Nova Group

Inspired Solutions by Nova Group

MERP Level 2 Energy Audit

Prepared For

Department of Buildings & General Services - State of Vermont
133 State Street
Montpelier, VT 05633

Grand Isle - Fire Station
17 Hyde Road
Grand Isle, VT 05458

Nova Group Carbon Neutral Report

novagroupgbc.com/carbonneutral

September 5, 2024

Department of Buildings & General Services - State of Vermont
133 State Street
Montpelier, VT 05633

Re: MERP Level 2 Energy Audit
Grand Isle - Fire Station
17 Hyde Road
Grand Isle, VT 05458
Nova Project No.: SE24-1853

Nova Group, GBC has completed a MERP Level 2 Energy Audit in accordance with the State of Vermont ACT 172 at Grand Isle - Fire Station located at 17 Hyde Road in Grand Isle, VT. Nova Group, GBC visited the site on April 5th, 2024.

The assessment was performed at the Client's request using methods and procedures consistent with and using methods and MERP Level 2 Energy Audit procedures as outlined in Nova Group, GBC Proposal.

This report has been prepared for and is exclusively for the use and benefit of the Client identified on the cover page of this report. The purpose for which this report shall be used shall be limited to the use as stated in the contract between the client and Nova Group, GBC.

This report, or any of the information contained therein, is not for the use or benefit of, nor may it be relied upon by any other person or entity, for any purpose without the advance written consent of Nova Group, GBC. Any reuse or distribution without such consent shall be at the client's or recipient's sole risk, without liability to Nova Group, GBC.

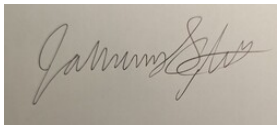
Estimated installation costs are based on Nova Group, GBC experience on similar projects and industry standard cost estimating tools including *RS Means*. Since actual installed costs may vary widely for particular installation based on labor & material rates at time of installation, Nova Group, GBC does not guarantee installed cost estimates and shall in no event be liable should actual installed costs vary from the estimated costs herein. We strongly encourage the owner to confirm these cost estimates independently. Nova Group, GBC does not guarantee the costs savings estimated in this report. Nova Group, GBC shall in no event be liable should the actual energy savings vary from the savings estimated herein.

Nova Group, GBC certifies that Nova Group, GBC has no undisclosed interest in the subject property and that Nova Group, GBC employment and compensation are not contingent upon the findings or estimated costs to remedy any deficiencies due to deferred maintenance and any noted component or system replacements.

Respectfully submitted,

NOVA GROUP, GBC

Reviewed by:



Johanna Stuz, BPI-BA
Field Associate

Jay Hrivnatz, RA, CEM
Technical Reviewer

Keely Felton, CEA
Chief Sustainability Officer

Table of Contents

APPENDICES

1.0 EXECUTIVE SUMMARY

1.1 General Description

1.1.1 Purpose

The purpose of this MERP Level 2 Energy Audit is to provide the State of Vermont - Building and General Services and Grand Isle - Fire Station with energy efficiency opportunities at the facility and specific recommendations for Energy and Conservation Measures (ECM's). Information obtained from these analyses may be used to support a future application to an Energy Conservation Program, Utility grants towards energy conservation, or as a basis for replacement of equipment or systems.

1.1.2 Scope of Work

1.1.2.1 Energy Audit Scope of Work

The purpose of this Energy Assessment is to provide the State of Vermont - Building and General Services and Grand Isle - Fire Station with a baseline of energy usage, the relative energy efficiency of the facility, and specific recommendations for Energy Conservation Measures. Information obtained from these analyses may be used to support a future application to an Energy Conservation Program, Federal and Utility grants towards energy conservation, as well as support performance contracting, justify a municipal bond-funded improvement program, or as a basis for replacement of equipment or systems.

The energy assessment consisted of an onsite visual assessment to determine current conditions, itemize the energy consuming equipment (i.e. Boilers, Make-Up Air Units, DWH equipment); review lighting systems both exterior and interior; and review efficiency of all such equipment. The study also included interviews and consultation with operational and maintenance personnel. The following is a summary of the tasks and reporting that make up the Energy Assessment portion of the report.

The following is a summary of the tasks and reporting that make up the Energy Assessment portion of the report.

Energy and Water Using Equipment

Nova Group, GBC has surveyed the tenant spaces, common areas, offices, maintenance facilities and mechanical rooms to document utility-related equipment, including heating systems, cooling systems, air handling systems and lighting systems.

Building Envelope

Nova Group, GBC has reviewed the characteristics and conditions of the building envelope, checking insulation values and conditions where accessible. This review also includes an inspection of the condition of walls, windows, doors, roof areas, insulation and special use areas.

Recommendations for Energy Savings Opportunities

Based on the information gathered during the on-site assessment, the utility rates, as well as recent consumption data and engineering analysis, Nova Group, GBC has identified opportunities to save energy and provide probable construction costs, projected energy/utility savings and provide a simple payback analysis.

Energy Assessment Process

- Interviewing staff and review plans and past upgrades
- Performing an energy assessment for each use type. Performing a preliminary evaluation of the utility system
- Making preliminary recommendations for system energy improvements and measures
- Estimating initial cost

Reporting

The Nova Group, GBC Energy Assessment Report includes:

- A comprehensive study identifying all applicable Energy Conservation Measures (ECMs) and priorities, based on initial cost.

