Municipal Facilities Replacement: Easton Police, Fire and Public Works

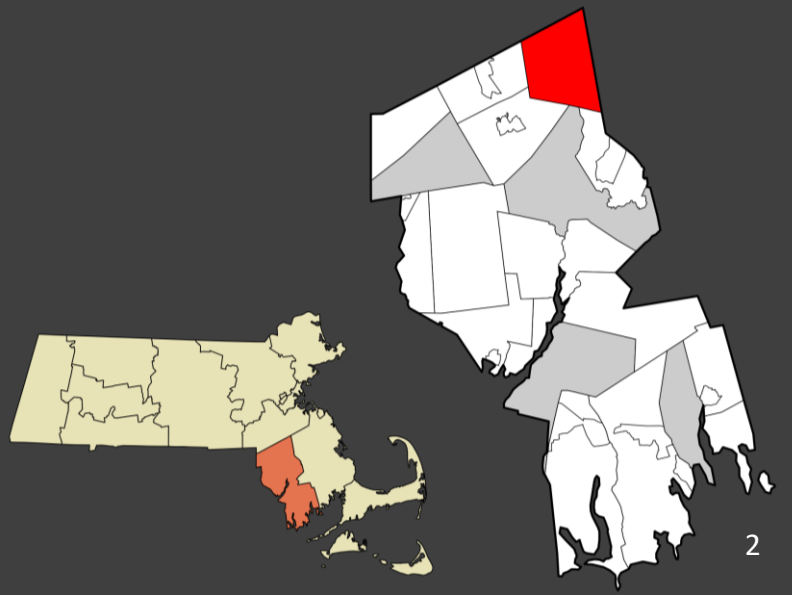
Financing Geothermal Systems in All New Municipal Facilites

