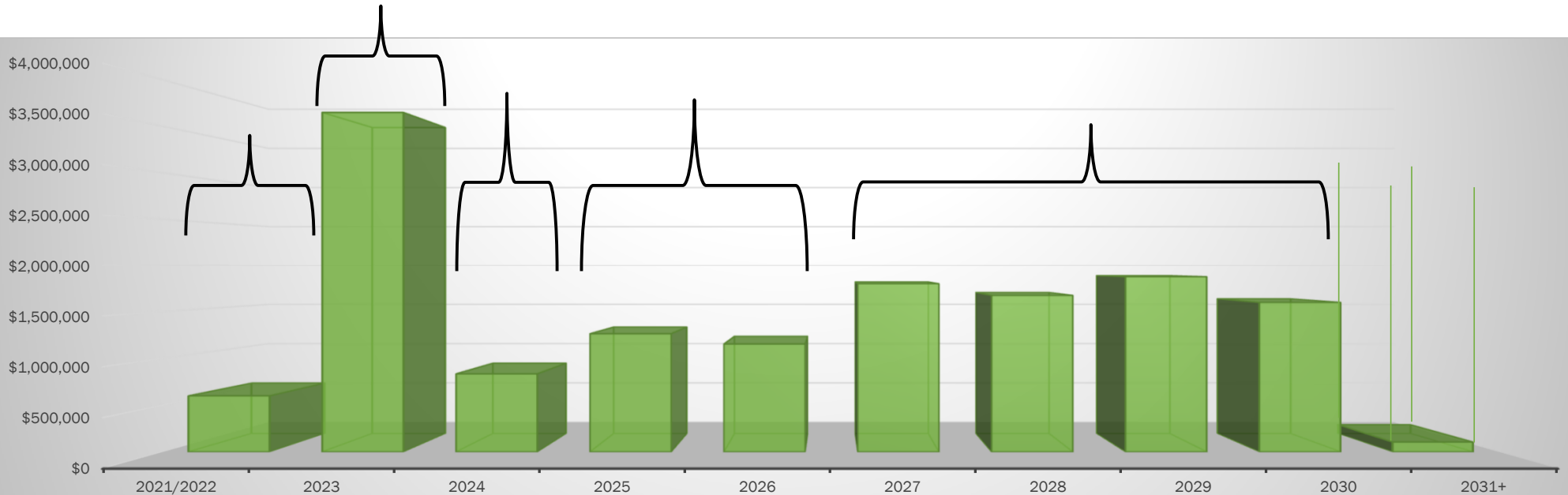
**CIP PROJECT 1  
CONSTRUCTION  
MOST CRITICAL  
ISSUES ARE  
ADDRESSED  
NON-REACTIVE  
STATE ACHIEVED**

**REHAB  
VALVE  
REPLACEMENT  
PUMP  
REPLACEMENT**

**ENGINEERING  
AND  
CONSTRUCTION  
ELECTRICAL  
REPLACEMENT  
BUILDING REHAB  
ADDITIONAL  
PUMP  
REPLACEMENTS**

**ENGINEERING AND  
CONSTRUCTION  
REPLACEMENT OF PUMPS  
AT LARGEST PUMP  
STATIONS**

**2029 AND BEYOND  
REASSESS FACILITIES.  
BEGIN SYSTEMATIC  
ELECTRICAL AND  
INSTRUMENTATION  
REPLACEMENTS.**



## Important Takeaways

- Collect and organize historical data early, identify operations staff to champion
- Ensure a competent consistent field team performs field assessments
- Understand the scoring system
- Communicate your goals and budgetary constraints
- Perform review of preliminary assessment results
- Provide continuous presence throughout the project

Questions