



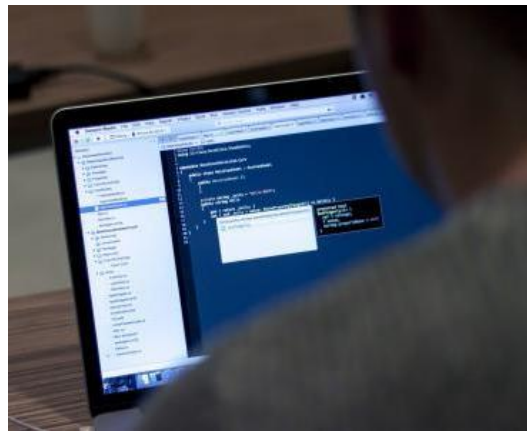
How to Build Resilience of Your Wastewater Utility to Disasters using EPA's Free Tools

David Goldbloom-Helzner

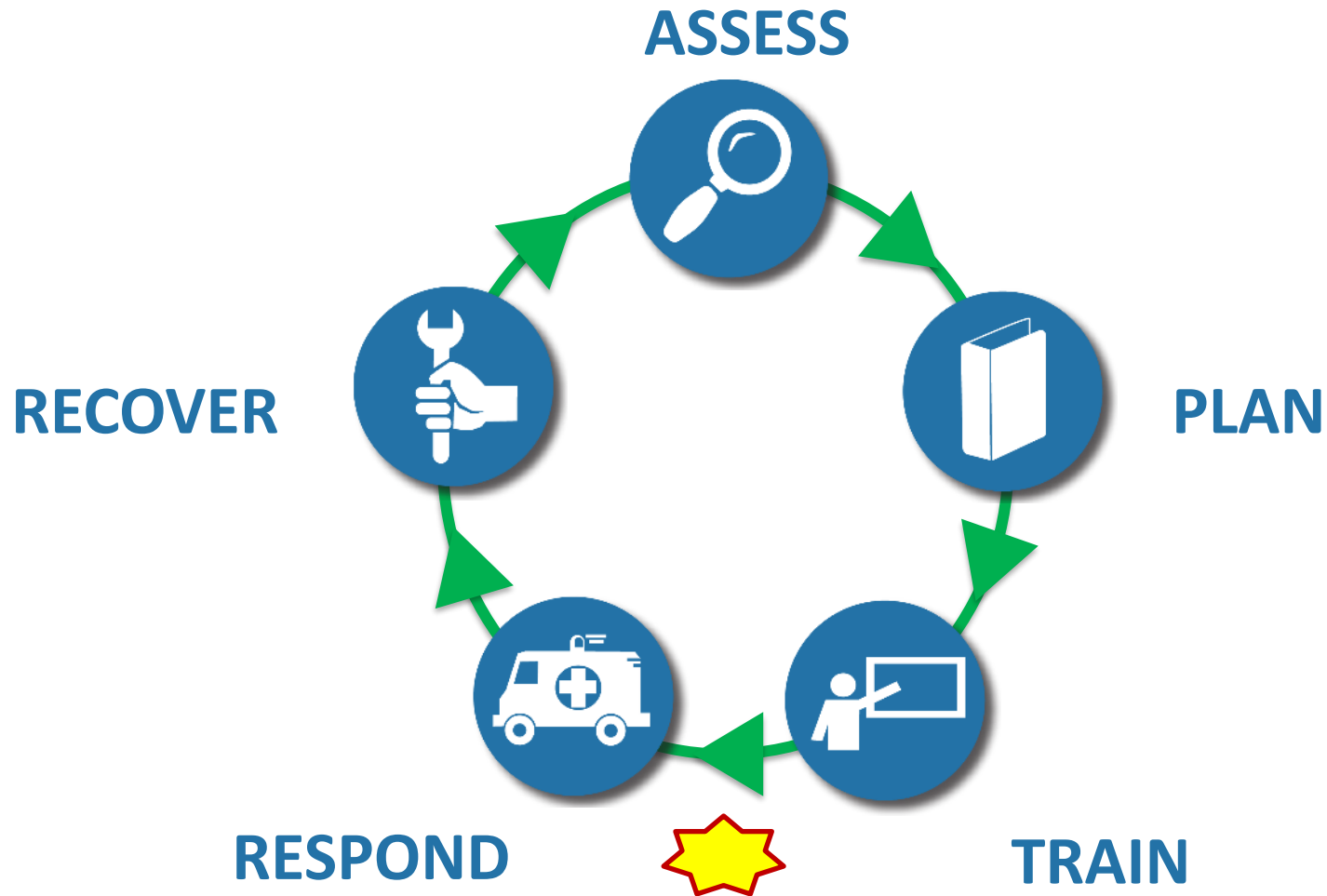
EPA Office of Water

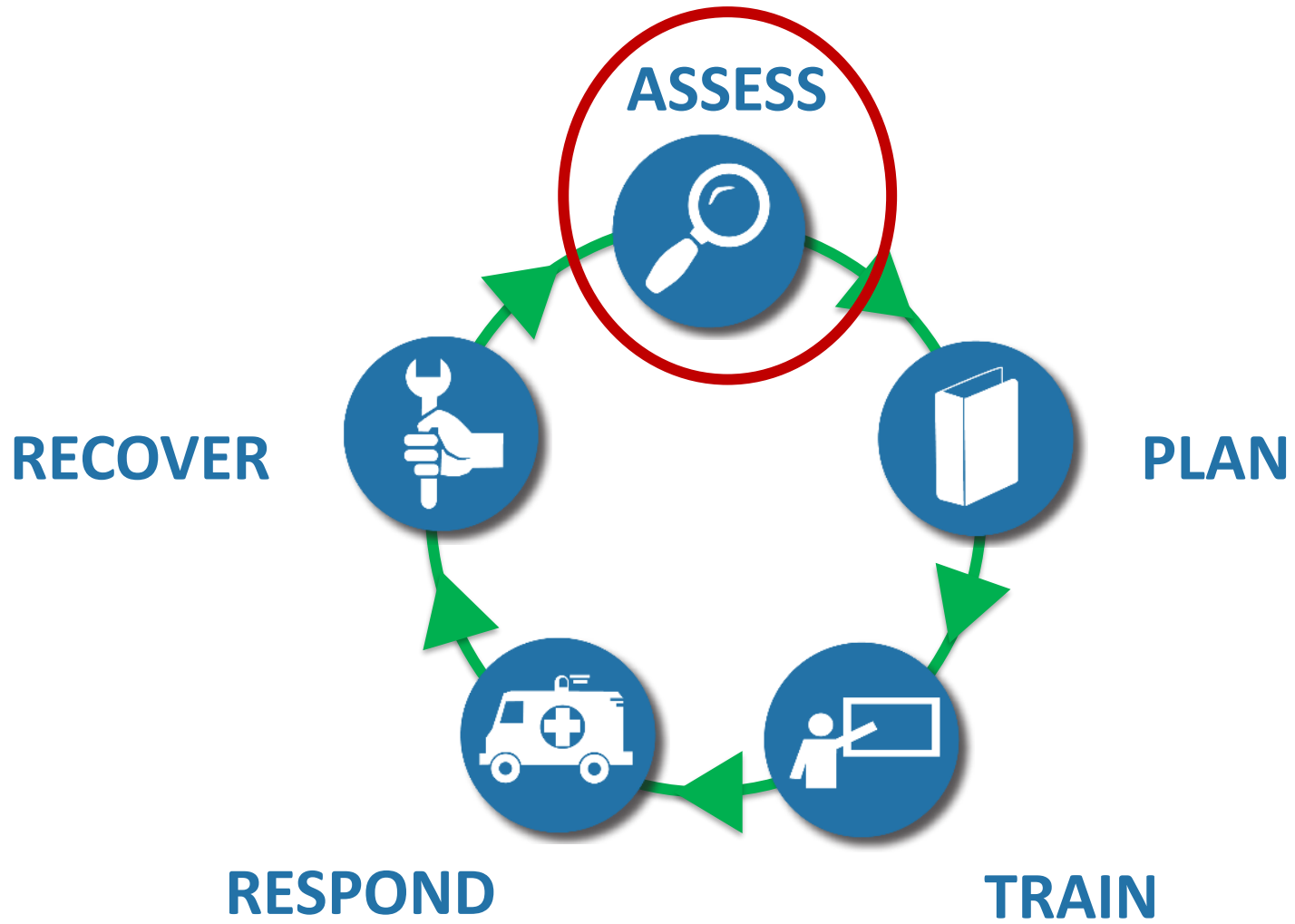
Goldbloom-Helzner.David@epa.gov

Disasters and Wastewater Utilities



Resilience Framework



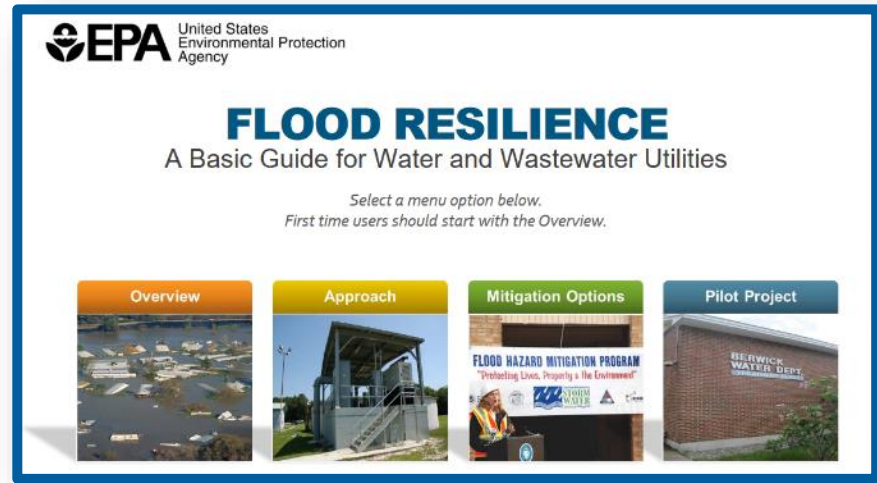




Tools to Assess Risk/Resilience (both water and wastewater utilities)