July 23, 2024

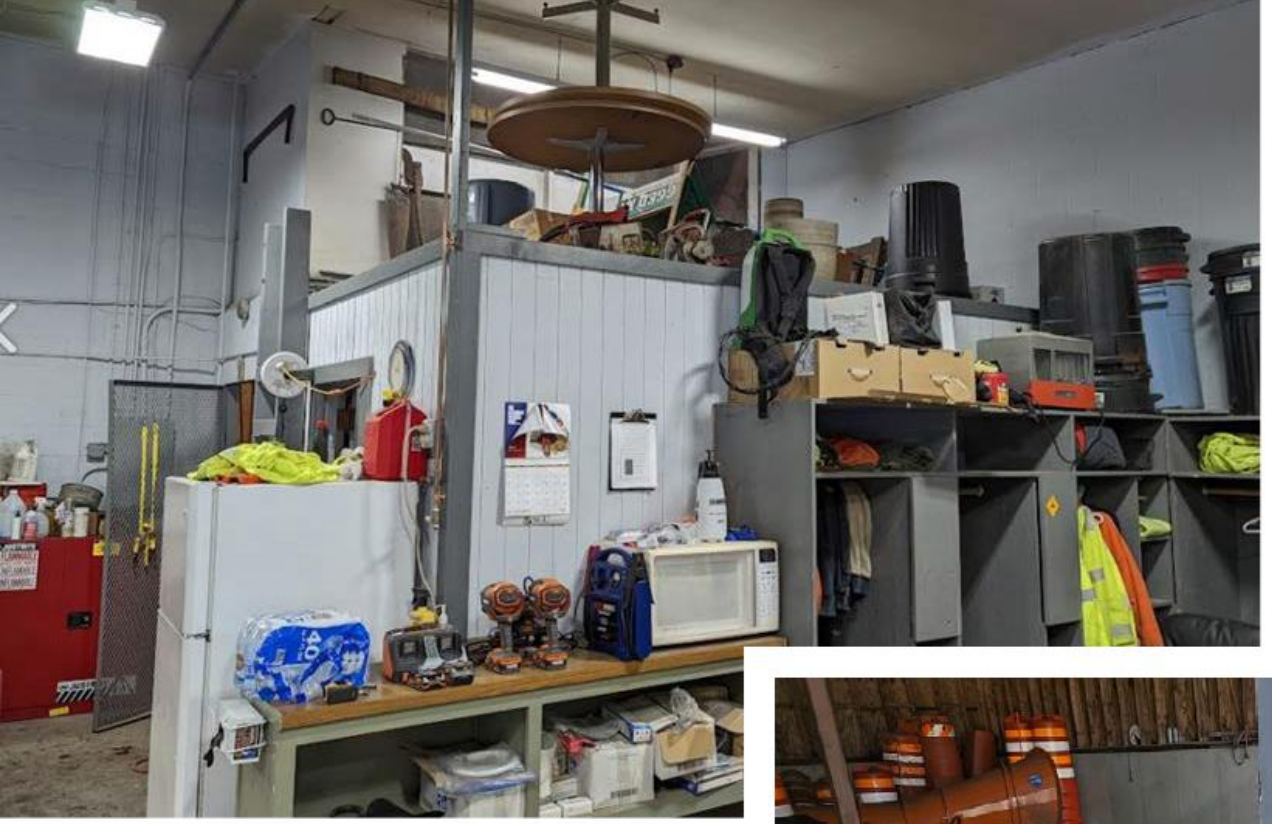
Connor Read
Easton – Town Administrator

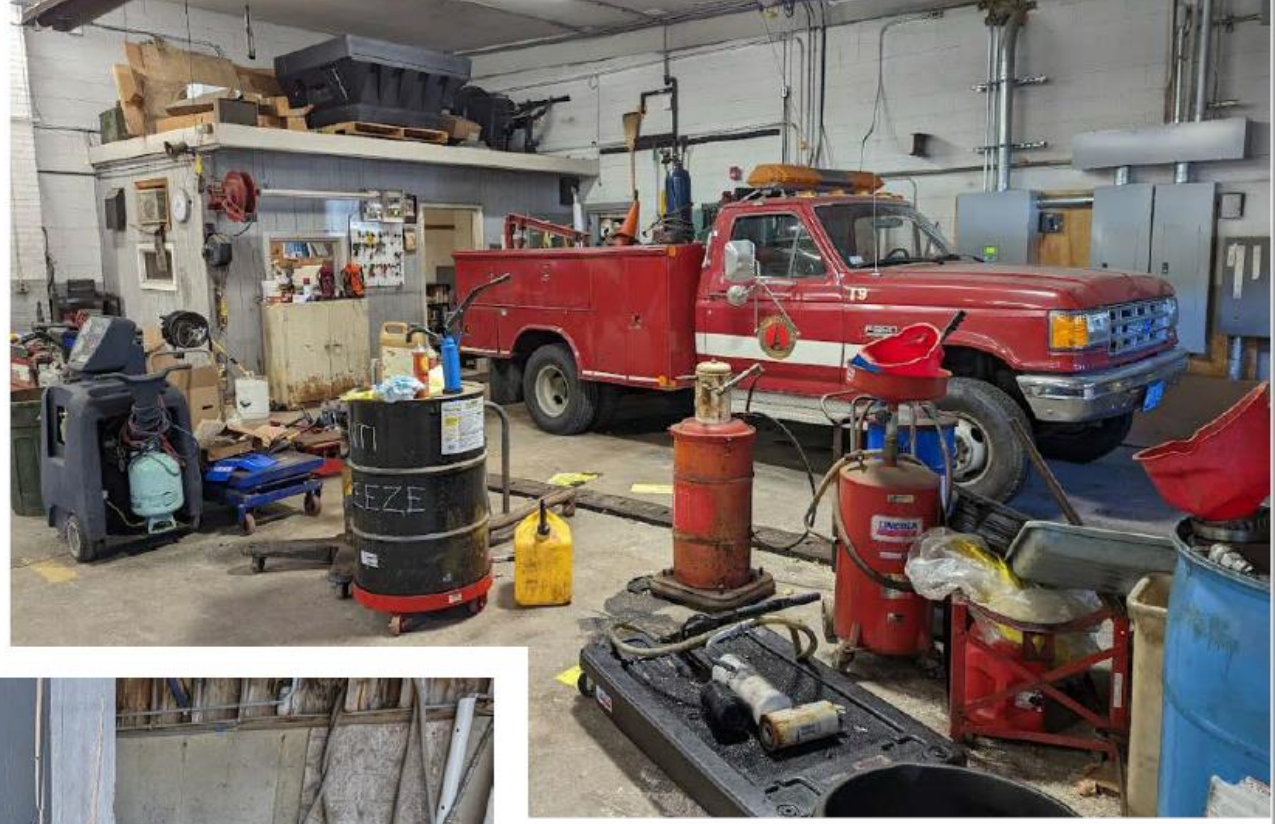
About Easton

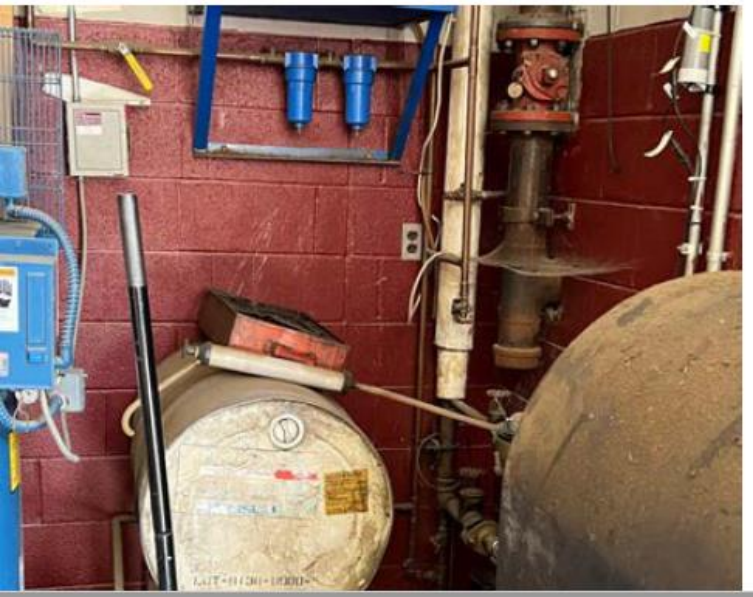
- Area: 29 SQ Miles
- Population: 25,000
- Annual Budget: $110M
- Government: Open Town Meeting
- Incorporated: 1725

