# Wastewater Resilience Planning

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# Presentation Outline

**Wastewater Resilience Planning**

1. Introduction
2. Assessment Methodology
3. Evaluation Results
4. Conclusion
5. Q&A

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# Introduction

Wastewater Resilience Planning

# Introduction

Presenters

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  Sewer Authority Mid-Coastside, Half Moon Bay, CA

# Introduction

The Sewer Authority Mid-Coastside (SAM) is a coalition of three entities on California's Pacific coast 30 miles (48 km) south of San Francisco

- City of Half Moon Bay
- Granada Community Services District
- Montara Water and Sanitary District


Granada Community Services District

Montara Water and Sanitary District

# Introduction

SAM provides wastewater treatment services and contract wastewater collection services for approximately 30,000 people in these 6 communities:

- City of Half Moon Bay
- El Granada
- Miramar
- Montara
- Moss Beach
- Princeton by the Sea

# Introduction

SAM's assets:

- 3 regional wastewater pumping stations
- 6.5 miles (10.5 km) of force mains and interceptors
- 1 regional wastewater treatment plant
- 1 ocean outfall

# Introduction

- Water agencies in the United States are required to prepare vulnerability assessment per the Environmental Protection Agency

- Although not required, wastewater agencies prepare similar assessments to reduce risk of service failures

- Resilience planning is the product of these assessments

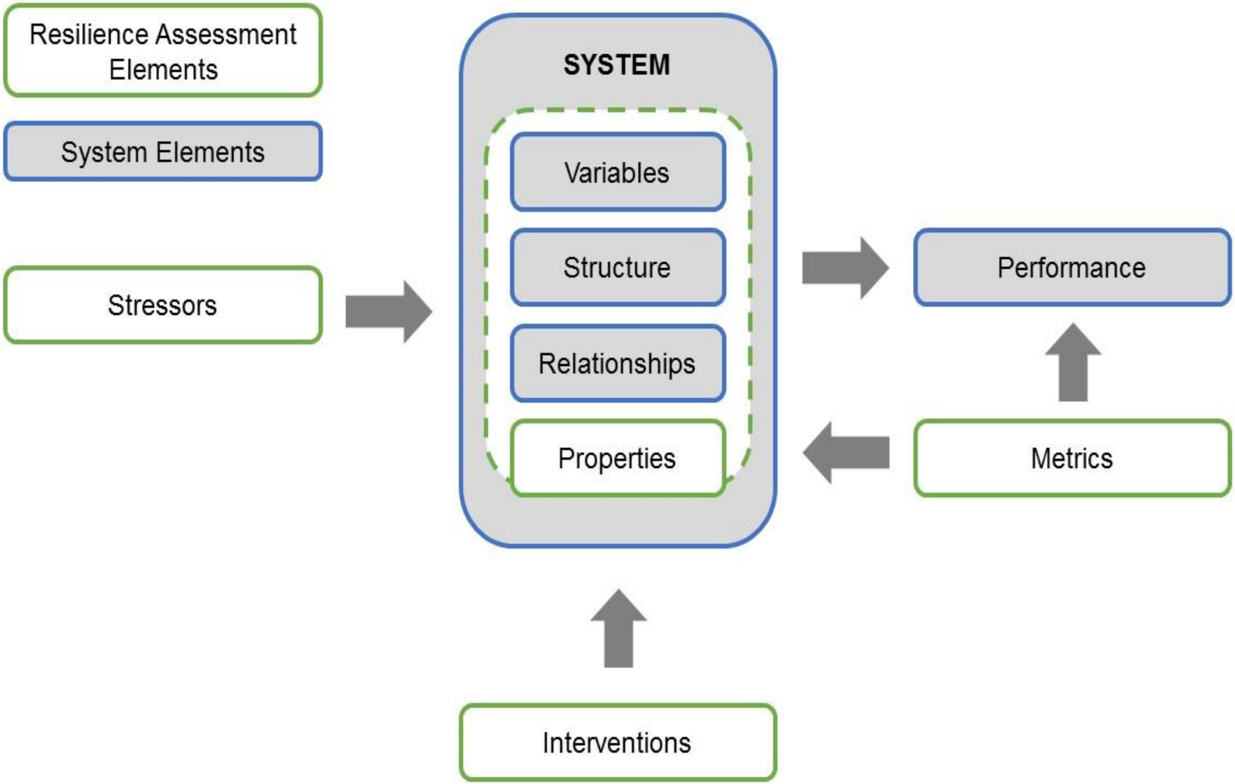
# Introduction

- Resilience in ecology:

  Capacity of an ecosystem to survive, adapt, and grow in the face of unforeseen changes

- Resilience in engineered systems:

  Capacity of the system to absorb disturbance while undergoing change so as to retain the same function, structure, identity, and response mechanisms


Resilience Assessment Elements
System Elements
Stressors
SYSTEM
Variables
Structure
Relationships
Properties
Performance
Metrics
Interventions

# Stressors to SAM's WWTP Assets

- Malevolent: sabotage of physical and cyber assets
- Natural: flooding, wild fires, earthquake
- Electro-mechanical failure
  - General failure
  - Lack of spare parts
  - Age

1 Introduction

2 **Assessment Methodology**

Wastewater Resilience Planning

# Assessment Methodology

- Performance Goals of SAM's WWTP:

  Average dry weather flow 4 MGD (18,200 m3/day)

  Peak wet weather capacity – 15 MGD (68,200 m3/day)

- Challenges to Meeting Performance Goals

  Lack of emergency storage

  Lack of redundancy

  Aging infrastructure

# Evaluation of SAM's Assets

- Assets were evaluated based on their criticality to the overall performance of the WWTP and pump stations

- Evaluation identified assets that if fail could result in:
  - *Prolonged or widespread interruption of service*
  - *Degradation of other systems*
  - *Injuries/fatalities*
  - *Detrimental economic impact to SAM or the community*
  - *Detrimental environmental impact*

# Age of SAM's Assets

| Asset Type | Useful Life (years) | Current Age (years) |
|---|---|---|
| Pipelines | 50 | 32 |
| Structures | 30 to 50 | 16 to 32 |
| Process Equipment | 15 to 20 | 30 |
| Auxiliary Equipment | 10 to 15 | 30 |

# Probability of Failure

| Rate of occurrence: | Once in 10 years | Once in 5-10 years | Once in 3-5 years | Once in 1-3 years | Less than once/yr. |
|---|---|---|---|---|---|
| Probability of failure rating: | 0.5 | 2.5 | 5.0 | 7.5 | 10.0 |

# Consequence of Failure

Three criteria were considered:

1. *Impact on the WWTP effluent quality*
2. *Impact on the WWTP treatment capacity*
3. *Ability to return the equipment to service (including staff)*

# Consequence of Failure

| Criteria | Relative Weight | Anticipated Consequences | | |
|---|---|---|---|---|
| Effluent quality | 33% | none | Mid-term Non-compliance | Immediate Non-compliance |
| Treatment capacity | 33% | none | No more redundancy or peak capacity <15 MGD | Failed process or average capacity <4 MGD |
| Ability to return to service | 34% | Immediate repair replacement possible | Repair possible before treatment is impacted | No contingency plan preparedness uncertain |
| Criteria rating: | | 1 = negligible | 5 = low | 10 = severe |
| Consequence rating: | | Sum of the three weighted criteria ratings | | |