• Resilience Guides

- Floods
- Earthquakes
- Drought
- Power
- Malevolent Acts

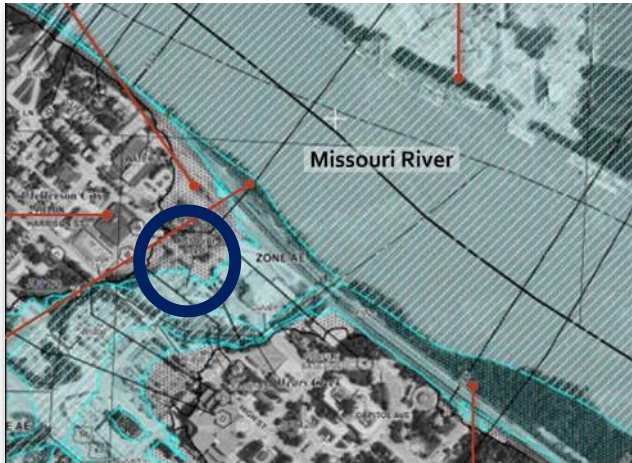


• Vulnerability Self-Assessment Tool

• Climate Resilience Evaluation and Awareness Tool (CREAT)

- heavier precipitation, drought, sea level rise, etc. (presentation in July)

FEMA Flood maps: 100 and 500-year flood



Elevation Survey



Determine Critical Assets that are Priority for Mitigation

Asset/ Operation	Vulnerability				Consequences		Priority for Mitigation ⁵				
	1	2	3	4	5	6	7	8	Low (✓)	Moderate (✓)	High (✓)
	Height of Asset Above Floor (ft) ¹	Elevation of Asset (ft) ²	Elevation of Flood Threat (ft) ³	Vulnerable to Flooding? (Yes/No) ⁴	Replacement Costs (\$) for Asset	Impact to Facility Operations from Asset Failure					
Raw Water Pump	0.5	238.5	240	Yes	20,000	Inability to feed raw water to the process tanks will render the facility inoperable.					✓
Air Compressor	0.75	238.75	240	Yes	15,000	Inability to provide high air pressure will limit the operation of pneumatic valves on the treatment process systems. This will render facility inoperable.					✓
Automatic Transfer Switch	2.5	240.5	240	No	5,000	If water damaged the Automatic Transfer Switch, the facility would be inoperable.	✓				
Electrical Outlets	2.5	240.5	240	No	5,000	The outlets for general use are not critical to facility operations and they are located above the 500-year flood elevation.	✓				



Identify Mitigation Measures for your Assets

DW Assets



DW & WW Assets

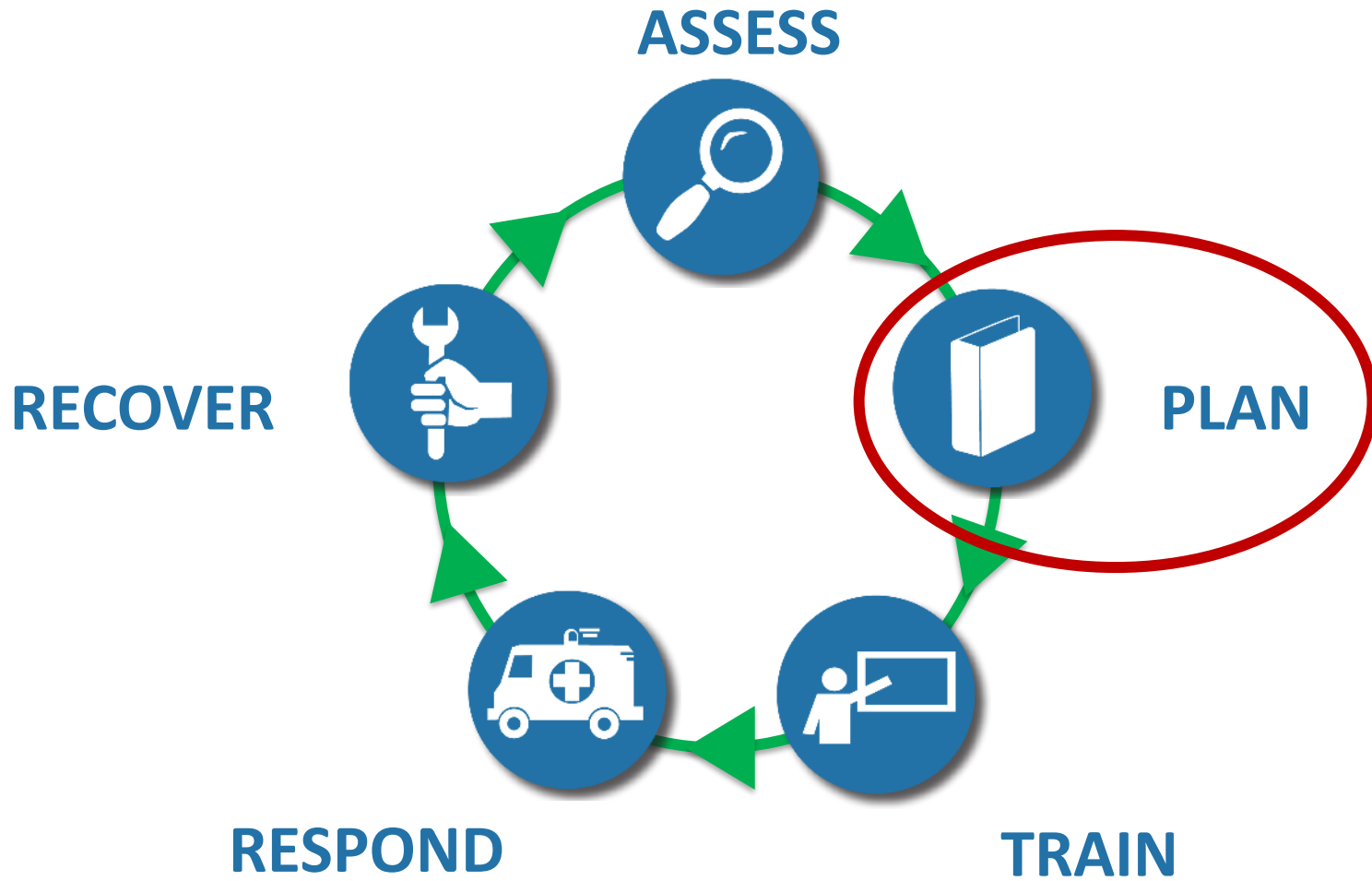


WW Assets





✓	Mitigation Options for Collection System Lift Stations	Cost
1. Prevent lift stations from flooding.		
	a. Procure temporary flood barriers (e.g., sandbags) for use in minor floods.	\$
	b. Extend vent lines above anticipated flood stage to prevent floodwater from entering the lift station.	\$-\$\$
	c. Install gates and backflow prevention devices on influent and emergency overflow lines to prevent inundation of the lift station by the collection system and the overflow.	\$
	d. Install permanent physical barriers (e.g., flood walls, levees, sealed doors).	\$\$
	e. Install green infrastructure to attenuate or divert flood water and storm surges away from lift stations.	\$\$
2. Protect critical components if lift stations do flood.		
	a. Install unions in the conduit system to reduce the time required to repair damaged sections.	\$
	b. During upgrades or design of new equipment, develop capability to temporarily remove and safely store vulnerable components before a flood when there is enough advanced notice to do so.	\$-\$\$\$



Wastewater Utility Emergency Response Plan (ERP): Template and Instructions **New!**

TABLE OF CONTENTS

- 1. UTILITY INFORMATION.....**
 - 1.1 Utility Overview
 - 1.2 Personnel Information
 - 1.3 Utility Components
 - 1.4 Industry Chemical Handling and Storage Facilities
 - 1.5 Safety
 - 1.6 Response Resources
 - 1.7 Key Local Services
- 2 RESILIENCE STRATEGIES**
 - 2.1 Emergency Response Roles
 - 2.2 Incident Command System (ICS) Roles

- 2.3 Communication
- 2.3.1 Internal Communication
- 2.3.2 External Response Partner Communication
- 2.3.3 Critical Customer Communication
- 2.3.4 Communication Equipment Inventory
- 2.4 Media Outreach
- 2.5 Public Notification Templates.....
- 3 EMERGENCY PLANS AND PROCEDURES**
 - 3.1 Core Response Procedures.....
 - 3.2 Incident-Specific Response Procedures
- 4 MITIGATION ACTIONS**
 - 4.1 Storage and Treatment Mitigation Actions
 - 4.2 Other Mitigation Actions
- 5 DETECTION STRATEGIES.....**

AWIA also requires an emergency response plan for water systems



2.1 Emergency Response Roles

Describe the roles and responsibilities for key utility and external response partner personnel in the tables below. You can add, edit, or delete rows as necessary.

Wastewater Utility and Partner Roles

Name/Title	Emergency Response Role	Responsibilities
<i>Wendy Smith, Deputy Superintendent</i>	<i>Emergency Response Lead</i>	<i>Responsible for all incident response activities, including developing strategies and tactics and ordering and releasing resources.</i>
<i>John Doe, Operations Chief</i>	<i>Alternate Emergency Response Lead</i>	<i>Perform duties as assigned by ER Lead; assumes duties listed above when ER Lead is not available.</i>
<i>Jim Rogers, County Public Affairs Officer</i>	<i>Public Information</i>	<i>Responsible for leading the public information effort based on information supplied by either the ER or Alternate ER Lead.</i>
<i>Jane Kelly, Chief of Police</i>	<i>Security</i>	<i>Will provide incident security as needed once notified by ER Lead.</i>
Other		
Other		
Other		

5 DETECTION STRATEGIES

This section contains strategies that can be used to aid in the detection of malevolent acts or natural hazards that threaten the security or resilience of the system.