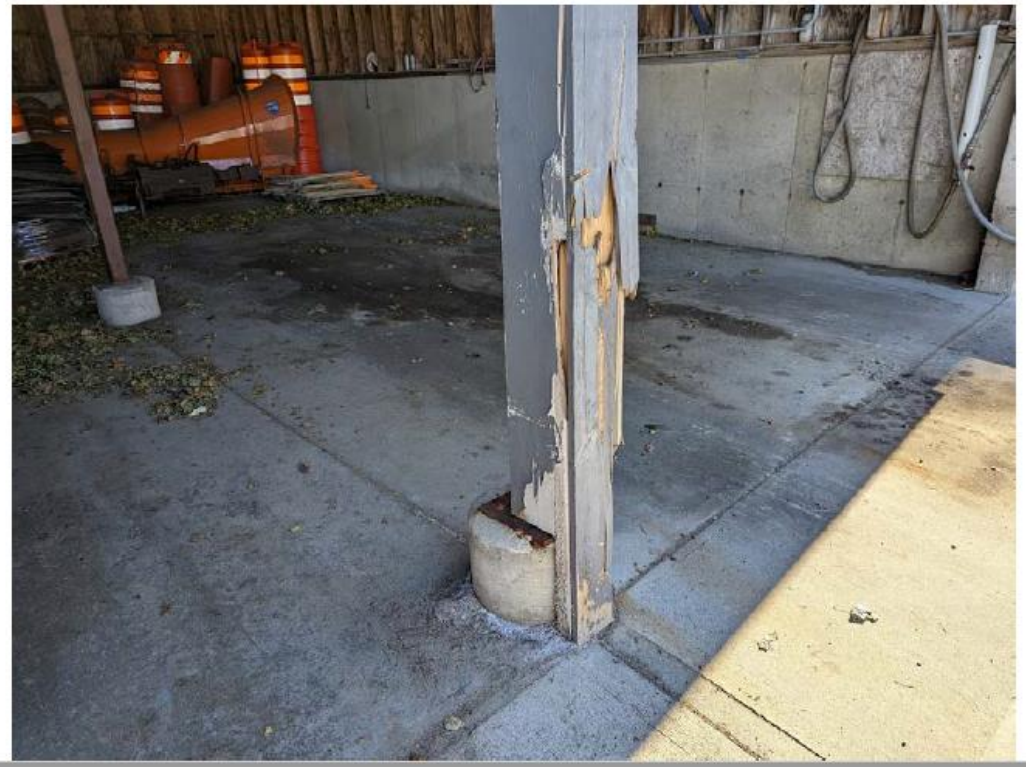


Replacing Police, Fire, and Public Works Facilities in Easton







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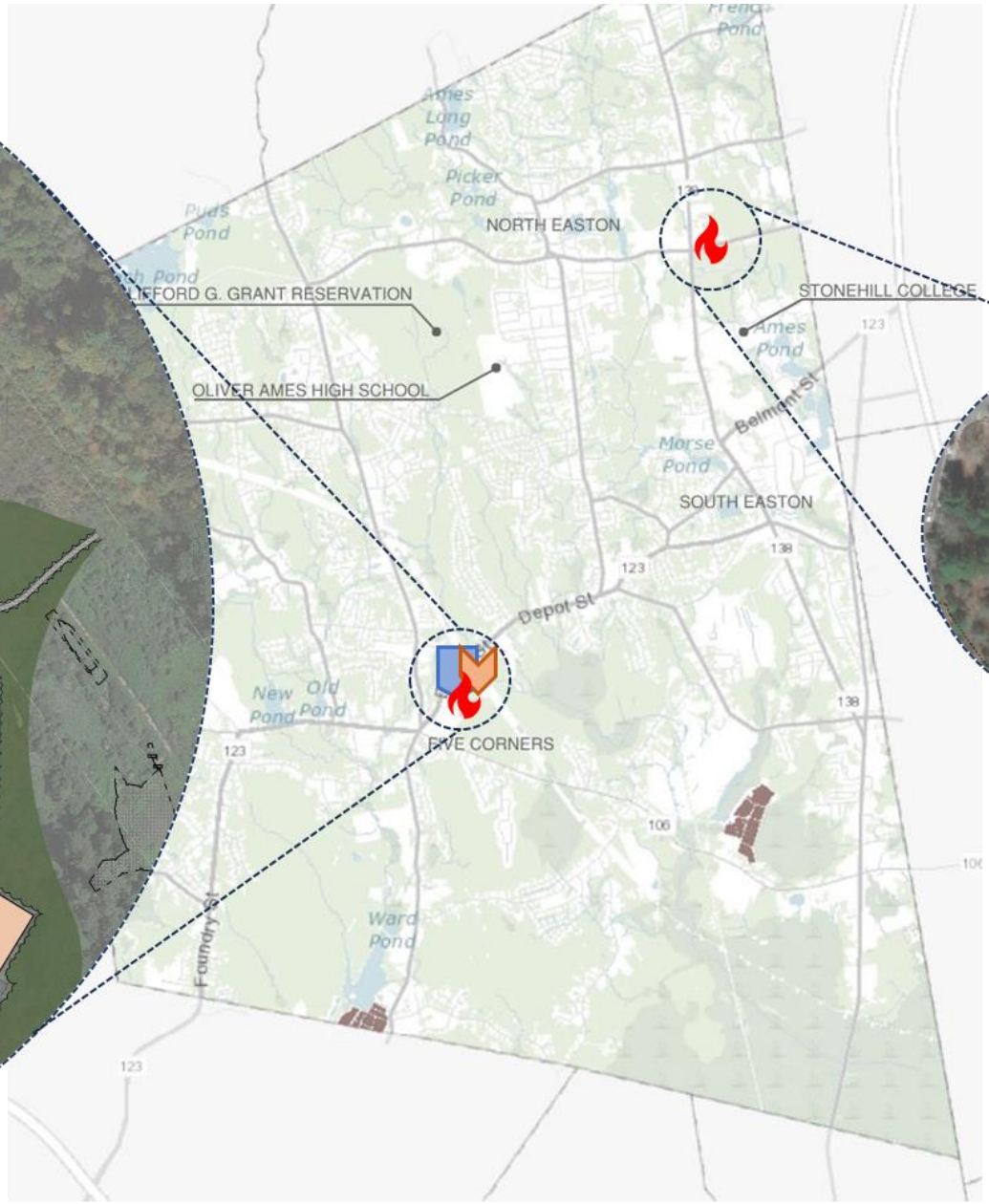
Project Overview

Connor Read
Easton – Town Administrator



Project Overview

Connor Read
Easton – Town Administrator

Enough space for today and tomorrow

- Designed with the space for today and tomorrow.
- Improved Emergency Operations Center.
- Publicly available community room.
- Fleet lifespan improvements.
- Room to generate repair revenue.

Safe workplaces and reduced environmental risks

- Reduces cancer and other health risks to firefighters.
- Reduce legal and injury liability.
- Improve employee health and reduce injuries.
- Improve hiring and retention.

Modern, efficient building systems and site infrastructure

- Geothermal, solar ready, stormwater treatment / mgmt, EV ports.
- Reduce environmental exposures and connect to sewer.
- Remove solid waste at 524 Depot Street.
- Improve capacity to repair Frothingham Hall and other municipal sites.

Effective, equitable, accessible space for first responders *and* the public

- ADA accessibility for public spaces.
- Facility parity for female first responders.
- Better Fire Station locations.
- Clean, accessible and safe public trailhead access at 524 Depot Street.

Project Timeline

Connor Read
Easton – Town Administrator

Dec 21'-Jan 22'
OPM ONBOARD
(1-2 mos.)

Jan 22'-Mar 22'
DESIGNER PROCUREMENT
(2-3 mos.)

Mar 22'-July 22'
FEASIBILITY STUDY REPORT
Existing Conditions Evaluation
Space Visioning
Space Program (By Dept.)
Space Needs Assessment
Development of Prelim. Options
Eliminate Non-Preferred Options

July 22'-Sep 22'
PREFERRED SCHEMATIC REPORT
Refinement of Options
Scope & Systems Development
Massing & Design Studies
Final Assessment of Options
Select "Preferred Option"

Oct 22'-July 23'
SCHEMATIC DESIGN
Exterior/Interior Design
Detailed Room Layouts
Finalize Project Scope
Establish Project Budget
7.11.23 Completion **Target**

July 23'-Oct 23'
COMMUNITY APPROVAL & VOTE
SCOPE LOCKED IN
BUDGET LOCKED IN
FALL SPECIAL TOWN MEETING
FALL SPECIAL TOWN ELECTION

Nov 23'-Nov 24'
Detailed Design
Design Development
80% Construction Documents
100% Construction Documents

2021 | 2022 | 2023 | 2024 | 2025 - 27

FORM THE TEAM | FEASIBILITY | SCHEMATIC | Design Development | Const. Documents | Bid | Construct

WE ARE HERE

Design Team – Key Members

Greg Joynt
KBA - Architect

KBA

PMA Consultants

- Architecture Landscape Architecture
- Mechanical & Electrical Engineering
- Geothermal Engineering
- Energy Modeling
- Civil Engineering / Environmental Permitting