1.2 Findings

1.2.1 Energy Conservation Measure Sorting

Simple Payback Period – The number of years required for the cumulative value of energy cost savings less future non-fuel costs to equal the investment costs of the building energy system, without consideration of discount rates. ECMs with a payback period greater than the Expected Useful Life (EUL) of the project are not typically recommended for loan-funded energy projects, as the cost of the project will not be recovered during the lifespan of the equipment; however they will be considered for energy projects funded by the MERP Implementation Grant. These ECMs are recommended for implementation during future system replacement. At that time, replacement may be evaluated based on the premium cost of installing energy efficient equipment. The ECMs presented in the table below are presented in order of priority of payback, however ECM's involving resilience components will be prioritized accordingly.

$$\textit{Simple Payback} = \frac{\textit{Initial Cost}}{\textit{Annual Savings}}$$

1.2.2 Assumptions

Nova Group, GBC has made the following assumptions in calculation of the Energy Conservation Measures.

- Building operating hours are assumed to be seven (7) hours per week.
- The facility occupancy is assumed to be four (4) people on a typical basis and up to twenty (20) people for events like training.
- Annual Heating Equipment Operating Hours are derived from actual consumption and equipment input rates to be 6,413 hours/year.
- Annual Cooling Equipment Operating Hours are derived from actual consumption and equipment input rates to be 2,355 hours/year.

1.2.3 Recommendations

Nova Group, GBC has recommended two (2) HVAC Energy Conservation measure options and five (5) Energy Conservation Measures (ECMs) that do not modify or replace the existing HVAC.

HVAC option two (1) includes installing new electric heaters in the garage areas.

HVAC option one (2) includes replacing the existing propane-fired boiler heating system with a new wood pellet-fired boiler system.

The savings for each measure is calculated using standard engineering methods followed in the industry.

The following table summarizes the recommended ECMs in terms of description, investment cost, energy consumption reduction, and cost savings.

Evaluated Energy Conservation Measures: Financial Impact			
	HVAC Option #1 -Electric Heaters	**HVAC Option #2 - Pellet Boiler**	**ECM Package Excluding HVAC**
Total Projected Initial ECM Investment	$ 55,200	$ 97,750	$ 18,240
Estimated Annual Cost Savings Related to all ECMs	$ 2,591	$ 2,475	$ 327
Estimated Annual Cost Savings-Electricity	$ (8,199)	N/A	$ (210)
Estimated Annual Cost Savings-Propane	$ 5,636	$ 5,636	$ 327
Estimated Annual Cost Savings-Fuel Oil	N/A	N/A	N/A
Estimated Annual Cost Savings-Wood Pellets	N/A	$ (3,160)	N/A
Net Effective ECM Payback	21 Years	39 Years	80.43 Years
Estimated Annual Energy Savings	-5%	-4%	2%
Estimated Annual Utility Cost Savings (excluding water)	28%	27%	4%

1.2.3.1 Solar and Battery Analysis

This site is equipped with an extensive rooftop photovoltaic array which consistently exceeds power demand for the building.

Nova Group, GBC has evaluated the site for a one (1) potential 267 kWh battery system, estimated at $186,986 (Total Investment Cost).

On Site RENEWABLE GENERATION Solar Photovoltaic Analysis with Battery	
Estimated number of panels	N/A
Estimated kW Rating	N/A
Potential Annual kWh Produced	267 kWh battery system
% of Current Electricity Demand	N/A
New Roof Cost	N/A
New Electrical Panel Cost	N/A
Battery Investment Cost	$186,986
Solar Investment Cost	N/A
Federal Investment Tax Credit (FITC)	N/A
Total Investment Cost (Solar+ Battery + Electrical Panel + Roof)	N/A
Estimated Annual Energy Cost Savings	N/A

On Site RENEWABLE GENERATION Solar Photovoltaic Analysis with Battery	
Payback without Incentives	N/A
Payback with all Incentives	N/A

ECM Recommendation Packages

HVAC Energy Conservation Measures

Evaluated HVAC Energy Conservation Measures with Savings												
ECM #	Description of ECM	Projected Initial Investment ($)	Natural Gas (Therms)	Propane (gal)	No. 2 Oil (gal)	Wood Pellets (Tons)	Electricity (kWh)	Energy Savings (kBTU)	% Savings (Energy)	Estimated Annual Maintenance Savings	Total Estimated Annual Cost Savings ($)	Simple Payback (Years)
Evaluated Measures												
1	*Option 1: Install ceiling suspended electric heating in the garage areas with a minimum of 97% AFUE.	$ 48,000	N/A	1,588	N/A	N/A	(41,299)	4,350	2.0%	N/A	$ (1,818)	N/A
Totals		$ 48,000	N/A	1,588	N/A	N/A	(41,299)	4,350	2.0%	N/A	$ (1,818)	N/A
	Interactive Savings Discount @ 10%	N/A	N/A	1,588	N/A	N/A	(45,429)	(9,741)	-4.6%	N/A	$ (2,564)	N/A
	Total Contingency Expenses @ 15%	$ 55,200	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Solar Produced Onsite	N/A	N/A	N/A	N/A	N/A	28,562	N/A	N/A	N/A	$ 5,155	N/A
Totals for Improvements		$ 55,200	N/A	1,588	N/A	N/A	(16,867)	(9,741)	-4.6%	N/A	$ 2,591	21.30
1	Option 2: Replace the condensing propane boiler (heating) with a new pellet-burning boiler with a minimum combustion efficiency of 92%.	$ 85,000	N/A	1,588	N/A	(8)	N/A	5,715	2.7%	N/A	$ 2,763	30.77
Totals		85,000	N/A	1,588	N/A	(8)	N/A	5,715	2.7%	N/A	$ 2,763	30.77
	Interactive Savings Discount @ 10%	N/A	N/A	N/A	N/A	(9)	N/A	(8,239)	-3.9%	N/A	$ 2,475	N/A
	Total Contingency Expenses @ 15%	97,750	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Solar Produced Onsite	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Totals for Improvements		97,750	N/A	1,588	N/A	(9)	N/A	(8,239)	-3.9%	N/A	$ 2,475	30.77
*This option is recommended for electrification purposes and to utilize the available solar energy the site produces.												