List the detection strategies and methods your utility uses to aid in the detection of malevolent acts or natural hazards. Also list the corresponding procedure to be used if the threat is detected.

Detection Strategies

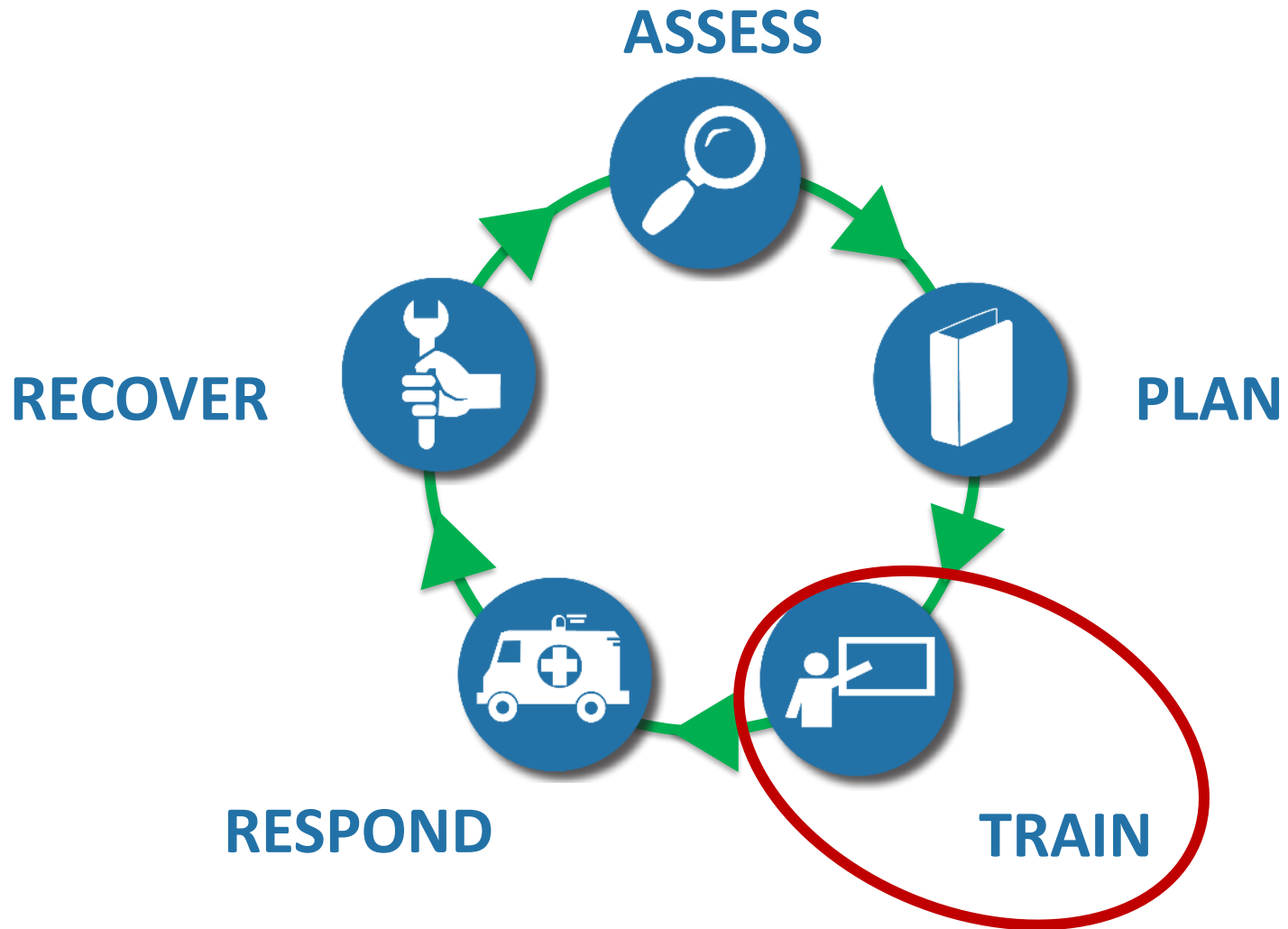
Threat	Detection Method	Plan/Procedure
<i>Unauthorized entry</i>	<ul style="list-style-type: none">• <i>Alarm from intrusion detection system</i>	<i>Call 911</i>
<i>Influent contamination</i>	<ul style="list-style-type: none">• <i>Notification from 911 for releases resulting from transportation accidents</i>	<i>Influent Contamination Incident Response Plan</i>
<i>Cyber intrusion</i>	<ul style="list-style-type: none">• <i>Automated IT and operation technology (OT) system intrusion detection monitoring</i>• <i>Notification from utility staff</i>	<i>Cybersecurity Response Plan, Cyber Incident Action Checklist</i>
<i>Hazardous chemical release</i>	<ul style="list-style-type: none">• <i>Chlorine gas in air monitors</i>	<i>Call Fire Department, Chlorine Leak Response Plan, Exposure and Planned Entry Procedures</i>
<i>Hurricane</i>	<ul style="list-style-type: none">• <i>Weather Service alerts</i>	<i>Hurricane Response Plan, Hurricane Incident Action Checklist</i>
<i>Flood</i>	<ul style="list-style-type: none">• <i>Notification from National Weather Service</i>	<i>Flood Response Plan, Flood Incident Action Checklist</i>
<i>Power outage</i>	<ul style="list-style-type: none">• <i>Notification from energy provider</i>• <i>Alarm from line power sensor</i>	<i>Commercial Power Outage Response Plan, Generator Start-up Checklist</i>
<i>Other</i>		



Besides an ERP:

- Join Mutual Aid – Water/Wastewater Agency Response Network (WARN)
 - utilities helping utilities
 - Need personnel (repair crews), equipment (pipe, pumps, generators)
 - <https://www.epa.gov/waterutilityresponse/mutual-aid-and-assistance-drinking-water-and-wastewater-utilities>
- Identify your response partners
- Develop Crisis Communication Plan
- Get involved in local Hazard Mitigation Planning

