

SCARBOROUGH WWTF FLOOD PROOFING PROJECT

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TOWN OF NARRAGANSETT

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CLIMATE CHANGE

- REAL OR IMAGINED?? WHAT DO YOU THINK??
 - “ENVIRONMENT AMERICA” REPORTS THAT NEW ENGLAND IS SEEING EXTREME PRECIPITATION EVENTS INCREASE IN FREQUENCY.
 - UNH REPORTED FOUR 100-YEAR FLOODS IN A 5 YEAR PERIOD.
 - CRMC REPORTS THAT THE TIDES IN NEWPORT, RI HAVE SHOWN AN INCREASE IN THE ACTUAL YEAR-TO-YEAR READINGS OF ROUGHLY 10.5 INCHES BETWEEN 1930 AND 2013.
 - AT THE LOCAL LEVEL, WE HAVE SEEN WATER IN AREAS WHERE WE NEVER SAW WATER BEFORE. SOMETIMES INTUITIVE KNOWLEDGE AND “LOCAL EXPERIENCE” IS WORTH MORE THAN THE SCIENCE (PURE OR FUZZY)...
 - SO, WHETHER YOU BELIEVE THE SCIENCE OR NOT, IT CERTAINLY APPEARS THAT CHANGE IS HAPPENING!

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- ACCEPTING SOME FORM OF CLIMATE CHANGE AS THE “NEW NORM”, WHAT DO YOU DO?
 - UTILITIES IN COASTAL COMMUNITIES ARE KEY COMPONENTS OF OUR QUALITY OF LIFE.
 - SEWER SYSTEMS, BY THEIR VERY NATURE END UP IN LOW LYING AREAS, AND TREATMENT PLANTS ARE OFTEN LOCATED DOWNHILL OF EVERYTHING ELSE AND NEED TO BE CLOSE TO A DISCHARGE POINT (OCEAN, BAY, RIVER – GREAT FOR DISCHARGE PURPOSES BUT ADDS TO SITE VULNERABILITY).
 - WHAT ARE YOUR OPTIONS??
 - RELOCATE YOUR FACILITY – NOT PRACTICAL IN MOST CASES.
 - HARDEN YOUR FACILITY – NUMEROUS OPTIONS AVAILABLE.

**TOWN OF
NARRAGANSETT**
Rhode Island

**Scarborough
WWTF**



1 inch = 67 feet

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**TOWN OF
NARRAGANSETT
Rhode Island**

**Scarborough
WWTF**

- Suspect Wetlands (2007)
- Inland Wetland
- Coastal Wetland
- Section 4.3 - Wetlands Overlay District**
- Wetland Overlay District
- 2013 Coastal A**
- AE
- 2013 Flood Zones**
- AE
- VE



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SCARBOROUGH WWTF FLOOD PROOFING PROJECT IT WAS ONLY A MATTER OF TIME

- **HURRICANE SANDY – 2012, AND THE SCARBOROUGH WWTF**
 - PRIOR TO SANDY, WE HAD NEVER OBSERVED FLOODING FROM THE ATLANTIC OCEAN ACTUALLY ON OUR PROPERTY. DESPITE RECEIVING A GLANCING BLOW ONLY, OCEAN WAVES FROM SANDY BREACHED OUR PROPERTY.
 - OUR ORIGINAL PLANT DESIGN IN THE LATE 1960'S INCLUDED AN AT-GRADE INFLUENT PUMP STATION WITH OPEN GRATING – DID NOT ANTICIPATE AN OCEAN IMPACT OF ANY KIND...
 - CRITICAL PORTIONS OF OUR SITE WERE IN A FEMA VELOCITY (V) ZONE. THIS IMPACTED OUR ABILITY TO CONSTRUCT CERTAIN PLANT IMPROVEMENTS, AS NEW CONSTRUCTION IN A "V" ZONE IS VERY DIFFICULT TO GET PERMITTED.

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SANDY IMPACTS

- FLOODED THE AT-GRADE HEADWORKS
- FLOODED BELOW-GRADE MOTORS AND INFLUENT PUMPS
- INTRODUCED SALT WATER TO THE TREATMENT PROCESS – NOT GOOD
- SOIL EROSION OF OCEANSIDE GRASS BUFFER
- DAMAGED FENCING

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SANDY APPROACHES



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SANDY RECEDES



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KEY DESIGN ELEMENTS INCLUDED THE FOLLOWING:

- WE RETAINED A MARINE ENGINEERING FIRM, **RT GROUP** (NORTH KINGSTOWN) TO PREPARE A MATRIX OF FLOOD PROOFING AND HARDENING OPTIONS FOR US.
- SURVIVABILITY – CAN THE HARDENING SURVIVE A MAJOR STORM?
- IS IT BETTER (I.E. EASIER AND LESS EXPENSIVE) TO CONSTRUCT INDIVIDUAL BUILDING HARDENING SYSTEMS (FLOOD DOORS, ELEVATED HATCHES) V. FLOOD PROOFING THE ENTIRE FACILITY?
- IN OUR CASE, AS OUR EXPANSION OPTIONS ARE LIMITED IN A FEMA “V” ZONE, CAN A SYSTEM BE DESIGNED THAT WOULD ULTIMATELY REMOVE THIS DESIGNATION FOR OUR SITE? THIS FACTOR LIMITED CERTAIN DESIGN OPTIONS, AND ADDED TO THE PROJECT COST.
 - EFFECTIVENESS OF THE SOLUTION.
 - EASE OF PERMITTING.