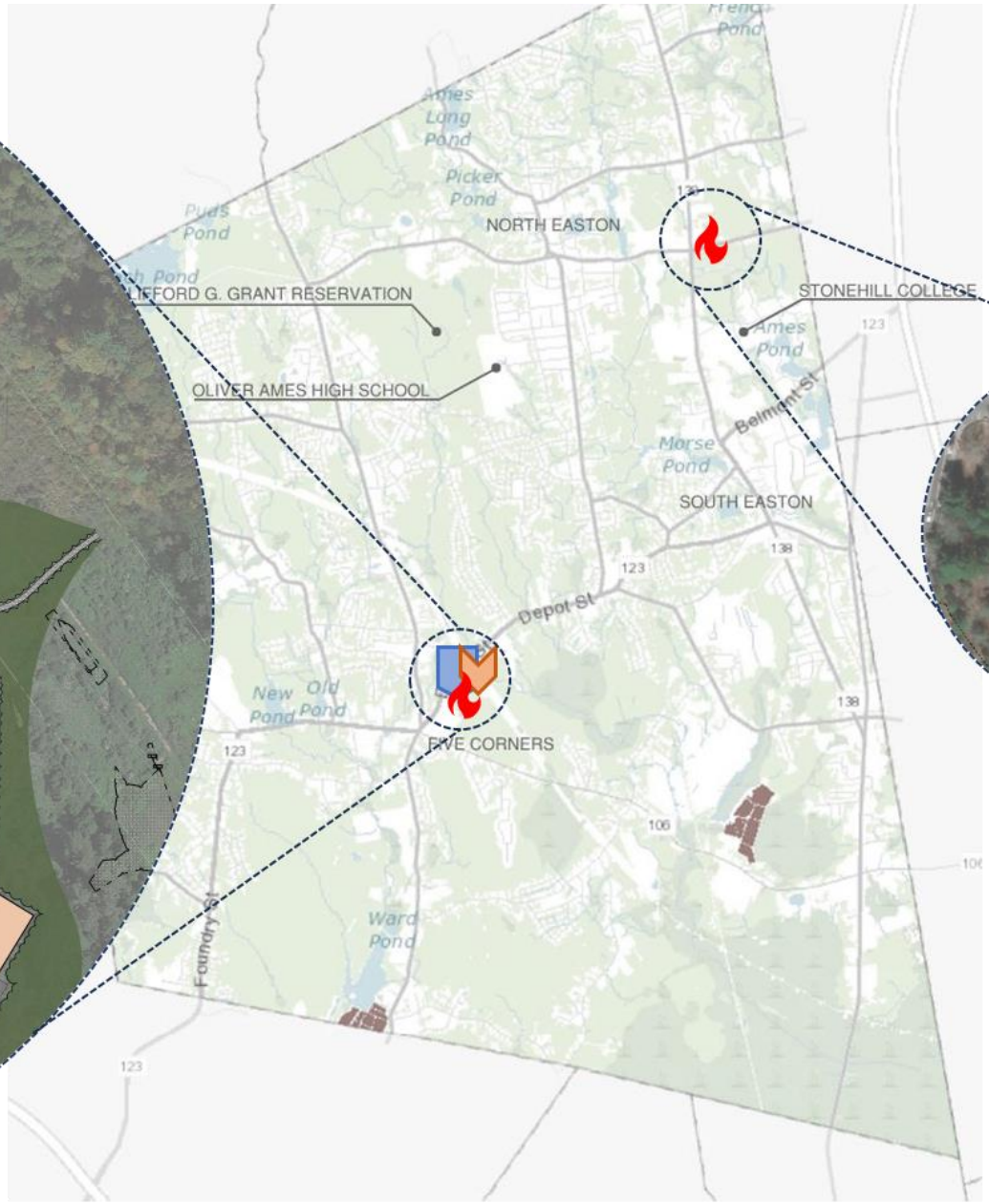
DESIGN TEAM

Municipal Building Committee

- Select Board
- Green Communities Committee
- Finance Committee
- Conservation Commission
- Public Works
- Board of Health

Project Overview

Greg Joynt
KBA - Architect



524 DEPOT ST


EASTON
PUBLIC
SAFETY
EASTON PUBLIC
WORKS COMPLEX
FIRE DEPARTMENT - STATION 1
POLICE DEPARTMENT
DEPARTMENT OF PUBLIC WORKS


524C
ENTRANCE


EASTON FIRE
STATION 2

Building Information

Greg Joynt
KBA - Architect

PUBLIC SAFETY

- 52,000 GSF
- 2-Story
- Construction: IIB
- Fully Sprinklered
- Use: I4, B, S1, R2