Energy Conservation Measure Options Excluding HVAC

Evaluated Energy Conservation Measures with Savings													
ECM #	Description of ECM	Projected Initial Investment ($)	Natural Gas (Therms)	Propane (gal)	No. 2 Oil (gal)	Steam (ML)	Wood (Tons)	Electricity (kWh)	Energy Savings (kBTU)	% Savings (Energy)	Estimated annual Maintenance Savings	Total Estimated Annual Cost Savings ($)	Simple Payback (Years)
Evaluated Measures													
1	Replace the existing showerheads with new WaterSense certified 1.5 GPM showerheads.	$ 60	N/A	24	N/A	N/A	N/A	N/A	2,155	1.0%	N/A	$ 84	0.72
2	Replace the existing bathroom aerators with new WaterSense certified 1.0 GPM aerators.	$ 30	N/A	1	N/A	N/A	N/A	N/A	67	0.0%	N/A	$ 3	11.48
3	Replace the existing refrigerator with a new ENERGY STAR rated refrigerator.	$ 850	N/A	N/A	N/A	N/A	N/A	250	853	0.4%	N/A	$ 45	18.84
4	Improve air sealing by reducing the ACH50 rate to 4.9 or lower in the South Wing.	$ 3,721	N/A	N/A	N/A	N/A	N/A	90	306	0.1%	N/A	$ 16	230.80
5	Replace the current DHW heater with a new point of use hot water heater rated at 0.98 EF.	$ 10,000	N/A	78	N/A	N/A	N/A	(1,649)	1,508	0.7%	N/A	$ (21)	N/A
6	Install a new level two electric vehicle charger.	$ 1,200	N/A	N/A	N/A	N/A	N/A	250	853	0.4%	$ (100)	$ 45	N/A
Totals		$ 15,861	N/A	102	N/A	N/A	N/A	(1,060)	5,742	2.7%	$ (100)	$ 172	219.41
	Interactive Savings Discount @ 10%	N/A	N/A	92	N/A	N/A	N/A	(1,166)	4,445	2.1%	$ (100)	$ 116	N/A
	Total Contingency Expenses @ 15%	$ 18,240	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Solar Produced Onsite	N/A	N/A	N/A	N/A	N/A	N/A	1,166	N/A	N/A	N/A	$ 210	N/A
Totals for Improvements		$18,240	N/A	92	N/A	N/A	N/A	1,166	4,445	2.1%	$ (100)	$ 327	80.43

1.2.4 Measures that Warrant Further Study

The following items are presented for consideration in operational and capital planning:

- No further measures were identified.

ENERGY CALCULATIONS AND ASSUMPTIONS

A property energy model was created using spreadsheet calculations based on appropriate and industry-accepted engineering formulas and standards for organizations such as ASHRAE. Nova cost estimates are based on construction cost data from sources such as RS-Means and technical discussions with equipment manufacturers and local contractors. The property owner may wish to solicit competitive bids from qualified contractors to ensure the most accurate pricing. Nova's cost estimates are general industry standards and may not account for all variations and specificities related to this site.

The building's historical energy consumption and the data collected on site were analyzed and "trued-up" in order to create energy models of the building systems. These models were used to predict energy and cost savings for the recommended measures. For this audit, Nova used proprietary spreadsheet models to estimate savings for the proposed retrofits.

Key information on building systems, including the results of performance tests conducted onsite are included in the tables on the following pages.

2.0 PROPERTY OVERVIEW

Facility Schedule	
Building Type/Name	Fire Station
# of Stories	One-story with garage loft
Year Built/Renovated	2015
Building Size	7,441 square feet
Hours of Operations/Week	Seven (7) hours
Operational Weeks/Year	52 weeks
Estimated Facility Occupancy	The facility occupancy is assumed to be four (4) people on a typical basis and up to twenty (20) people for events like training.

Property Contact	
Point of Contact Name	Ron Bushway1@hotmail.com
Point of Contact Title	Facilities Maintenance
Point of Contact - Contact Number	(802) 324-0974

3.0 SITE VISIT

The objective of the Document Review and Interview process is to augment the walk-through survey and to further assist in understanding the Site's latent physical components, physical deficiencies as well as preceding or on-going efforts toward energy and water conservation and/or waste diversion. The information obtained as a result of the Document Review and Interview process is assumed to be true and correct, provided that such information appears to be reasonable.

3.1 Site Visit Information

SITE VISIT INFORMATION	
Date of Site Observation	April 5th, 2024
Weather Conditions	Overcast, 38°F
Nova Field Associate	Johanna Stuz, BPI-BA
Nova Reviewers	Jay Hrivnatz, RA, CEM Keely Felton, CEA

3.2 Interviews

PROVISION OF INFORMATION	
	Property Management did not provide us with service provider information as requested in our Pre-Survey Questionnaire.
✔	Property Management did provide us with some information regarding service providers.