# Determining Risk Score

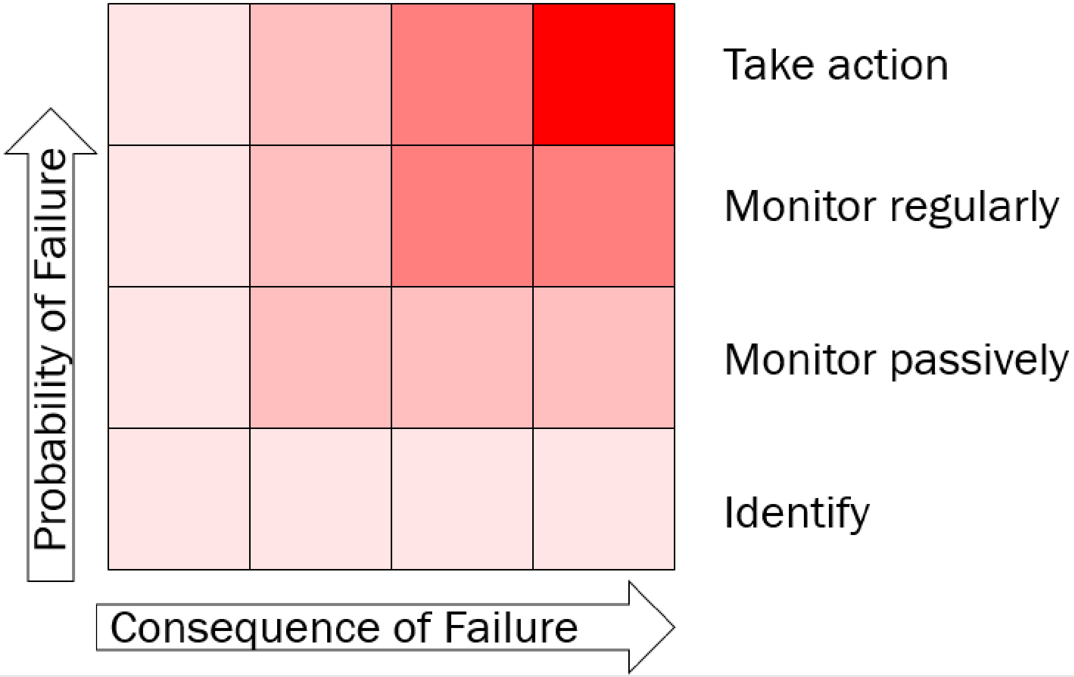
Risk Score = Probability of Failure Rating x Consequence Rating

Example:

| Asset | Probability of Failure Rating | Consequence of failure | | | Consequence of Failure Rating | Risk Score |
|---|---|---|---|---|---|---|
| | | Quality | Capacity | Service-ability | | |
| | | 33% | 33% | 34% | | |
| Belt filter press | 10 | 5 | 10 | 10 | 8.4 | 84 |

$$\text{Risk Score} = 10 \times (5 \times 0.333 + 10 \times 0.333 + 10 \times 0.344) = 84$$

# Risk Scores Used to Prioritize Projects



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3 **Assessment Results**

Wastewater Resilience Planning

# Assessment Results

- 50 major projects identified
- Projects ranked according to Risk Score from lowest to highest
- Projects further prioritized:

  Mandatory – regulatory or safety driven

  *must do*

  Replacement and Rehabilitation

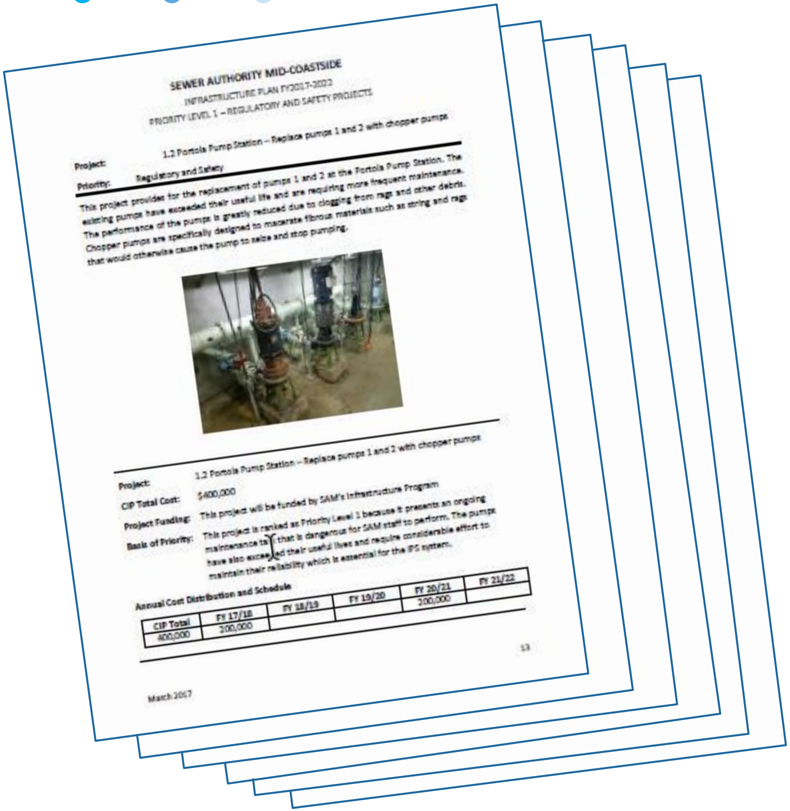
  *must be done*

  Sustainability, energy reduction, optimization

  *should be done*

# Assessment Results

- 5 year capital improvement plan
- $22.0 million in projects
- Update each year
- Proactive funding
- Risk reduction



SEWER AUTHORITY MID-COASTSIDE
INFRASTRUCTURE PLAN FY2017-2022
PRIORITY LEVEL 1 – REGULATORY AND SAFETY PROJECTS

**Project:** 1.2 Portola Pump Station – Replace pumps 1 and 2 with chopper pumps
**Priority:** Regulatory and Safety

This project provides for the replacement of pumps 1 and 2 at the Portola Pump Station. The existing pumps have exceeded their useful life and are requiring more frequent maintenance. The performance of the pumps is greatly reduced due to clogging from rags and other debris. Chopper pumps are specifically designed to macerate fibrous materials such as string and rags that would otherwise cause the pump to seize and stop pumping.

**Project:** 1.2 Portola Pump Station – Replace pumps 1 and 2 with chopper pumps
**CIP Total Cost:** $400,000
**Project Funding:** This project will be funded by SAM's Infrastructure Program
**Basis of Priority:** This project is ranked as Priority Level 1 because it presents an ongoing maintenance task that is dangerous for SAM staff to perform. The pumps have also exceeded their useful lives and require considerable effort to maintain their reliability which is essential for the IPS system.

**Annual Cost Distribution and Schedule**

| CIP Total | FY 17/18 | FY 18/19 | FY 19/20 | FY 20/21 | FY 21/22 |
|---|---|---|---|---|---|
| 400,000 | 200,000 | | | 200,000 | |

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March 2017

# SAM's Wastewater Resilience Projects

## Wastewater Pumping Station Rehabilitation

# SAM’s Wastewater Resilience Projects

## Force Main Replacement

# SAM's Wastewater Resilience Projects

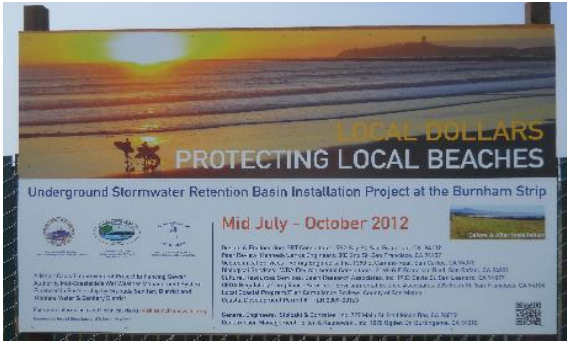
Force Main By-Pass Improvements

# SAM's Wastewater Resilience Projects

Interceptor Repairs and CIPP Lining

# SAM’s Wastewater Resilience Projects

## Wet Weather Storage Facility



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# Conclusion

Wastewater resilience planning:

- *Improves safety*
- *Improves reliability*
- *Reduces risk of failure*
- *Allows systematic modernization of facilities*
- *Prioritizes competing projects*
- *Allows more predictable funding vs reactionary spending*

# Q&A