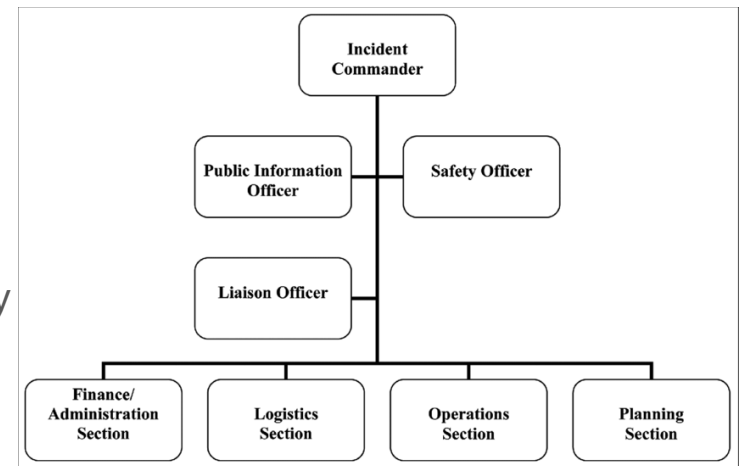


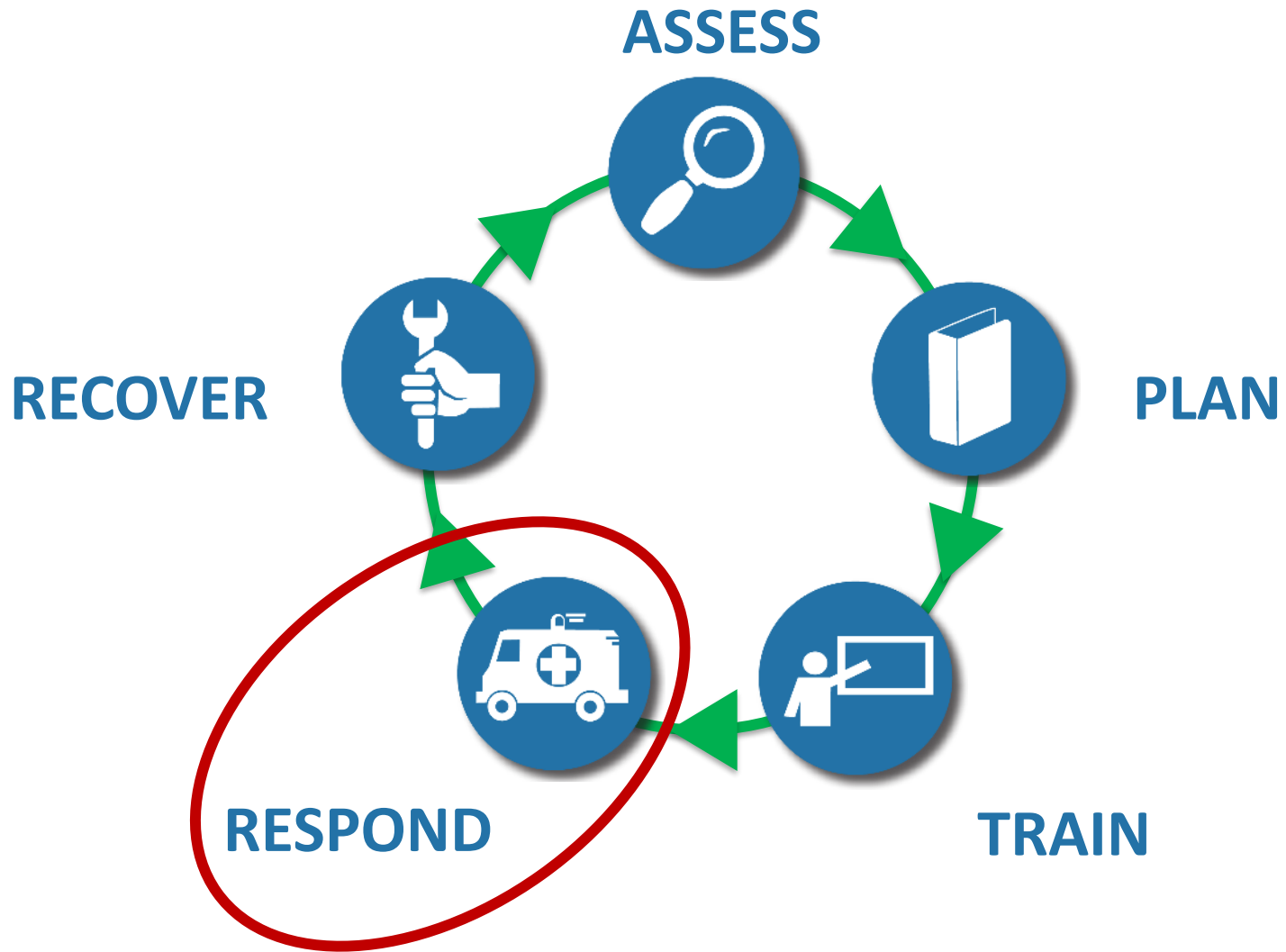




Opportunities for Training

- Emergency Response Plan
- Emergency Exercises
 - Tabletop Exercise Tool (TTX tool)
 - 12 Scenarios
 - <https://www.epa.gov/waterresiliencetraining/develop-and-conduct-water-resilience-tabletop-exercise-water-utilities>
- Incident Command System Training
 - Remote and in-person
 - On-line at <https://www.epa.gov/waterresiliencetraining/emergency-management-training-water-and-wastewater-utilities>







Response Tools

- Incident Action Checklists
- Water Utility Response On-The-Go App
- Wastewater Response Protocol Toolbox

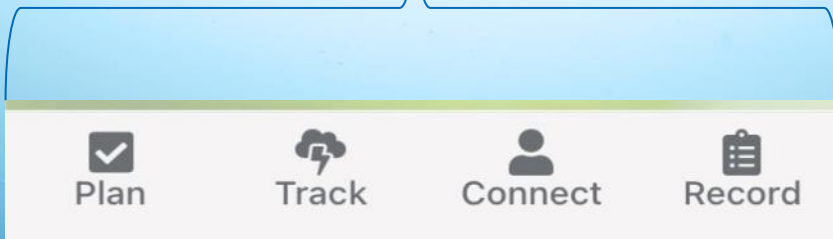
EPA Water Sector Incident Action Checklists

Drought, Earthquake, Extreme Cold, Winter Storms, Extreme Heat, Flood, HAB, Hurricane, Tornado, Tsunami, Volcano, Wildfire, Cyber, Power, and Pandemic



PRINT OUT THE CHECKLISTS YOU NEED AND BE READY TO TAKE ACTION:
<http://water.epa.gov/infrastructure/watersecurity/emerplan/index.cfm#pp29>

Water Utility Response On-The-Go App





Wastewater Response Protocol Toolbox: Planning For and Responding To Wastewater Contamination Threats and Incidents

December 2011



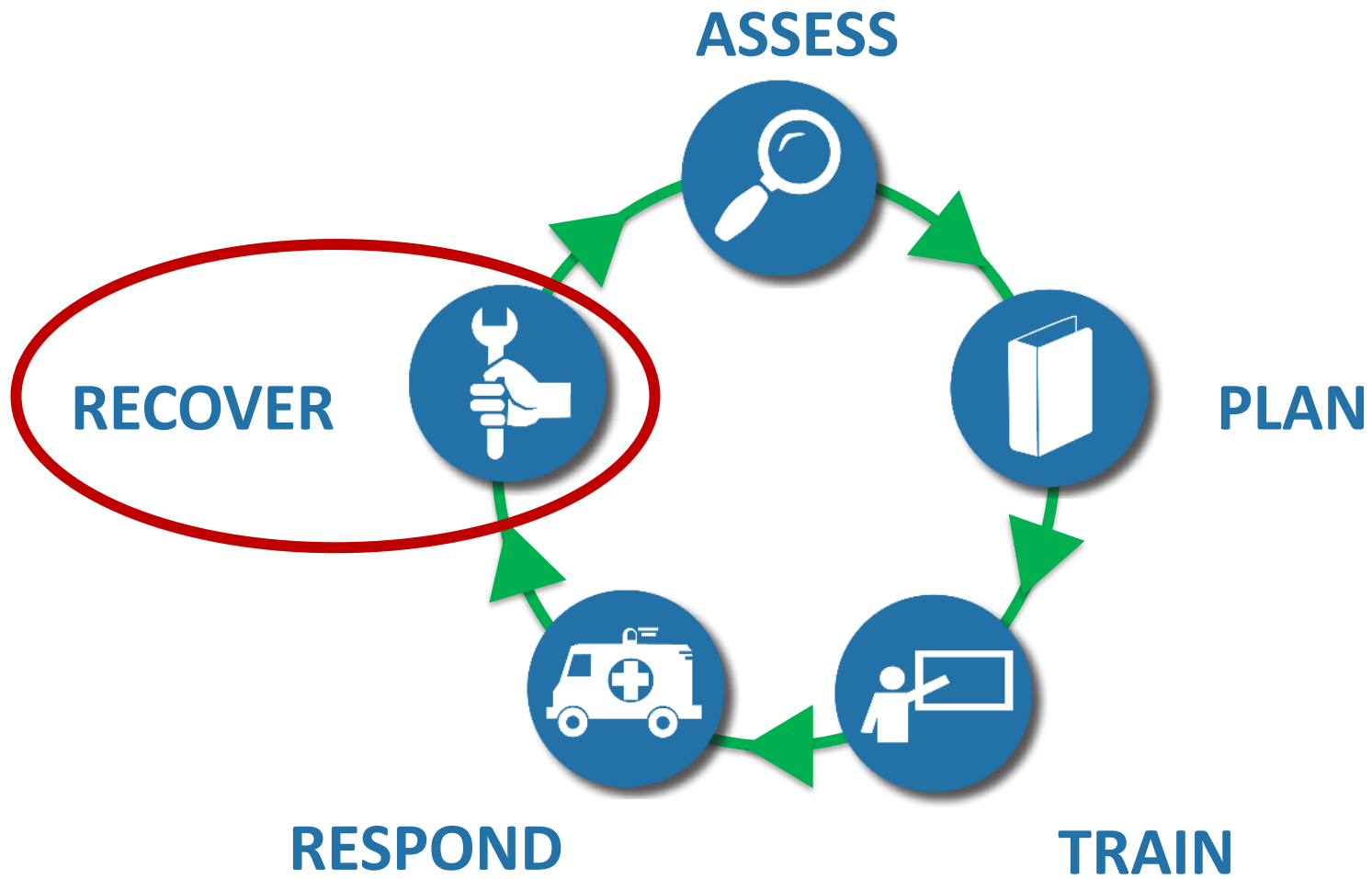


Wastewater Response Protocol Toolbox

- Protect wastewater systems from contamination
- Identify credible incidents and dismiss false alarms
- From discovery to remediation to normal operations

Toolbox Module

1. Wastewater Utility Planning Guide
2. Contamination Threat Management Guide
3. Site Characterization and Sampling Guide
4. Analytical Guide
5. Public Health and Environmental Impact Response Guide
6. Remediation and Recovery Guide





Recovery

- Major repairs
- Mitigation measures
- Back to full or improved operations or compliance
- Long-term efforts require time and funding



e Funding

from EPA, FEMA and HUD.



Fund
Stori



Explore
opport

4

Fed FUNDS tool

epa.gov/fedfunds

information tailored to water and wastewater utilities on federal disaster and mitigation funding. Search by type of utility (e.g. public, private non-profit) and see numerous success stories in your area.

Look at

More Details on Funding

Keys to A



Search for Right Funding

Answer the questions below to find the best federal disaster funding program(s) for your utility. Click the button to answer the question. The appropriate funding programs will appear and then, click on them to learn more. Additionally, you can print a report of the search results.

1. Based on the following sectors, how would you classify your water/wastewater utility?

- Public
- Private Non-Profit
- Private For-Profit

2. Do you want to learn about funding opportunities to repair damage to your utility from an emergency?

- Yes
- No

Applicable programs include:

- [FEMA Public Assistance](#)
- [HUD Community Development Block Grant and Section 108 Loans](#)

3. Are you seeking funding for mitigation activities that reduce losses from future disaster damages?

Yes

No

Applicable programs include:

- [EPA State Revolving Fund and WIFIA](#)
- [FEMA Hazard Mitigation Assistance \(3 grants\)](#)

4. Are you a rural utility (population less than 10,000)?

Yes

No

Applicable programs include:

- [USDA Emergency Community Water Assistance Grants](#)
- [USDA Water and Disposal Loan Program \(PDF\)](#)

e Funding

from EPA, FEMA and HUD.