Based upon the Pre-Survey Questionnaire and the interview process, the individuals and organizations listed below were contacted and/or interviewed:

INTERVIEWS					
Service Provider/Property Rep.	**Title / Organization**	**Contact Information**	**Contact Attempted**	**Contact Made**	**No Reply / No Response**
Ron Bushway1@hotmail.com	Facilities Maintenance, Town of Grand Isle	(802) 324-0974		✔	
Melissa Boudin	Town Clerk and Treasurer, Town of Grand Isle	(802) 578-0472		✔	

4.0 ENERGY AUDIT - HISTORIC UTILITY CONSUMPTION

4.1 Utility Consumption

A preliminary end use analysis was performed on the subject property to understand how the property is using energy, to understand its performance relative to similar properties and to establish baseline GHG Emissions.

4.1.1 Historical Energy Consumption and Costs

Site Utilities	
Facility Electric Service Size	400 AMPS
Onsite Transformer	There is no transformer on-site.
Electric Meter Location	Outside on the east wall of the building.

Utility Analysis

Utility Type	Utility Provider	Meter Quantity	Energy/Water Uses	Annual Consumption	Est./Act.	Annual Cost
Electric (Grid)	Vermont Electric Co-Op	One (1)	Air Conditioning, Lighting, Cooking, Plug Loads	2,971 kWh	Actual	$371
Electric (Solar)	On-Site	One (1)	Air Conditioning, Lighting, Cooking, Plug Loads	16,435 kWh (consumed) 50,939 kWh (produced by on-site solar)	Actual	$(8,088) This is the amount of net metering credits the site has for the previous year. These credits will expire within a year and will likely expire before redeemed by the site.
Propane	Delivery; vendor may vary	None	Space Heating, Water Heating	1,586 Gal	Actual	$3,597

4.1.2 On-Site Utility Storage

Onsite Utility Storage	
Battery Storage	
Storage Capacity	None
Year Installed	N/A
Location Installed	N/A
Space Served	N/A
Fossil Fuel Storage	
No. 2 Oil	None
Propane Gas	One (1) buried tank of unknown capacity.
Wood Chips/Pellet	None

4.1.3 On-Site Generation

There is a solar photovoltaic system on-site and there is a generator on-site.

Solar Rooftop Photovoltaic System	
Installed Capacity	40 kW; four (4) 10,000W Inverters; (130) 320W Panels
Year Installed	2017
Location Installed	Roof
Space Served	Entire Building

Emergency Backup Generators	
Generator Capacity	25 kW
Year Installed	2017
Location Installed	East side of the building
Space served	Entire Building
Generator Fuel	Propane
Make	Kohler

4.1.4 On-site Electric Vehicle Charging

There are no electric vehicle charging stations on-site.

Onsite Electric Vehicle Charging	
Installed Chargers	None
Electrical Charger Type	N/A
Location Installed	N/A
Charger Manufacturer	N/A
Electric Metering to Chargers	N/A
Recommendations	There is both sufficient parking and availability on the current on-site breaker for an on-site electric vehicle charger. If electric heating equipment were to be installed it is likely the panel will need to be replaced. A licensed electrical engineer should be consulted to verify.

4.2 Heating Fuel

Nova was provided with three (3) years of propane usage totals in bill format from the property for one (1) owner-paid account. Total consumption and cost was provided. The most recent year of historical data was considered in Nova's analysis.

The following chart shows propane consumption month by month for the period from 1/1/2023 to 12/31/2023.

4.2.1 Provision of Data

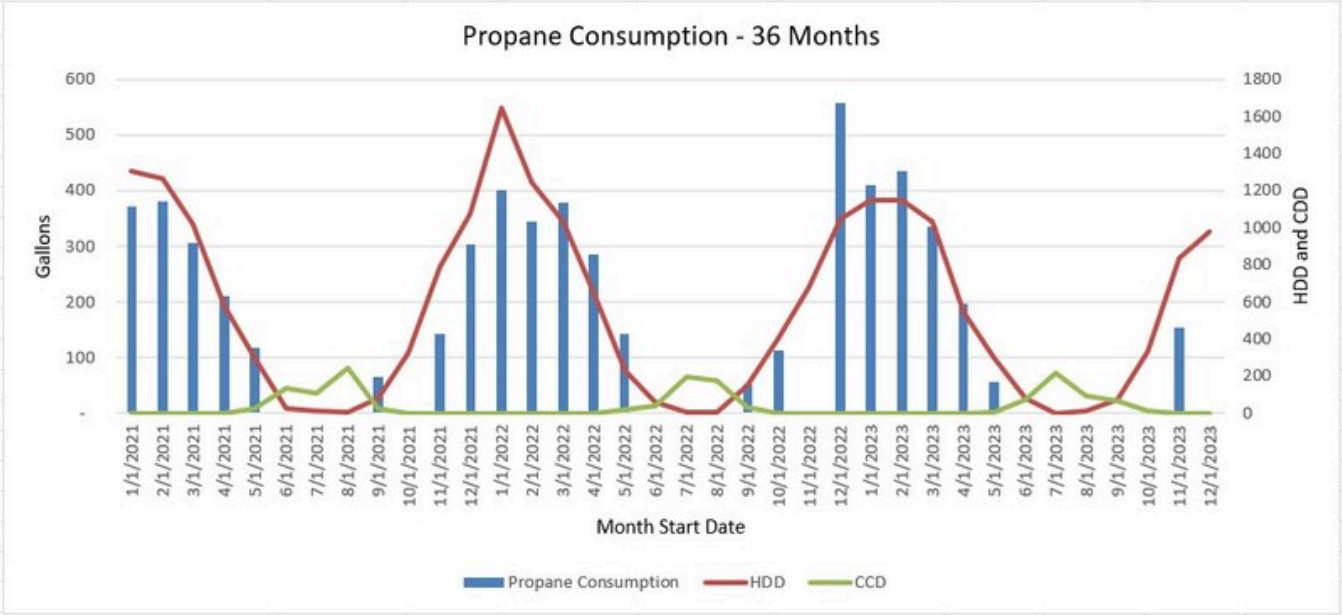
ANNUAL CONSUMPTION FOR HEATING FUEL					
Start	**End**	**Consumption**	**Cost**	**Estimated**	**Days**
1/1/2021	12/31/2021	1,897	$3,615	No	365
1/1/2022	12/31/2022	2,274	$5,130	No	365
1/1/2023	12/31/2023	1,586	$3,67	No	365