PUBLIC WORKS

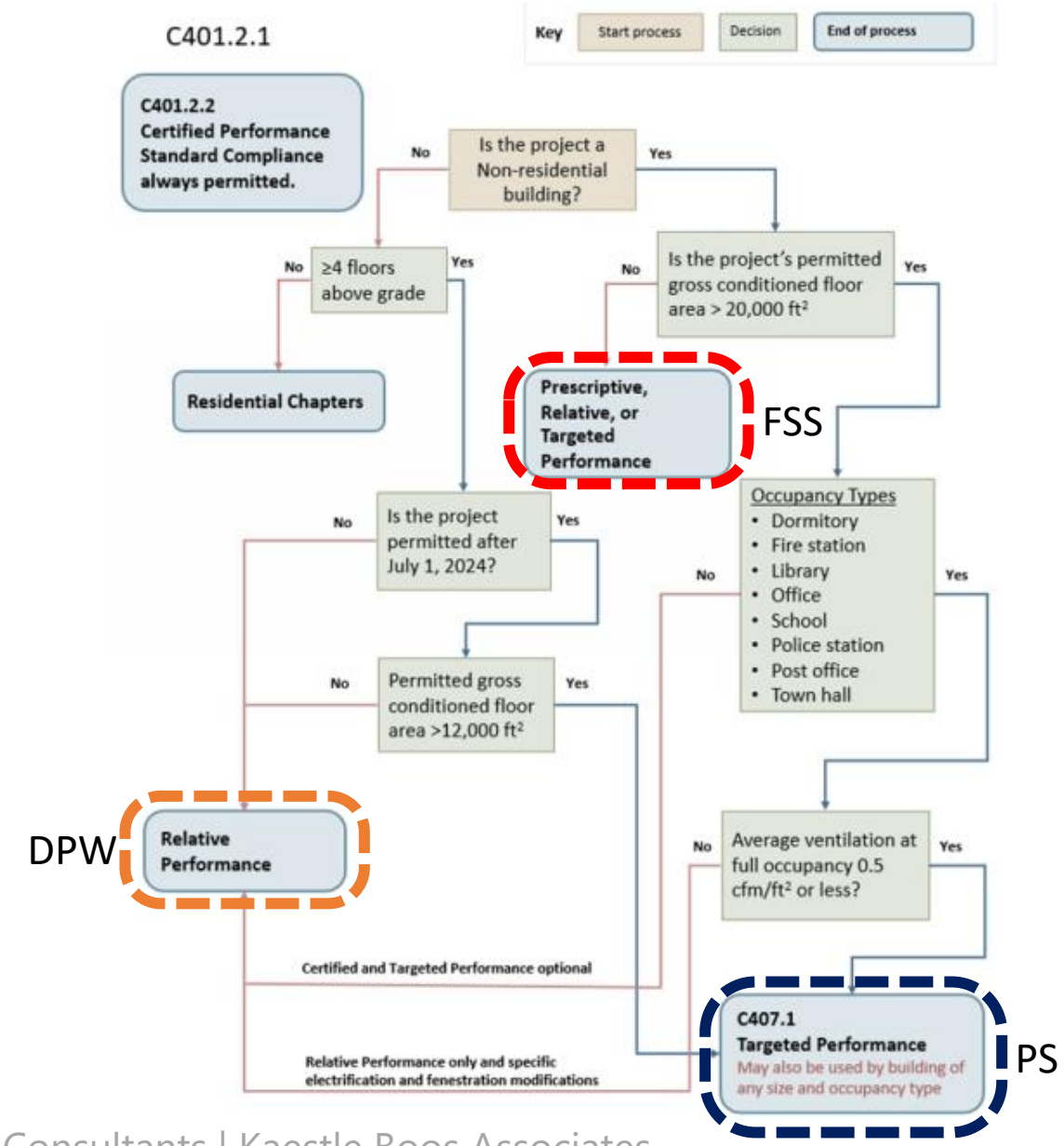
- 63,000 GSF
- 1-Story
- Construction: IIB
- Fully Sprinklered
- Use: S2, S1, B

FIRE SUB-STATION

- 14,800
- 1-Story
- Construction: IIB
- Fully Sprinklered
- Use: S1, B, R2

Stretch Code Compliance Pathways

Greg Joynt
KBA - Architect



- From State's technical guidance on the stretch code
- Public Safety will require TEDI
- DPW's do not fall under the category based on the ventilation rates in the maintenance bays and will use relative performance
- Fire Sub-Station will use either Prescriptive

EASTON IS HERE

Base Code (IECC 2021)
- New construction in towns & cities not a green community
- **52 communities**

Expected from BBRS: **July 2023**

Stretch Code (2023 update)
- New construction in towns & cities that are a green or stretch community
- **299 communities**

Residential : Jan 2023
Commercial: July 2023

Specialized Code ("Net-Zero")
- New Construction in towns & cities that vote to opt-in to this code
- **Effective date:** Typically 6-11 months after Town/City vote

Lifecycle Cost Analysis – Understanding an LCCA

Greg Joynt
KBA - Architect

Option	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Gas Cons. (Therms)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)****
Baseline Option (ASHRAE 90.1 Appendix G)	1. Basic Code Minimum System 2. Tied to Fuel Type	Construction $			$	$	$	$/SF	#EUI	$	$	-	-	-
1, 2, 3	1. More Efferent Systems	↑ Construction $	↓	↓	↓$	↓$	↓$	↓$/SF	↓EUI	↑$	↓$	$Savings	Annual Savings x System Life / Life Cycle Savings	Years To Pay Back

Simple Payback (Years) = (Option Construction Cost - Baseline Construction Cost) / Combine Expense Savings

Discounted Payback (Years) = Simple Payback adjusted + future worth of each system option considered using the DOE rates for nominal discount, escalation (for each utility type based on region), inflation and interest.

Baseline Option Does Not Meet the MA Stretch Code Requirements that Easton is subject to.

Lifecycle Cost Analysis – Public Safety Building Mechanical Systems

Option	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Gas Cons. (Therms)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)****
1	1. Hot Water Coil Heating/DX Cooling VAV AHU System w/ ERV & Demand Control Ventilation (DCV) serving terminal VAV boxes w/ hot water reheat coils 2. High-Efficiency Gas-Fired Condensing Boiler Plant	$3,771,707	510,661	48,578	$99,205	$68,650	$167,855	$3.23	127.2	$33,279	$201,134	-	-	-

Option	System	Gross Capital Investment*	Annual Elec. Cons. (kWh)	Annual Gas Cons. (Therms)	Annual Electric Cost	Annual Gas Cost	Combined Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings**	Total Life-Cycle Savings***	Discounted Payback (Years)****
2	1. VRF System w/ Air-Source Heat Recovery Condensing Units 2. Heat Pump VAV Dedicated Outdoor Air Systems (DOAS) w/ DCV & ERV 3. Supplemental Hot Water Heating 4. High-Efficiency Gas-Fired Condensing Boiler Plant	$3,633,350	388,911	35,974	$69,472	$50,839	$120,311	$2.32	94.9	$40,929	$161,240	$39,894	$1,462,325	Instant ******
3	1. VRF System w/ Ground-Source Heat Recovery Condensing Units 2. Ground-Source VAV DOAS w/ DCV & ERV with Terminal VAV Boxes 3. Supplemental Hot Water Heating 4. Geothermal Water-to-Water Heat Pump Heater Plant	$5,761,455	416,016	30,031	$73,007	$42,440	$115,447	$2.22	85.2	$42,024	$157,471	$43,663	-$553,984	Not Reached *****

* Gross capital investment based upon cost estimates provided by the project cost estimator PM&C dated 5/10/23.
** Combined expense savings is the difference between the combined annual expense of the baseline and system in comparison.
*** Total life-cycle savings is based on a 30 year study period.
**** Discounted payback years is based upon BLCC5 Life Cycle Analysis.
***** Discounted payback never reached within 30 year study period.
****** Discounted payback never reached because system is more efficient and/or less expensive than baseline system.

Note 1: Values based on energy model performed for HVAC System Life Cycle Cost Analysis purposes. A 30% safety factor should be applied for budgeting purposes to account for potential variances to the actual operation of the building. Per ASHRAE Standard 90.1:

Neither the proposed building performance nor the baseline building performance are predictions of actual energy consumption or costs for the proposed design after construction. Actual experience will differ from these calculations due to variations such as occupancy, building operation and maintenance, weather, energy use not covered by this procedure, changes in energy rates between design of the building and occupancy, and the precision of the calculation tool.