Fund
Stori



Explore
opport

4

information tailored to water and wastewater utilities on federal disaster and mitigation funding. Search by type of utility (e.g. public, private non-profit) and see numerous success stories in your area.

epa.gov/fedfunds

ok at

More Details on Funding



Keys to A



[Funding](#)
[at Funding](#)

- [FEMA Public Assistance Grants](#)
- [FEMA Hazard Mitigation Assistance](#)
- [EPA State Revolving Loans and W/FIA](#)
- [HUD Community Block Grants and](#)

- [Reimbursement](#)
- [Combine Funding](#)
- [Prepare for Fund](#)

FEMA Mitigation Funding



Contact your local grants manager or emergency management agency



EPA Funds

- Clean Water State Revolving Funds
- Water Infrastructure Finance Investment Act
- Resilience Uses:
 - Relocation/elevation of treatment plants
 - Physical flood barriers (e.g., sea walls, levies, dikes, berms)
 - Backup generators (new or replacement) and fuel transport/storage
 - Wind Resistance
 - Drought contingency plans
 - Wells – additional, replacement, deepening
 - Intakes – reposition, relocation, elevation, alternative, backup
 - Vulnerability assessments and operational security (cyber)
 - Improves performance/reliability and eliminates sanitary sewer overflows

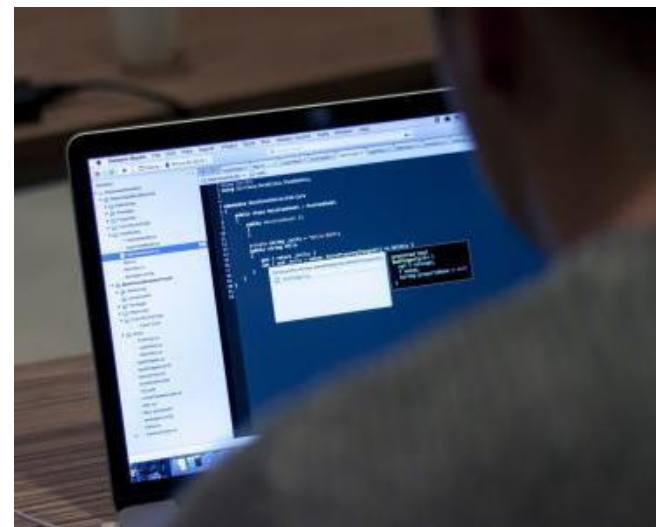


Clean Water
State Revolving Fund

Cyber and CWSRF

Supporting Cybersecurity Measures with the CWSRF
See https://www.epa.gov/sites/production/files/2021-05/documents/cwsrf_cybersecurity_fs_final_0.pdf

- Used to fund cybersecurity practices and measures at POTWs
- Outlines resources for free vulnerability assessments and cybersecurity training





Rural Utility Serving Population < 10,000 Check out USDA

- Water & Waste Disposal Loan & Grant Program
- Revolving Funds for Water and Wastewater Projects
- Contact local Rural Development Office
 - <https://www.rd.usda.gov/page/state-offices>



Assess



- [Conduct a risk assessment](#)
- [Create Resilient Water Utilities](#)
- [Develop water quality surveillance and response capabilities](#)
- [Adopt cybersecurity best practices and see cyber alerts](#)

Respond



- [Response On-The-Go Tool](#)
- [Print a checklist to help you respond](#)
- [Monitor severe weather](#)

Plan



- [Develop emergency response plans](#)
- [Build relationships in your community](#)
- [Access lab resources](#)
- [Build hazard resilience](#)
- [Share resources during an emergency](#)

Recover



- [Find federal funding for your utility](#)
- [Decontamination resources](#)
- [Get reimbursement tips](#)
- [Learn about the Public Assistance Program](#)

Train



- [Access the All-Hazards Boot Camp](#)
- [Develop a training and exercise plan](#)
- [Conduct tabletop exercises](#)
- [Find training opportunities](#)



Questions?

Contact

- David Goldbloom-Helzner
- EPA Office of Water
- Goldbloom-Helzner.David@epa.gov



**PROTECTING YOUR UTILITY FROM DISASTERS -
RESILIENCE PART 1 OF 2**

JUNE 24, 2021

ELKADER IOWA'S STORY

We are known for the natural beauty, scenic areas and rolling hills.



The rolling hills provide topographical challenges for our water and wastewater systems.

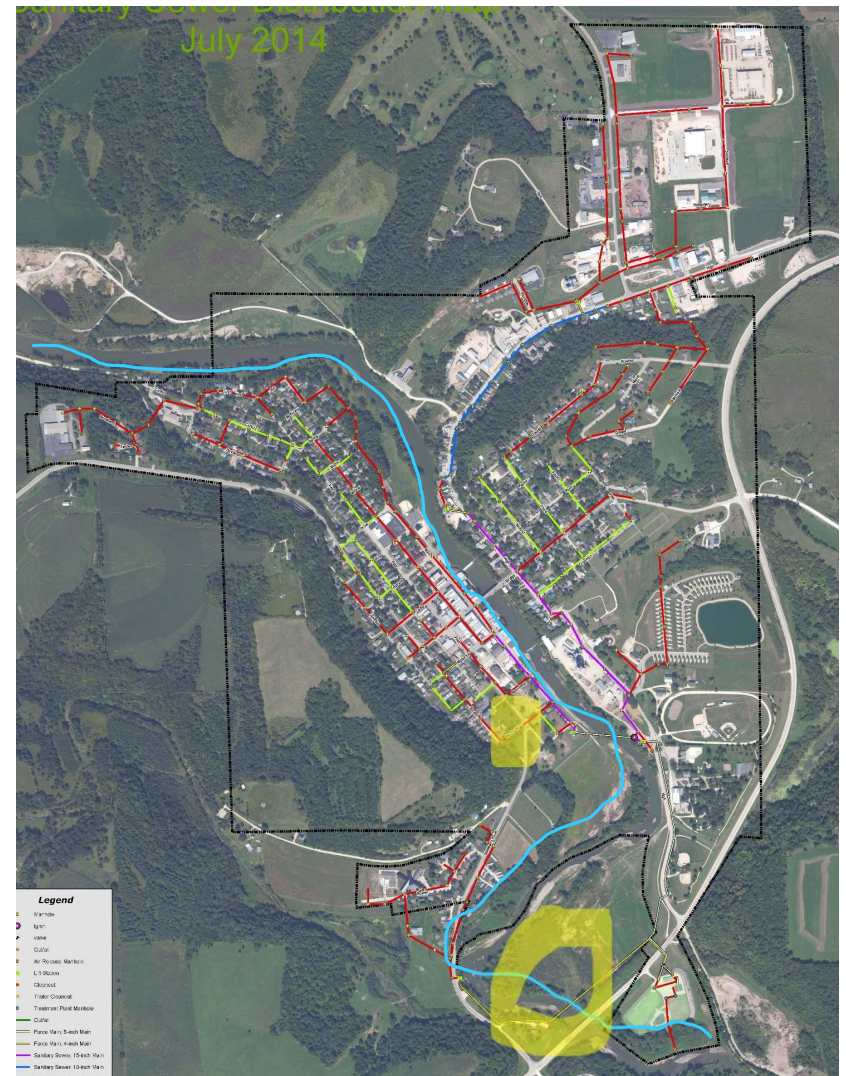


The Turkey River flows through the heart of the town.



ELKADER'S WASTEWATER SYSTEM

Highlighted are the two areas of discussion today – the “main” lift station and the wastewater treatment facility. Four of our five lift stations are along the river.



Historic Crests

- (1) 27.77 ft on 06/10/2008
- (2) 27.32 ft on 06/15/1991
- (3) 25.57 ft on 05/23/2004
- (4) 22.57 ft on 08/26/2016
- (5) 20.65 ft on 09/23/2016
- (6) 20.50 ft on 08/29/1990
- (7) 19.35 ft on 05/17/1999
- (8) 18.90 ft on 04/02/1993
- (9) 18.84 ft on 04/26/2008
- (10) 18.82 ft on 06/21/2014

Post flood of 2008





Main Lift Station –
Flood 1999



Main Lift Station –
Flood 1999



- Funding from FEMA's Hazard Mitigation Grant Program (HMGP) was secured to:
 - increase the height of an existing berm around the WWTP and lagoons
 - to build a floodwall and install flood resilient doors to protect the main lift station.
- The project was completed in October 2000 at a total cost of \$134,917 (50% from the City and 50% from HMGP funds).
- The City has since experienced major flooding in May 2004, June 2008 and 2016.
- Because of the mitigation measures, the wastewater treatment plant and lift station were not impacted and continued to operate during these floods.
- According to a FEMA Loss Avoidance Study (May 2010), the total losses avoided for the project was over 5 times the total project investment.

Both projects were completed with expenses under \$150K!

SUBGRANTEE: City of Elkader

PROJECT NUMBERS: 965-22-01 (FEMA's #0003) / 928-22-01 (FEMA's #????) new

GRANT AGREEMENT NUMBERS: 965-0001

PROJECT TITLE: Elkader Sewage Project

APPROVED SCOPE OF WORK: Raise the earthen berm surrounding the City's lagoon and construct a concrete wall around and install a steel entry door at the City's pump station at a height of at least 724.5 feet to provide 500-year flood protection

BUDGET CATEGORIES	APPROVED BUDGET (DR 965)	BUDGET CHANGES (DR 928)	PROPOSED BUDGET	FEMA-965-DR-1A		FEMA-928-DR-1A	
				FEDERAL (50%)	LOCAL (50%)	FEDERAL (50%)	LOCAL (50%)
Flood Berm (Lagoons) construction and engineering	\$110,000	\$14,917	\$124,917	\$55,000	\$55,000	\$7,459	\$7,458
Flood Wall and Steel Closure (Pump Station) construction and engineering	\$10,000	\$0	\$10,000	\$5,000	\$5,000		
TOTALS	\$120,000	\$14,917	\$134,917	\$60,000	\$60,000	\$7,459	\$7,458

Project approval was received from FEMA Region VII on 6/11/1998 (\$60,000 federal funds under FEMA-965-DR-1A)
 Amendment #1 (cost overrun, not a change in SOW) was submitted to FEMA Region VII on 5/17/2001 (\$7,459 federal funds under FEMA-928-DR-1A)

To add protection to the Main Lift they built a wall with gate like this one (still exists) and a wall around the station with a similar gate. The wall of the facility had a vent and window on the river side so the new wall was to protect that.



BERM AROUND WWTP

The WWTP was new in 2010 but during that project the berm remained the same. It was not overtopped in the flood of record in 2008.