PROPANE CONSUMPTION					
Start	**End**	**Consumption (Gallons)**	**Cost**	**Estimated?**	**Days**
1/1/2023	1/31/2023	411	$ 931	No	31
2/1/2023	2/28/2023	436	$ 987	No	28
3/1/2023	3/31/2023	336	$ 762	No	31
4/1/2023	4/30/2023	196	$ 446	No	30
5/1/2023	5/31/2023	56	$ 128	No	31
6/1/2023	6/30/2023	-	$ -	No	30
7/1/2023	7/31/2023	-	$ -	No	31
8/1/2023	8/31/2023	-	$ -	No	31
9/1/2023	9/30/2023	-	$ -	No	30

PROPANE CONSUMPTION					
Start	**End**	**Consumption (Gallons)**	**Cost**	**Estimated?**	**Days**
10/1/2023	10/31/2023	-	$ -	No	31
11/1/2023	11/30/2023	153	$ 342	No	30
12/1/2023	12/31/2023	-	$ -	No	31
		1,586	$ 3,597		0

4.2.2 Analysis

When charted against heating degree days, it is evident that propane consumption peaks during the colder months, likely due to increased heating load.



4.3 Electricity

4.3.1 Provision of Data

Nova was provided with one (1) year of electricity usage history in PDF format from the property for solar generation, consumption and excess generation. Total consumption was provided and costs were calculated using the current Vermont Electric Coop tariff rates. The most recent twelve (12) months of historical data was considered in Nova's analysis.

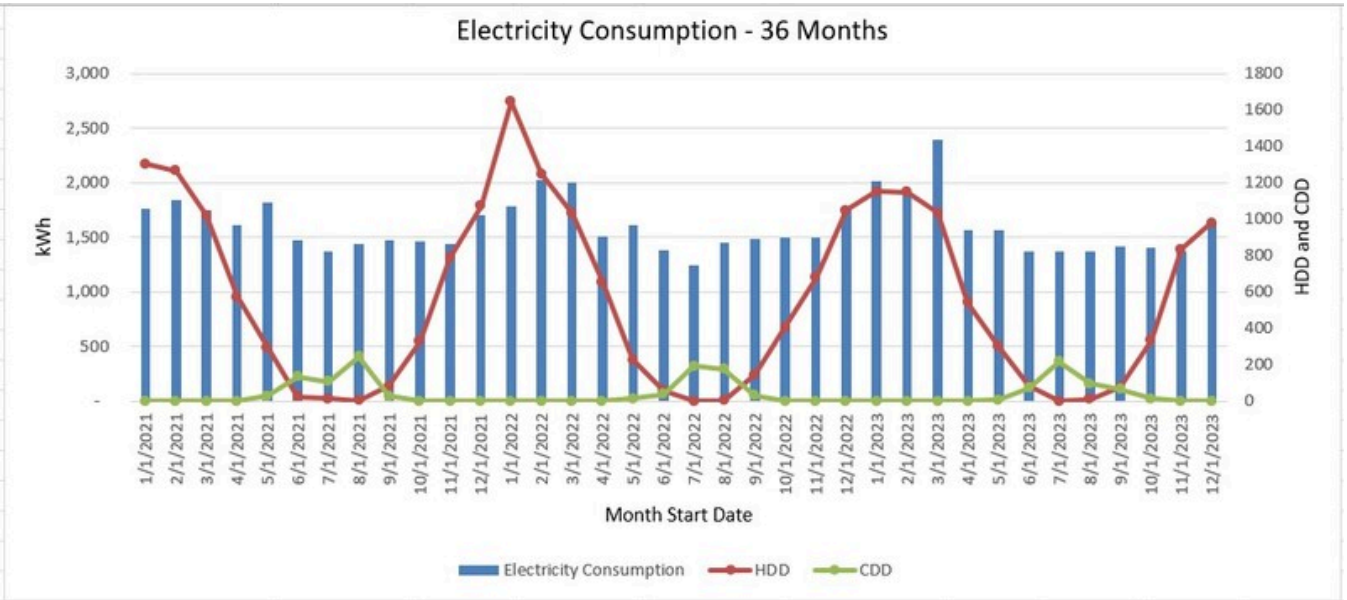
The following chart shows electric consumption month by month for the period from 1/1/2023 to 12/31/2023.