Lifecycle Cost Analysis – Public Safety Building Mechanical Systems

Greg Joynt
KBA - Architect

	Option 1	Option 2	Option 3
Initial Cost	Higher	High	Highest
Energy Rebates	Low	Low No Mass Save Heat Pump Adder (Gas)	High Mass Save + Inflation Reduction Act(IRA)
Energy Usage	Low	Lower	Lowest
All Electric HVAC	No	No	Yes
Equipment Life	20-30 Years	20-30 Years	20-30 Years 50 Years for Ground Loop
Payback vs ASHRAE Baseline Without IRA Rebate (Estimated)	4-6 Years	Instant	Not Reached

Lifecycle Cost Analysis – Public Safety Building Mechanical Systems

Greg Joynt
KBA - Architect

Option	System	Gross Capital Investment*	Mass Save Heat Pump Adder Incentive **	IRA Geothermal Federal Tax Credit **	Net Investment	Annual Elec. Cons. (kWh)	Annual Gas Cons. (Therms)	Annual Electric Cost	Annual Gas Cost	Comb. Utility Cost	Annual Utility $/s.f.	Annual kBTU/s.f. (EUI)	Annual Maint. Cost	Combined Annual Expense	Combined Expense Savings***	Total Life-Cycle Savings ***	Discounted Payback (Years) ****
1	1. Hot Water Coil Heating/DX Cooling VAV AHU System w/ ERV & Demand Control Ventilation (DCV) serving terminal VAV boxes w/ hot water reheat coils 2. High-Efficiency Gas-Fired Condensing Boiler Plant	$3,771,707	$0	$0	$3,771,707	510,661	48,578	$99,205	$68,650	$167,855	$3.23	127.2	$33,279	$201,134	-	-	-
2	1. VRF System w/ Air-Source Heat Recovery Condensing Units 2. Heat Pump VAV Dedicated Outdoor Air Systems (DOAS) w/ DCV & ERV 3. Supplemental Hot Water Heating 4. High-Efficiency Gas-Fired Condensing Boiler Plant	$3,633,350	$0	$0	$3,633,350	388,911	35,974	$69,472	$50,839	$120,311	$2.32	94.9	$40,929	$161,240	$39,894	$1,462,325	Instant *******
3	1. VRF System w/ Ground-Source Heat Recovery Condensing Units 2. Ground-Source VAV DOAS w/ DCV & ERV with Terminal VAV Boxes 3. Supplemental Hot Water Heating 4. Geothermal Water-to-Water Heat Pump Heater Plant	$5,761,455	$607,500	$1,466,171	$3,684,784	416,016	30,031	$73,007	$42,440	$115,447	$2.22	85.2	$42,024	$157,471	$43,663	$1,522,687	Instant *******

$5.3

700,000

47

* Gross capital investment based upon cost estimates provided by the project cost estimator PM&C dated 5/10/23.
** Combined expense savings is the difference between the combined annual expense of the baseline and system in comparison.
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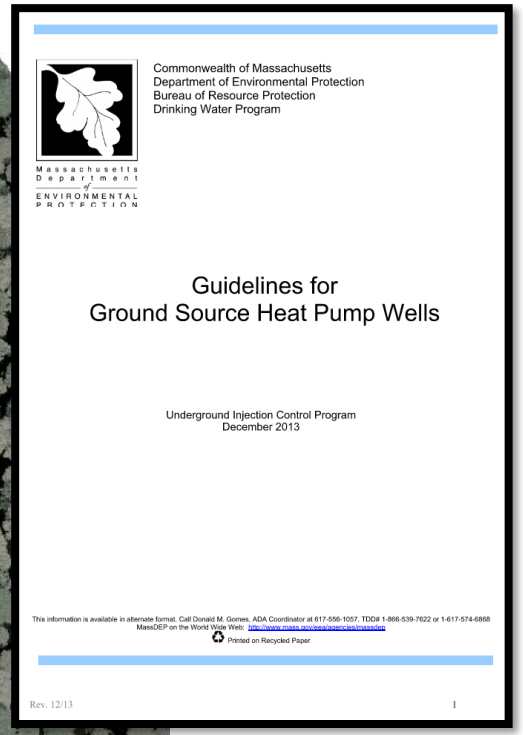
GROUND SOURCE HEAT PUMPS(GEOTHERMAL)

Greg Joynt
KBA - Architect

- Vertical ground loop heat exchanger piping is HDPE 4710 with pressure ratings suitable for bore depth.
- Heat exchanger piping is supplied on rolls with factory welded u-bends.
- Each bore with piping is grouted from the bottom up with Bentonite grout (Bentonite and water mixture).
- Entire system is closed loop so there is no transfer of heat exchanger fluid to the surrounding soil.
- 50 year life span of piping.
- Drilling fluids to be reused as much as possible; excess to be discharged to a settling tank. Solids and remaining fluid to be disposed of per Massachusetts guidelines.

GEOTHERMAL FIELD LOCATIONS

Greg Joynt
KBA - Architect



Commonwealth of Massachusetts
Department of Environmental Protection
Bureau of Resource Protection
Drinking Water Program

Massachusetts Department of ENVIRONMENTAL PROTECTION

Guidelines for
Ground Source Heat Pump Wells

Underground Injection Control Program
December 2013

This information is available in alternate format. Call Donald M. Gomes, ADA Coordinator at 617-556-1057. TDD# 1-866-539-7622 or 1-617-574-6868
MassDEP on the World Wide Web: http://www.mass.gov/eea/agencies/massdep