With the Flood of Record in 2008, there were a lot of other issues so we were glad not to have to deal with the WWTP being off-line.

- a sewer main under the river broke
- a water main under the river broke
- fire station flooded
- many businesses and residences flooded



The wastewater treatment facility
after the 2008 flood.



OTHER FLOODPROOFING PROJECTS:

- updates to entire wastewater system began in 2007 and were completed in 2010
- new AeroMod treatment system
- all lift stations and WWTP have independent generators so we don't have to try to get a generator on a trailer to the site.
- the lift stations most at risk for flooding are elevated.

New Main lift station



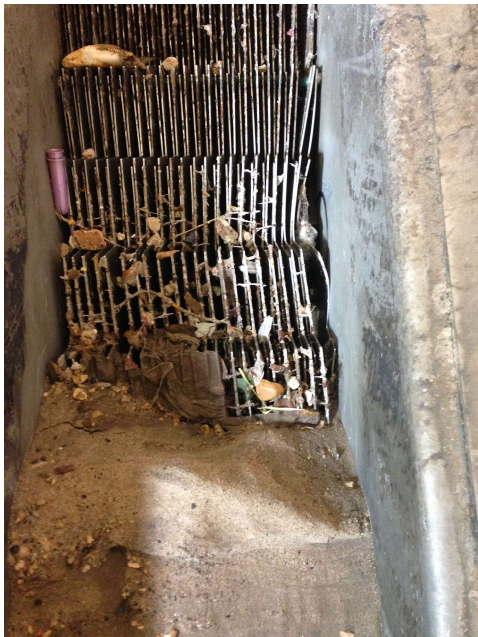
MAIN LIFT STATION
(2016 FLOOD)



The West Lift station after flood-proofing project.



Even with the planning and improvements, sometimes things happen! In the 2016 “high water event” a hole in a sewer main developed. This main goes directly to the Main Lift station. Mud and sand were sucked in and damaged the step screen. Repairs cost about \$15,000.



Pumping Station Resiliency Projects

Greater New Haven WPCA
New Haven, CT

Presented By:

Isabella Schroeder
Project Manager - GNHWPCA

Christopher Wester, PE
VP - Weston & Sampson Engineers



*Protecting your Utility from Disasters
Resilience Part 1 of 2*

June 24, 2021



Presentation Agenda:

Background and Funding Information

GNHWPCA's Resiliency Goals

Resilient Projects & Systems

Fort Hale's Resiliency Upgrades

Resiliency Funding Opportunity

Background

- GNHWPCA's greatest business risk: **Storms**
- Many older coastal zone assets
- 13 of 30 pump stations exposed to coastal flooding
- Facility dependency on outside electric utility

Post-Disaster Funding Opportunity

- Hurricane Irene (8/26/11)
 - Superstorm Sandy (10/27/12)
 - Emergency Declared by Governor Malloy, CT (2012)
 - Disaster Declared by President Obama (2012)
 - Damages sustained by some facilities (2011/2012)
 - FEMA Hazard Mitigation Grant Program (HMGP)
- Post Disaster Funding Opportunity Becomes Available



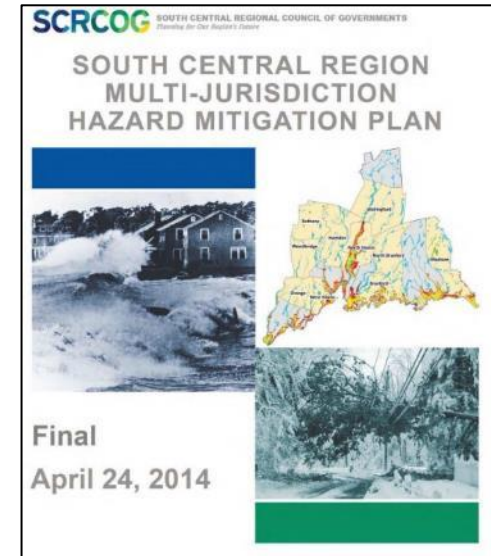
Emergency preparedness consisted of plywood, sandbags, steel plates, and removal of critical components:

- *labor intensive*
- *dependency on supplies and access*
- *wastewater service disruptions / damages*

Note: The new BRIC (Building Resilient Infrastructure and Communities) Pre-disaster program was not available to us then.

FEMA HMGP Application

- Competitive grant process (75% grant, 25% match)
- Requires approved Hazard Mitigation Plan (HMP)
- Prescribed public planning process
- Utilities must be mentioned as “critical infrastructure” in HMP
 - GNHWPCA not able to have own HMP – must be addressed in individual town’s HMPs
- Must show commitment of Funds for “Local Share”



Need to clearly articulate the need:

- Complete Benefit-Cost Analysis (BCA)
- Demonstrate improvements will be lasting/preventative
- Scope terminology can be important (new building vs. elevated utility enclosure)

Material
 ons for sanitary sewer
 residential structures
 re recently revised by

Funding Timeline

- **Submitted applications to FEMA Post Disaster HMGP for New Haven and East Haven (Dec 2013)**
 - BRIC pre-disaster program not available to us at that time
- **Awarded 4 Stations in East Haven (Jan 2015)**
- **East Haven Stations Completed 2018 - Delays:**
 - scope change from application to preliminary design
 - need to recalculate BCA
 - expiration/approval of updated East Haven HMP
- **Awarded 4 Stations in New Haven (Jan 2019)**
 - Unspent grant monies from other projects became available
 - Updated scope/application submitted December 2017
 - Project substantial completion May 2021



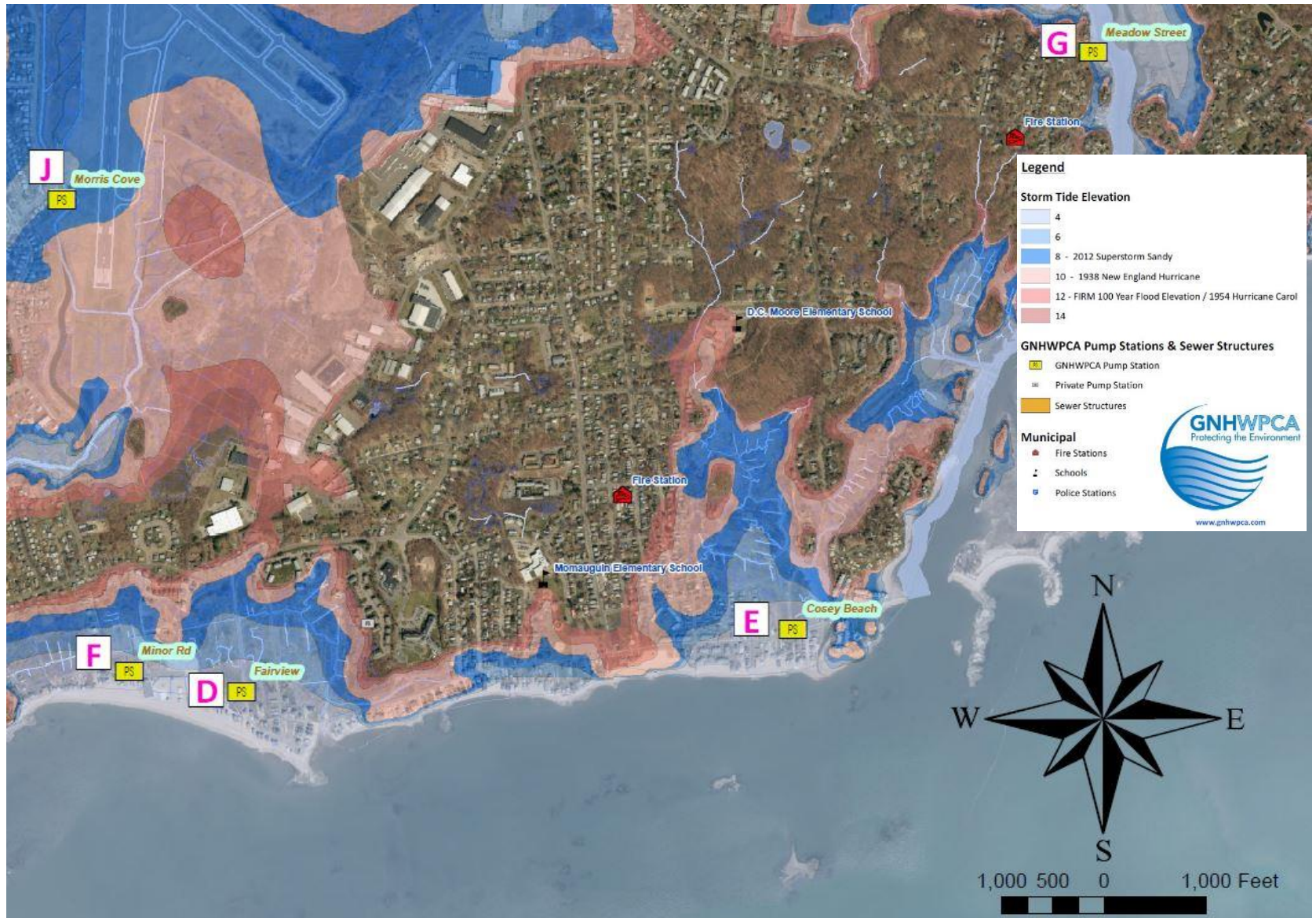
Funding Takeaways

- Process requires significant upfront planning, communication and scheduling (learning curve) but the benefits are apparent and significant:
 - ✓ Receive 75 cents on every dollar spent
 - ✓ Significantly reduces business vulnerability
 - ✓ Improves emergency preparedness planning/response
 - ✓ Reduces future costs (insurance/operations)
- Scope changes can cause **SIGNIFICANT DELAYS**
 - ✓ Application vs Design Scope should match
- Conservative estimates avoid delays in contract award/need to revisit BCA
 - ✓ “contingency” (non-eligible budget item)
 - ✓ “upgrades or replacements” are not eligible*
 - ✓ “change orders” may not be eligible for reimbursement (have local share funds available)
 - ✓ unit cost breakdowns must be clearly presented
 - ✓ communications / clarifications can provide partial funding (ex. pumps with integrated leads, larger sized generators)
- Proper documentation/close out inspections required
 - ✓ State & FEMA Reps Attend

*GNHWPCA
Reimbursed
\$4.7M in grant
funds!*

GNHWPCA Predicted Storm Surge

"We didn't have this nice map in 2013!"