Annual Consumption of Electricity									
Start	End	Consumption (kWh)	Utility Cost	Solar Generation	Solar Credits	Total kWh	Total Cost	Estimated?	Days
1/1/2021	12/31/2021	3,337	$ 417	50,336	$ (8,359)	19,151	$ (7,942)	No	365
1/1/2022	12/31/2022	1,319	$ 165	56,214	$ (9,335)	19,278	$ (9,170)	No	365
1/1/2023	12/31/2023	2,971	$ 371	50,939	$ (8,459)	19,406	$ (8,088)	No	365

ELECTRICITY CONSUMPTION									
Start	End	Consumption (kWh)	Utility Cost	Solar Generation	Solar Credits	Total kWh	Total Cost	Estimated?	Days
1/1/2023	1/31/2023	971	$ 121	1,042	$ (173)	2,013	$ (52)	No	31
2/1/2023	2/28/2023	1,054	$ 132	883	$ (147)	1,937	$ (15)	No	28
3/1/2023	3/31/2023	946	$ 118	1,453	$ (241)	2,399	$ (123)	No	31
4/1/2023	4/30/2023	-	$ -	2,545	$ (423)	1,571	$ (423)	No	30
5/1/2023	5/31/2023	-	$ -	6,268	$ (1,041)	1,561	$ (1,041)	No	31
6/1/2023	6/30/2023	-	$ -	7,599	$ (1,262)	1,369	$ (1,262)	No	30
7/1/2023	7/31/2023	-	$ -	7,821	$ (1,299)	1,371	$ (1,299)	No	31
8/1/2023	8/31/2023	-	$ -	6,421	$ (1,066)	1,366	$ (1,066)	No	31
9/1/2023	9/30/2023	-	$ -	5,967	$ (991)	1,418	$ (991)	No	30
10/1/2023	10/31/2023	-	$ -	5,579	$ (926)	1,408	$ (926)	No	31
11/1/2023	11/30/2023	-	$ -	3,168	$ (526)	1,369	$ (526)	No	30
12/1/2023	12/31/2023	-	$ -	2,193	$ (364)	1,624	$ (364)	No	31
		2,971	$ 371	50,939	$ (8,459)	19,406	$ (8,088)		

4.3.1.1 Analysis

When charted against heating degree days, it is evident that electric consumption peaks during the colder months, likely due to increased heating load.



4.3.1.2 Renewable (Green Power) Energy Sources

No renewables or energy generation systems were observed on site.

4.4 Utility Rate Structure Analysis

Rates for common area utilities were provided on the utility bills for each utility.

UTILITY RATE STRUCTURE ANALYSIS						
Service	**Utility**	**Rate**	**Service/Customer Charge**	**Demand Charge**	**EIA Rate**	**Rate Used In Calculation**
Electricity	Vermont Electric Co Op (Glover, Eden, and Montgomery Properties)	$0.18049 per kWh up to 15,000 kWh and $0.10330 per kWh over 15,000 kWh	Customer Charge: $20.81 per meter up to 15,000 kWh and $34.69 per meter over 15,000 kWh.	$23.79 kW demand over 15,000 kWh	$0.1887 per kWh	$0.00 per kWh (for kwh that does not exceed current solar generation) $0.18049 per (kWh for additional kWH that does exceed current on-site solar generation)
Propane	Delivery company varries	Rates vary	NA	No	$3.548 per gallon	$3.548 per gallon

4.4.1 Billing Irregularities

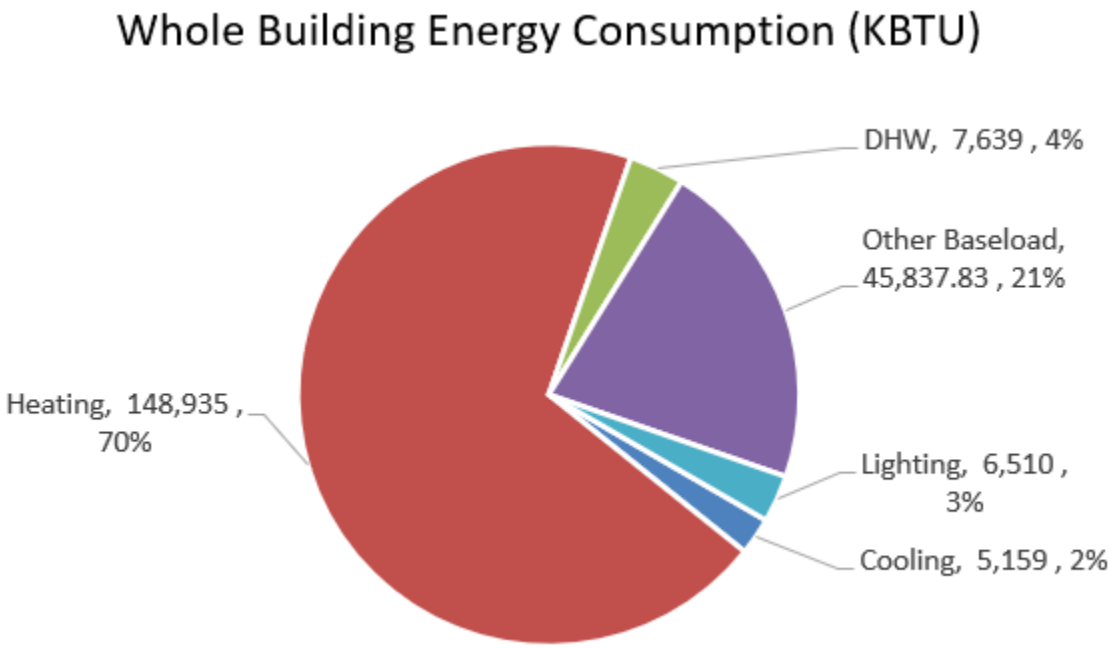
No billing irregularities were identified during the analysis of the utility data.