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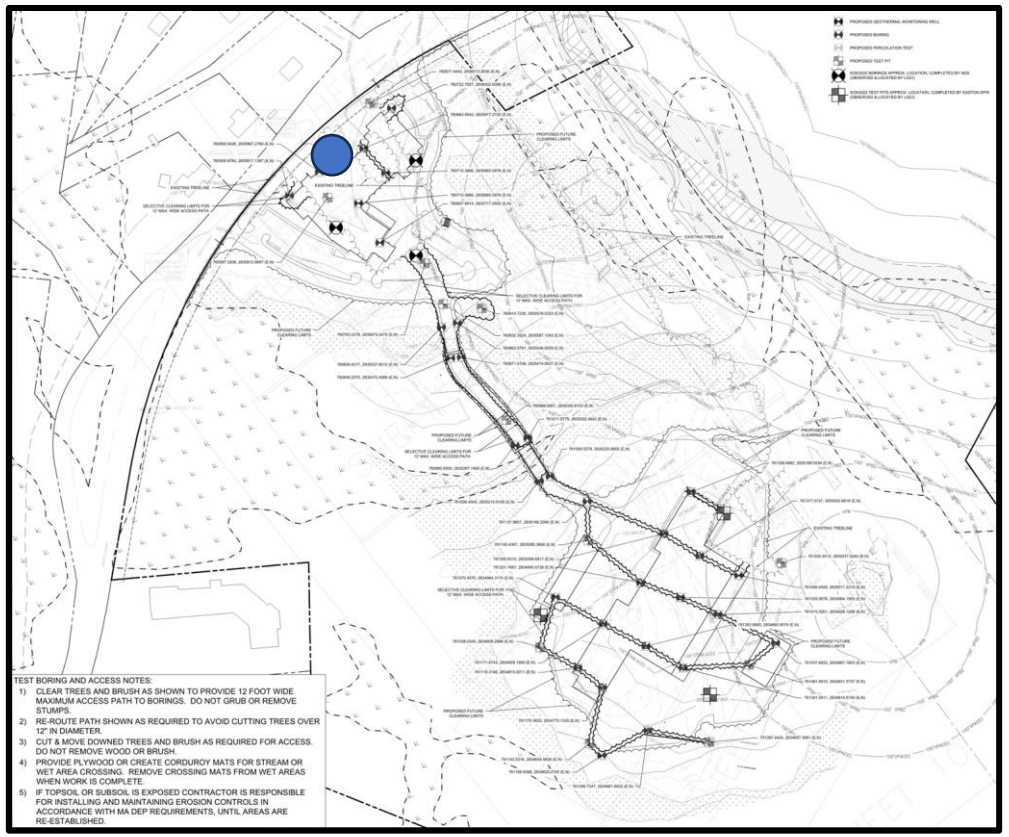
Rev. 12/13 1

- Massachusetts DEP published guidelines in December 2013
- Section 9.7 of Guidelines for Ground Source Heat Pump Wells requires the following:
  - 10’ setback required from potable water and sanitary lines
  - 25’ from existing/potential sources of contamination
  - 50’ from private water supply wells
  - Wells cannot be within Zone I of public water supply wells
  - 10’ from surface water bodies

Geothermal Thermal Conductivity Testing



524 Depot St

Initial Findings:

- Bore hole hit ledge at +/- 60’
- ground temperature range of 52.4-53.5°F
- Formation Thermal Conductivity = 2.00 Btu/ hr-ft-°F

Main St

Findings:

- Bore hole hit ledge at +/- 20’
- ground temperature range of 52-53°F
- Formation Thermal Conductivity = 1.43 Btu/ hr-ft-F

Geothermal Overview

Greg Joynt
KBA - Architect

PUBLIC SAFETY

- 28 BOAR HOLES
- 1 ½” DR11 QUAD-LOOPs
- 600’ DEPTH
- 20’ x 20’ SPACING

PUBLIC WORKS

- 60 BOAR HOLES
- 1 ½” DR11 QUAD-LOOPS,
- 600’ DEPTH
- 20’ x 20’ SPACING

FIRE SUB-STATION

- 12 BOAR HOLES
- 1 ½” DR11 QUAD-LOOPS,
- 600’ DEPTH
- 20’ x 20’ SPACING

The Project Budget

Connor Read
Easton – Town Administrator

CONSTRUCTION COST ESTIMATE RECONCILIATION		
Designer Estimate (Record)	**OPM Estimate (Collaborative)**	**Estimate Variance**
$116.4M	$117.2M	0.65%

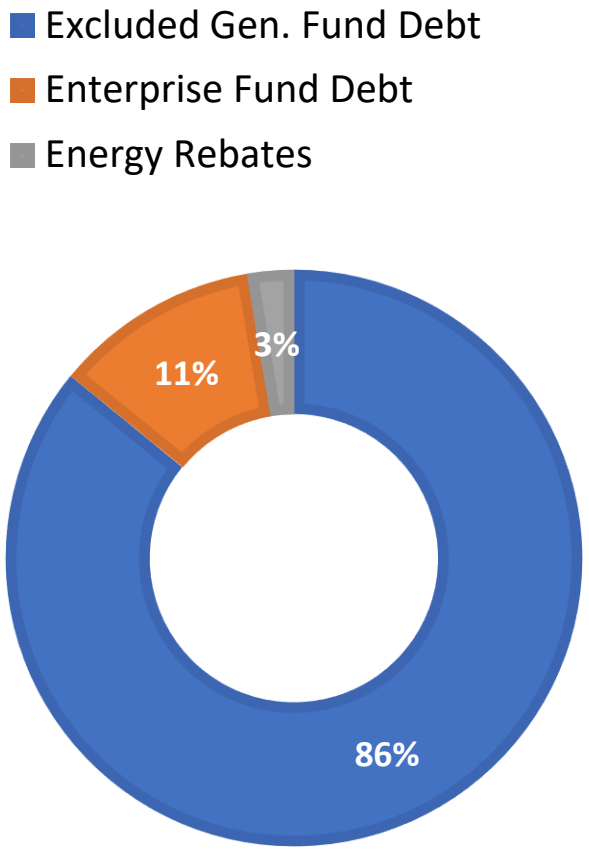
Construction Cost + Soft Costs + Contingencies (approx. 29%)

= Total Project Budget - $150.5M +/-

Assumptions & Qualifications

- Procurement Method: MGL. Chapter 149 General Contractor
  - Add 8-15% for MGL. Chapter 149a. CM @ Risk
- Escalation to Start of Construction: Fall 2024
- Construction Budget Values Above: Total Project Budget have been Developed Based on Final Value Management Decisions on 8/1 by MBC