GNHWPCA FEMA HMGP Resiliency Projects

Station	Existing FF	Design Flood Elevation (TR-16)
Boulevard PS	10.6	15.0
Cosey Beach PS	8.7	16.3
East St PS	10.6	16.0
Farview PS	7.8	15.0
Fort Hale PS	10.2	14.0
Meadow St PS	9.3	13.8
Minor Rd	7.6	15.0
East Shore WPAF	14.5	15.0

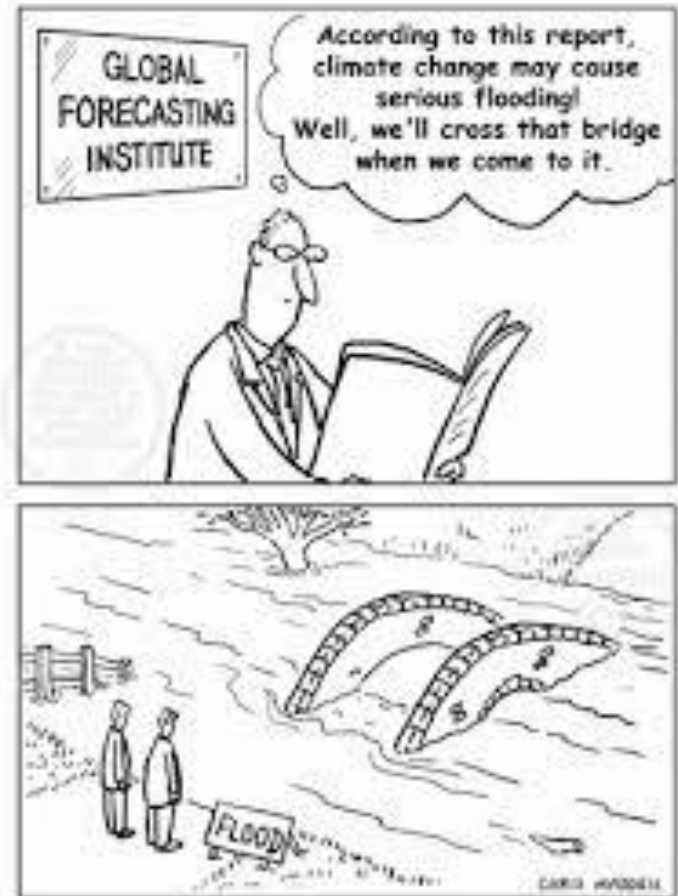
LEGEND:

- Category 1 Hurricane
- Category 2 Hurricane
- Category 3 Hurricane
- Category 4 Hurricane



Project Goals

- Protect Coastal Infrastructure
- Dry- and Wet-Floodproofing
- Raise electrical and communications equipment above 500-year flood levels
- Review options to protect equipment that cannot be raised
- Ensure resilient back up power is available
- Provide safe means of egress during a flood event



East Haven Pumping Stations Resiliency Project



East Haven Pumping Stations Resiliency Project



New Haven Pumping Stations Resiliency Project

GNHWPCA WWTP,
Boulevard PS and East Street PS
2019-2021



FLOOD WALLS

Interior and exterior flood walls installed to protect existing large wastewater pumping stations and wastewater treatment plant 2019-2021



FLOOD WALL CONSTRUCTION

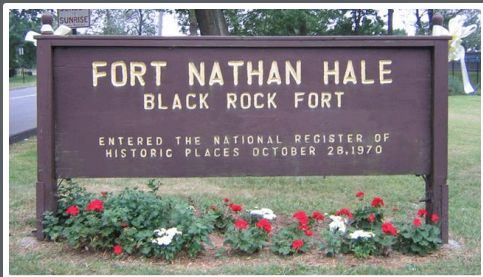
Interior and exterior flood walls installed to protect existing large wastewater pumping stations and wastewater treatment plant 2019-2021



DOOR AND WINDOW FLOOD BARRIERS

- Deployable Flood Panels
- Steel plates at windows
- Flood swing gates
- Flood Door





Fort Hale Pump Station

CRITICAL STATISTICS

Construction Date – 1946/1967

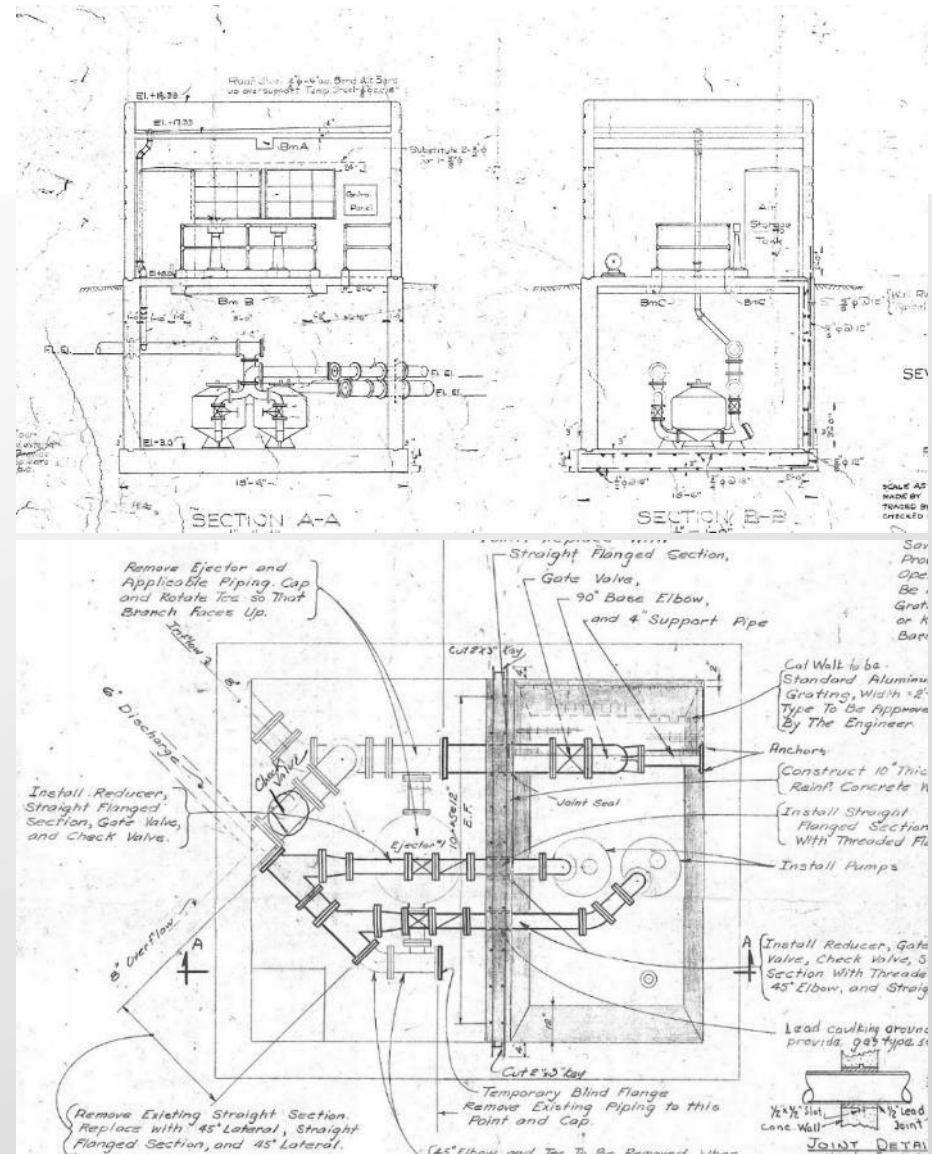
Duplex Station

Wet well and valve vault below building

Capacity = 300 GPM

Existing Floor Elevation = 10.2'

Design Flood Elevation = 14.0'

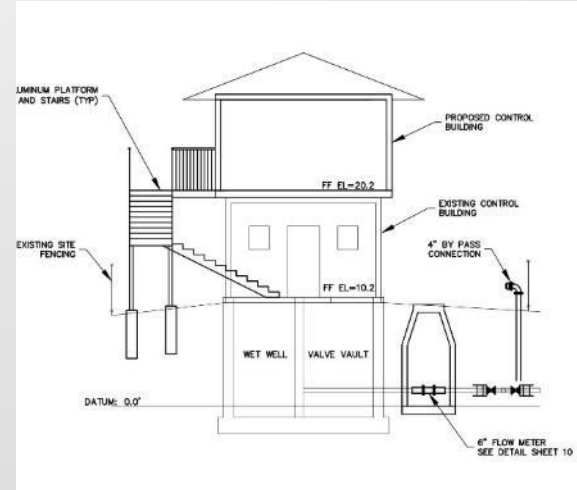
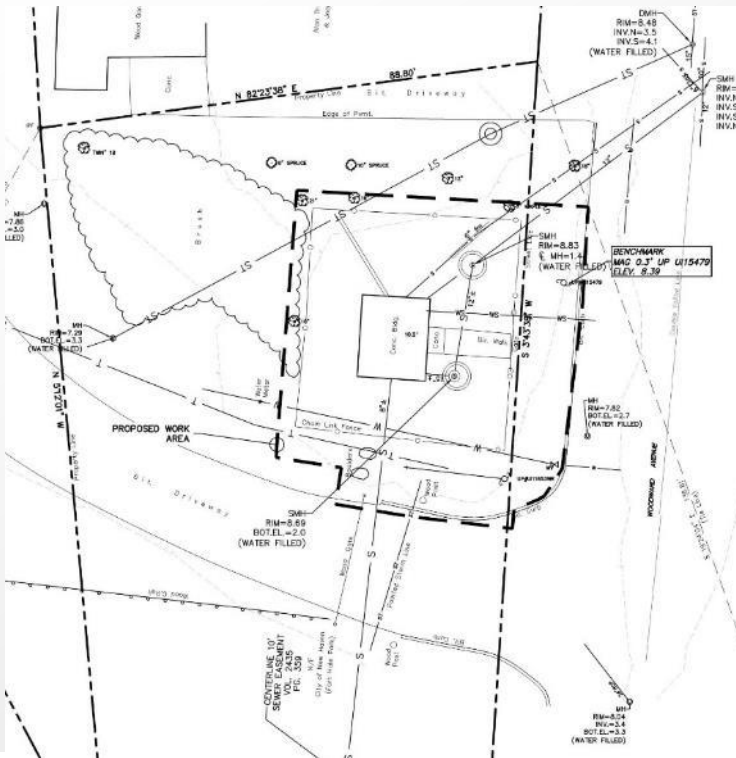