4.5 Utility End Use Analysis

Utility end use at the subject property was observed to be consistent with similar real estate assets previously analyzed by Nova Group, GBC.

4.5.1 End Use Breakdown

The figure below shows an annual breakdown of energy consumption for the entire facility.



5.0 EXISTING SYSTEMS AND EQUIPMENT - ENERGY

5.1 Existing Conditions

This section includes an inventory of existing systems and equipment and their current conditions.

Detailed equipment tables are included in Exhibit C of this report.

5.2 Building Envelope

The foundation is a poured concrete slab on grade with concrete walls raised sill plates in the garages. The walls are double thick wood framed with some CMU block walls and some steel structural framing. The wall exterior facade is corrugated metal and some CMU block walls. The interiors are finished with gypsum drywall in the offices and the garages. The ceiling are flat and finished with gypsum drywall. The attics are vented and assumed to be wood framed and insulation assumed to be equivalent to R-49.

5.2.1 Structure

The foundation is a poured concrete slab on grade with concrete walls raised sill plates in the garages. The walls are wood framed around some CMU block walls and steel structural framing. The sloped metal roof is over a vented attic.

STRUCTURE	
Component	**Description**
Construction Drawings	Construction drawings were not made available for review.
Foundation Type	Building foundations appear to be slab-on-grade.
Wall Type and Framing	The superstructure appears to be conventional wood stud framing.
Upper Floor Framing	The loft is wood framed.
Exterior Facade Description	Metal Siding
Wall Insulation Verification	Insulation was verified via discussions with maintenance staff.
Roof Type	Buildings on site are constructed with gable roofs.
Roof Framing	Roof framing consists of pre-manufactured wood trusses, supporting plywood or OSB roof sheathing.
Roofing Material	Building sloped roofs are light gray-painted standing seam metal.
Median Roof Age	Nine (9) years (original)
Roofing Reflectance	0.05-0.08, which is not considered reflective
Roof Water Intrusion	No evidence of active roof leaks was reported or observed.
Roof Insulation Verification	Insulation was verified via discussions with maintenance staff.

ENVELOPE INSULATION			
Slab	**Basement Walls**	**Above Grade Walls**	**Roof/Attic**
1" XPS Rigid Foam, R-5	N/A	Double Walls 8" Fiberglass Batt, R-26	12"+ Fiberglass Batt, R-49

DOORS AND WINDOWS	
Component	**Description**
Windows	
Window Frame	Windows are vinyl framed with the exception of three (3) windows on the south wall that are metal framed.
Window Operation	Crank Vent
Window Glazing	Windows are double glazed except for the windows in the overhead doors which are single glazed.
Window Weatherstripping	Weather stripping does appear to provide an adequate air seal to the exterior.
Window Age	Windows are original to the Property.
Window Center of Glass (COG) Values	U-Factor - .35 SHGC - .50
Window Tint/Films	Windows are not tinted.
Window to Wall Ratio	11.1% (5,842 square feet of exterior wall surface area; 651 square feet of window surface area)
Doors	
Main Entry Doors	Entry doors are metal doors in metal frames.
Door Weatherstripping	Weather stripping does appear to provide an adequate air seal to the exterior.
Door Age	Doors are original to the Property.
Overhead Doors	There are a total of six (6) overhead doors. Each overhead door is fourteen (14) feet wide and has 48 square feet of single glazed window area. Three (3) overhead doors are fourteen (14) feet tall and three (3) overhead doors are twelve (12) feet tall.

Blower Door Testing	
Blower Door Equipment	Retrotec
Building Volume	South Wing (Exclude Garage): 13,333 cubic feet Entire Building: 112,221 cubic feet
Leakage Rate @ -50 Pa (CFM50)	South Wing (Exclude Garage): 1,165 CFM50 Entire Building: 1,730 CFM50
Leakage Rate ACH50	South Wing (Exclude Garage): 5.2 ACH50 Entire Building: 0.92 ACH50
Noted areas of infiltration	Air infiltration was seen at the overhead doors, entry doors, bottom plates, holes in the ceiling above the office drop ceiling and interior doors to the garage.

Infrared Imaging	
Infrared Equipment	Flir One Pro
Outdoor temperature	39 degrees F
Indoor space temperature	70 degrees F in the residential area; 64 degrees F in the garage
Infrared Comments	Heat loss was seen at the metal door frames, exposed concrete vertical foundation walls; west garage exhaust vent, bottom plates and top plates.

5.3 Heating, Ventilation and Air Conditioning (HVAC)

5.3.1 Heating

Heating is provided by a boiler and radiant heating in the floor. During the spring and fall when the boiler is not running, the south wing is heated via mini-split ductless heat pumps.