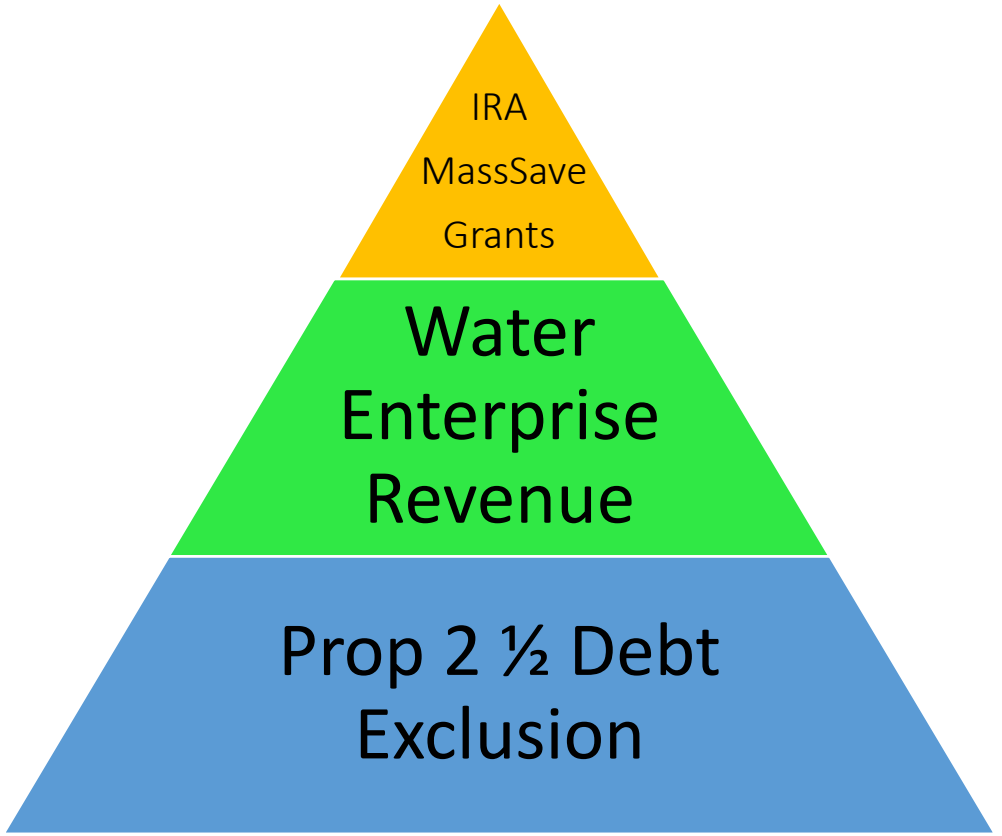
ANTICIPATED FUNDING SOURCES



Available Funding Mechanisms / Revenue Sources for the Project

Connor Read
Easton – Town Administrator

- No MSBA - Local Funding is Only Path Forward
- Delay in hopes of future state program is high risk – inflation could increase cost by $10M each year.
- Primary Funding Mechanism for Capital Program = Debt Exclusion
- Next Major Source = Enterprise (Water) Fund
- Other Sources – IRA / Mass Save are largest grant opportunity



Project Team

Connor Read
Easton – Town Administrator

Project Owner - Town of Easton – Select Board / Municipal Building Committee

Connor Read
Town Administrator

David Field
Director of Public Works
Town Engineer

Chief Boone
Police Department

Chief Alexander
Fire Department

Owners Project Manager

PMA Consultants

Walter Hartley Jr.
Senior Associate

Chad Crittenden
Managing Director

Designer

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Mitchell Associates Architects

Weston & Sampson

Greg Joynt
KBA - Architect

Brian McCusker
W&S - Architect

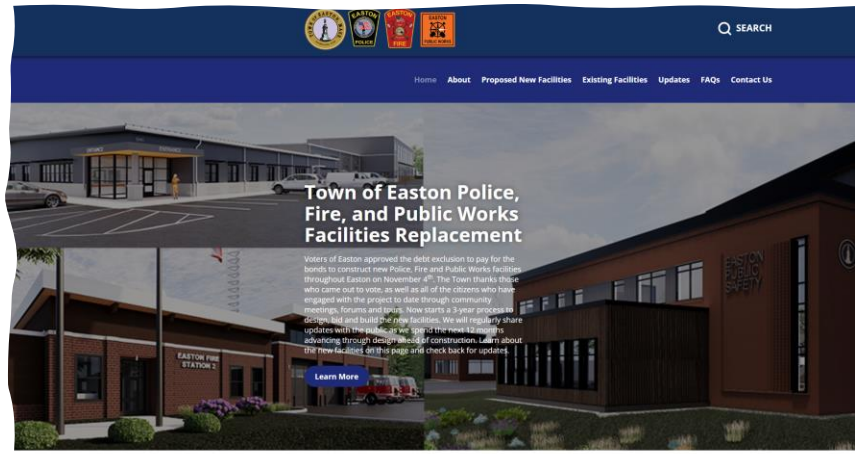
Building Community Support: The Challenge

Another Override? In *this* economy!?

No MSBA Grant Program

Smaller Customer Base

The (Mis)Information Economy



Building Community Support: The Strategy

Connor Read
Easton – Town Administrator

1. **Go Everywhere – Speak with Everyone**
   - 27 public events in six weeks leading up to Town Meeting
2. **Meet People Where They Are**
   - Don't be shocked busy working families can't make it to a 3- hour finance committee on a work night!
   - GO TO THEM – Soccer field, concerts, art festivals, Lions Club, etc.
3. **Seek Allies Across Diverse Disciplines / Interests**
   - Go beyond "required" boards with jurisdiction - Environmental groups are great stakeholders on new building projects that leverage geothermal and solar.
4. **Know The Audience & Tailor Materials for the Venue**
   - Information medium should match the forum.
   - Detailed reports may work for a Finance Committee - not a concert handout.

Building Community Support: The Results

Start from a place of understanding – you are asking your community to put faith in an extremely expensive and complex project - you owe it to them to do the work and get in front of as many as possible and earn trust.

Project was ultimately approved by voters at Town Meeting and Debt Exclusion Election.

Lessons Learned

- ***Big Picture***
  - Good planning may take years – but good projects create public value *for generations.*
  - Large public facilities projects are multi-decade decisions - consider systems (gas v. electric v. geothermal) thoughtfully and involve your facilities professionals for their expertise.
  - Decision will have large capital impact on front end and operating impact for years to come – positive or negative. Consider the LCCA weighing IRA / MassSave as integral to project budget planning.
  - Incorporate other energy analyses - solar, PPAs, leases, etc. - as systems you choose will impact annual consumption patterns and operating costs.
  - Lean on others for their expertise – call Jonathan!

Lessons Learned

Connor Read
Easton – Town Administrator

- ***Geothermal as part of a bigger project:***
  - Start discussions early and think about it from multiple frames:
    - Capital cost / lifecycle operating cost
    - Future proofing
    - Environmental benefits / resiliency
  - Understand that different constituencies respond to each of these frames, figure out who they are, work with them and bring them into the fold to build allies and advocates across a broad array of backgrounds:
    - Sustainability advocates
    - Select boards, Finance committees and public leaders
    - Project managers / Designers

  Carefully analyze IRA and other incentives / grants with legal and finance to make sure your appropriation language does the job!

Questions & Comments