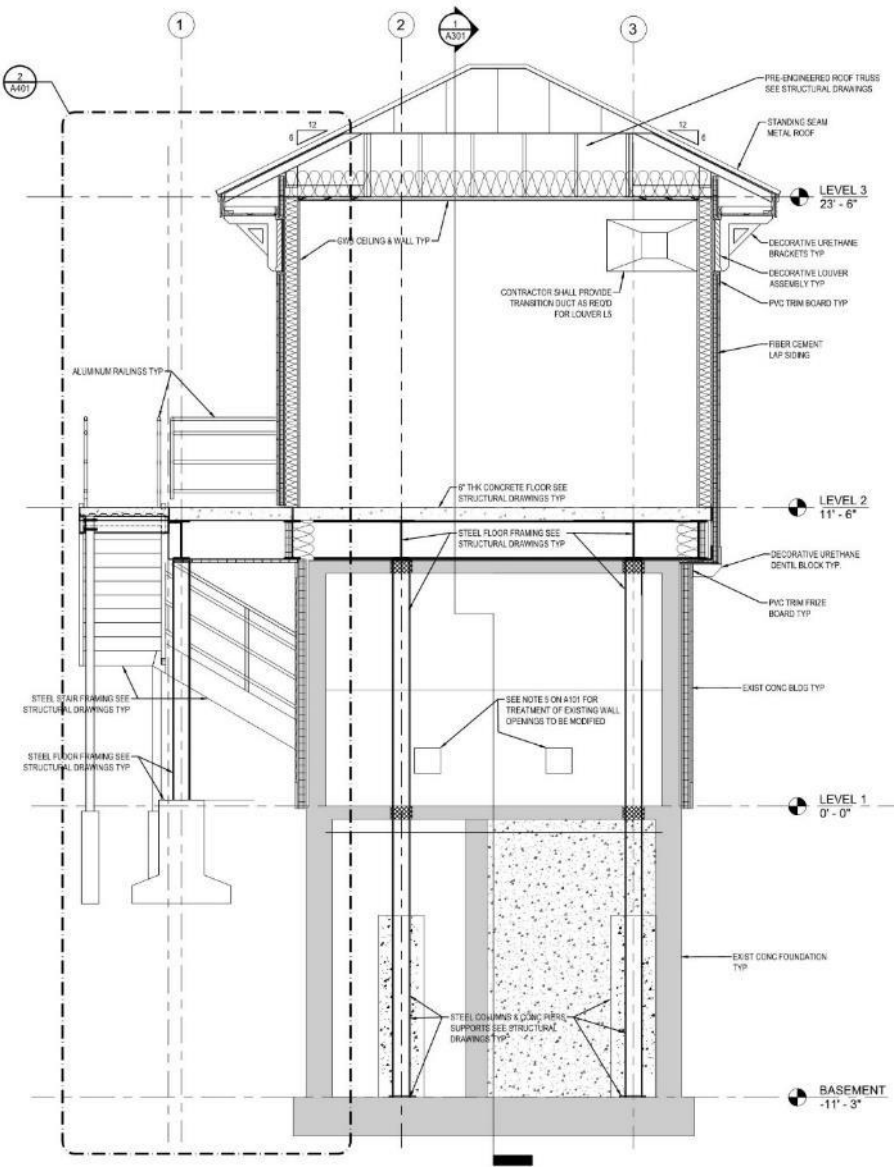
Client Needs | Wish List

- Fort Hale ***Needs:***
 - Flood Resiliency of Proposed Equipment
 - Permanent Standby Generator
 - Upgrade of Existing 208V Electrical Service
 - Limit Confined Space Entry Requirements

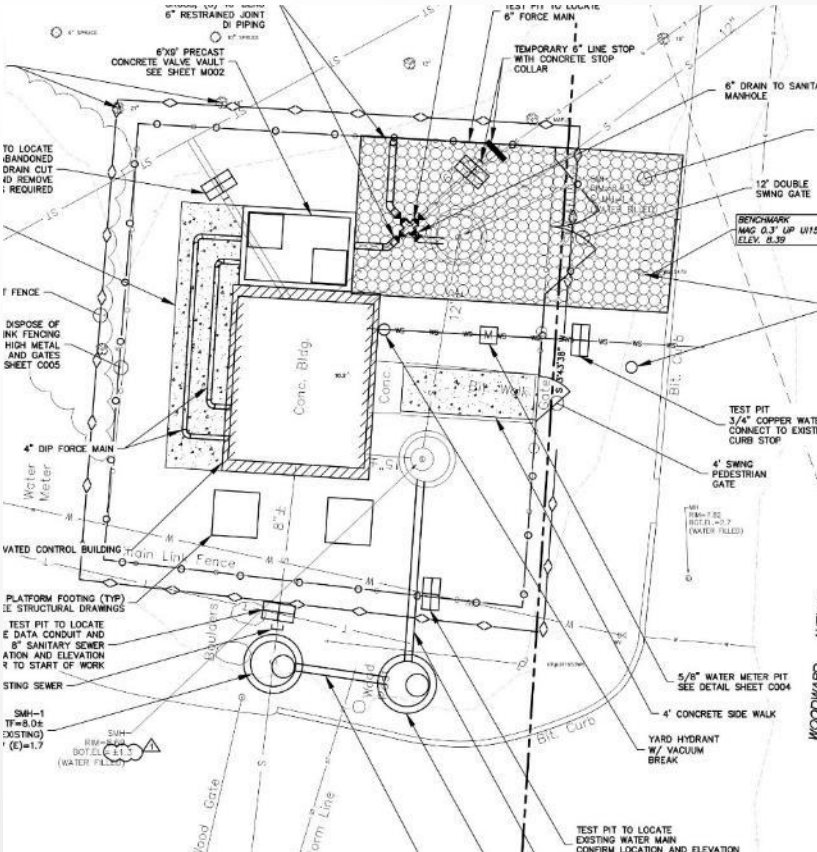
- Fort Hale ***Wish List*** Items:
 - Building Aesthetics
 - Bypass Piping Connections

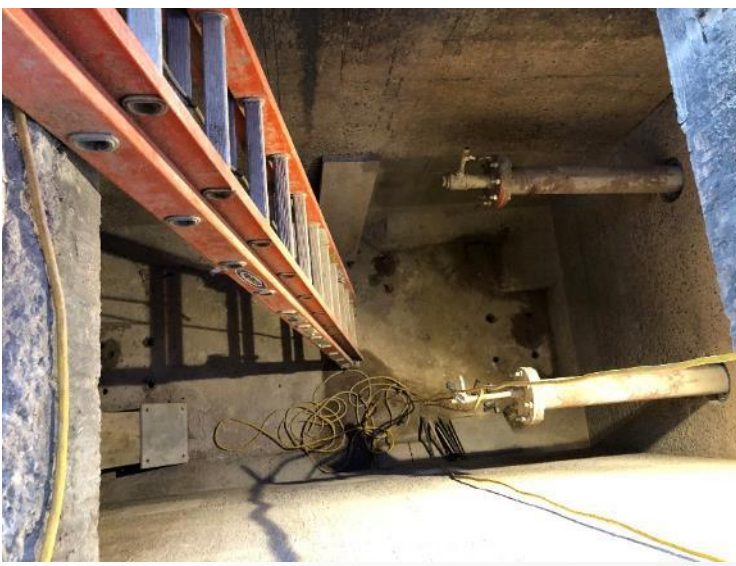
Preliminary Concept Design





Site Prep and Pump Station Bypass

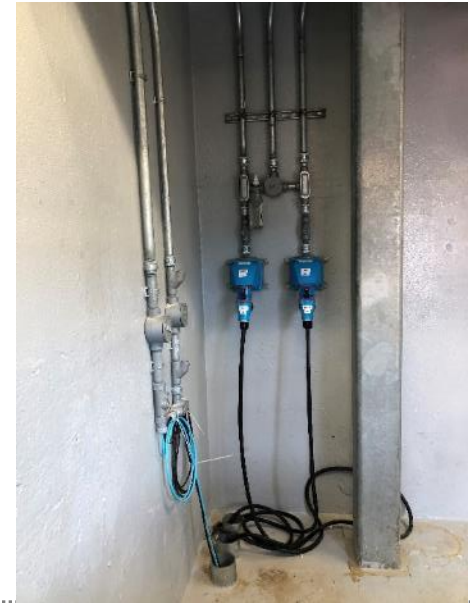




Upper Level



Lower Level





The Final Product

GOALS MET:

- All sensitive equipment protected
- Permanent stand by generator
- Bypass connection installed
- Beautiful and resilient WWPS



thank you