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SELECTED OPTION

- THE FINAL OPTION THAT WE SELECTED INCLUDED A STEEL SHEET PILE WALL (DRIVEN PILES) WITH WATERSIDE STONE RIPRAP TO PROTECT THE PILING AND A LANDWARD SIDE EARTHEN BERM FOR STABILIZATION. A PORTION OF THE BARRIER WAS POURED IN PLACE CONCRETE (IN THE AREA OF UNDERGROUND PIPING).
- THE HORSESHOE-SHAPED BARRIER WAS DESIGNED TO EXTEND BACK TO MEET THE 100 YEAR FLOOD ELEVATION CONTOURS.
- **WORKING CLOSELY WITH CRMC, WE INCORPORATED A SEA LEVEL RISE COMPONENT INTO THE DESIGN**
 - WHILE THERE WAS NO FIXED REGULATORY GUIDANCE ON THIS AT THE TIME OF OUR DESIGN\PERMITTING, THE FIGURE OF 1.5 – 2 FEET IN 50 YEARS WAS RECOMMENDED BY CRMC. THIS DID ADD TO THE PROJECT COST...

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SHEET PILE INSTALLATION



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PREP WORK FOR POURED IN PLACE SECTION;
BERM WORK



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SCARBOROUGH WWTF FLOOD PROOFING PROJECT UNINTENDED CONSEQUENCES

- THE PLANT PROPERTY SLOPES DOWN FROM OCEAN ROAD TO THE OCEAN (MAKES SENSE, RIGHT??).
- THE BARRIER WOULD THEN TRAP STORM WATER FROM RAIN STORMS ON THE PLANT SITE (I.E. BEHIND THE BERM). RT GROUP DESIGNED A STORM WATER SYSTEM TO CATCH AND TREAT (SAND FILTER - RIDEM REQUIREMENT) THE STORM WATER BEFORE IT DISCHARGES TO THE OCEAN.
- ONE-WAY VALVES ALLOW THE STORM WATER TO FLOW OUT AND KEEP THE OCEAN FROM ENTERING.

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PREP WORK FOR STORM WATER FILTRATION SYSTEM



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SCARBOROUGH WWTF FLOOD PROOFING PROJECT STORM WATER VAULT – TIGHTNESS TESTING



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REGULATORY PROCESS

- THE FOLLOWING AGENCIES ALL HAD A PART IN THIS PROJECT:
 - **RIDEM** – STORM WATER DISCHARGE APPROVAL AND VERIFICATION THAT TREATMENT PLANT PROCESSES WOULD NOT BE IMPACTED
 - **CRMC** – WORK WITHIN A FLOOD ZONE; SPECIAL EXCEPTION REQUIRED FOR WORK IN A COASTAL ZONE – EVALUATION OF ALTERNATIVES REQUIRED.
 - **US ARMY CORPS** – WORK WITHIN A FLOOD ZONE (COORDINATED REVIEW WITH CRMC).
 - **FEMA** – WORK WITHIN A FLOOD ZONE, CLOMR AND LOMR APPLICATIONS.
 - **CDBG** – SANDY DISASTER RECOVERY (DR) FUNDING – EXTENSIVE RECORDKEEPING REQUIRED THROUGHOUT THE PROJECT.
 - ALLOW LOTS OF TIME FOR DESIGN AND PERMITTING – WE BEGAN OUR PROCESS SHORTLY AFTER HURRICANE SANDY, AND DID NOT START CONSTRUCTION UNTIL 2016-17.
 - HAVING A GREAT RELATIONSHIP WITH ALL OF THE REGULATORY AGENCIES HELPS!!!

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HOW TO GET THE MONEY!!!

- DURING THE PRELIMINARY DESIGN PHASE, WE APPLIED FOR A HAZARD MITIGATION GRANT THROUGH THE DHS HURRICANE SANDY DISASTER RECOVERY (DR) PROGRAM. IN ORDER TO BE ELIGIBLE FOR THIS PROJECT, THE FOLLOWING REQUIREMENTS HAD TO BE MET:
 - YOUR COMMUNITY HAS TO HAVE AN APPROVED HAZARD MITIGATION PLAN, AND THE PROJECT HAS TO BE INCLUDED THEREIN.
 - THE PROJECT MUST BE “ACTIONABLE”, MEANING THAT YOU CAN REALLY BUILD IT AND THAT IT WILL FUNCTION AS DESIGNED, AND IT MUST BE A REALISTIC AND REASONABLE SOLUTION.
 - PROJECTS MUST BE READY TO PROCEED, AND MUST BE COMPLETED WITHIN AN AGREED-UPON SCHEDULE (TIED TO THE DR PROGRAM REQUIREMENTS).

SCARBOROUGH WWTF FLOOD PROOFING PROJECT SUMMARY

- THE PROJECT WAS COMPLETED IN A SINGLE CONSTRUCTION SEASON (2017) AT A COST OF APPROXIMATELY \$1.8 MILLION. THIS INCLUDED ENGINEERING COSTS NECESSARY TO SUBMIT THE CLOMR AND LOMR TO FEMA TO REMOVE THE SITE FROM A FLOOD ZONE, AND THE INVESTIGATION OF ALL ALTERNATIVES (INCLUDING RELOCATING THE PLANT
 - CRMC REQUIRED THIS AS PART OF THEIR EVALUATION TO ALLOW FOR A SPECIAL EXCEPTION FOR CONSTRUCTION WORK IN A FLOOD ZONE).
- WE APPLIED FOR AND RECEIVED A GRANT THRU CDBG (SANDY DR FUNDS) IN THE AMOUNT OF \$1 MILLION. THE BALANCE CAME FROM THE WASTEWATER ENTERPRISE FUND – WE SET UP A LINE ITEM TO APPROPRIATE FUNDING OVER THE SEVERAL YEAR DESIGN AND PERMITTING PERIOD.

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SCARBOROUGH WWTF FLOOD PROOFING PROJECT
COMPLETE



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