HEATING SYSTEM SUMMARY		
Area Served	Entire Building	South Wing
Heating System Type	Boiler	Air Source Heat Pump - Ductless
Heating Fuel	Propane	Electricity
Heating System Configuration	Hydronic Boiler and Radiant Floor	Ductless System
Heating Equipment Location	Central mechanical room	South Wing; Condenser Outside
Typical Range of Efficiency	93.2% AFUE	11 HSPF
Equipment Manufacture Date Range	2017	2016
Quantity	One (1)	Two (2) evaporators; One (1) condenser
Access Issues	None	None
Description of Variation in Type, Fuel, Configuration or Location Between Areas	N/A	N/A

COMMERCIAL HEATING EQUIPMENT - PROPERTY WIDE	
Sample Representation	100% of systems on site were observed as part of the sample.
Explanation of Discrepancy	None
Heating Systems Recommended for Replacement	The boiler heating system serving the entire building.
Reason for Replacement	The option is recommended for decarbonization and resiliency reasons.

5.3.2 Cooling

The office, kitchen and training room areas of the south wing are cooled. The garages are not cooled.

COOLING SYSTEM SUMMARY	
Area Served	South Wing (1,600 square feet; 13,333 cubic feet)
Cooling System Type	Air Source Heat Pump - Ductless
Cooling System Capacity	Four (4) ton
Cooling Equipment Location	South Wing; Condenser Outside
Typical Range of Efficiency	SEER 16.5
Equipment Manufacture Date Range	2016
Quantity	Two (2) evaporators; One (1) condenser
Access Issues	None
Description of Variation in Type, Fuel, Configuration or Location Between Areas	N/A

COMMERCIAL COOLING EQUIPMENT - PROPERTY WIDE	
Sample Representation	100% of systems on site were observed as part of the sample.
Explanation of Discrepancy	None
Cooling Systems Recommended for Replacement	None
Reason for Replacement	N/A

5.3.3 Distribution, Controls and Ventilation

Heating distribution is by ductless, point source heat pump in the south wing and by radiant floor in the garages. Thermostats are programmable. There are exhaust fans in the garage to remove exhaust fumes.

There is one (1) ERV on-site manufactured by Renewaire in 2017. The model number is EV450JIN-S11E-GNT-L and the motor is 0.5 HP.

DISTRIBUTION & CONTROLS	
Ducted Distribution	
HVAC Duct Location	ERV ducts are located from the garage loft and above the finished ceiling
Access HVAC to Ductwork	Approximately 30% of ductwork is accessible from the loft.
HVAC Ductwork Air Sealing	Where exposed, ductwork appeared to be well air-sealed, based on visual inspection.
HVAC Duct Insulation	Most observed ductwork was insulated.
Affected Systems	ERV
HVAC Blower Fan Motors	
Type of Blower Fan Motors	N/A
Hydronic or Steam Distribution	
Type of Distribution	Hydronic radiant floor
Hydronic or Steam Pipe Insulation	Yes
Affected Systems	Heating
Controls	
Leased Area Thermostats	There are no leased areas.
Common Area Thermostats	Programmable
Building Automation System	N/A
Heating Setpoints	70 degrees in the south wing; 64 degrees in the garages
Cooling Setpoints	70 degrees in the south wing
Opportunity for Improvement	None

VENTILATION	
Kitchen Ventilation Type	Mechanical exhaust fans - individual
Kitchen Exhaust Destination	Recirculating
Bathroom Ventilation Type	Mechanical exhaust fans - individual
Bathroom Exhaust Destination	Vented to the exterior.

5.4 Domestic Water Heating

5.4.1 DHW Equipment

The entire building is served by one (1) on-demand, propane fired water heater.

DOMESTIC HOT WATER SYSTEM SUMMARY	
Area Served	Entire Building
DHW System Type	Tankless - On Demand
DHW Fuel	Propane
DHW System Capacity	199 kBTUh
DHW Equipment Location	Central mechanical room
Typical Range of Efficiency	0.95 EF
Equipment Manufacture Date Range	2017
Quantity	One (1)
Access Issues	None
DHW Lines	Domestic hot water piping was observed to be insulated where exposed.
Is a re-circ pump installed?	None
Existing High Rise Water Pressure Boosting System	No
Are Existing Booster(s) Variable Speed?	N/A
Description of Water Fixtures Related to DHW Usage (Faucet Aerators and Showerheads)	Four (4) faucets and two (2) showerheads
Description of Variation in Type, Fuel, Configuration or Location Between Areas	N/A

DHW EQUIPMENT - PROPERTY WIDE	
Sample Representation	100% of systems on site were observed as part of the sample.
Explanation of Discrepancy	None
DHW Systems Recommended for Replacement	The DHW system serving all hot water location in the building.
Reason for Replacement	Equipment is approaching or has exceeded its EUL, and efficiency could be improved to achieve savings goals

WATER FIXTURES - SUMMARY					
Fixture Type	**Location**	**Range Rated Flow Rate (GPM or GPF)**	**Average Rated Flow Rate (GPM or GPF)**	**Qty**	**% of Sample**
Toilet	Restroom	1.28	1.28 GPF	Three (3)	100%
Showerhead	Restroom	2.5 GPM	2.5 GPM	Two (2)	100%
Urinal	Restroom	0.125-1.0 GPF	0.125-1.0 GPF	One (1)	100%
Faucet	Restroom	1.2 GPM	1.2 GPM	Three (3)	100%
Faucet	Kitchen	1.5 GPM	1.5 GPM	One (1)	100%

5.5 Lighting

5.5.1 Interior Lighting

LED light fixtures containing 26W to 100W lamps provide all interior lighting in the buildings.

The facility has automatic lighting controls on the internal light fixtures located in smaller rooms such as closets and bathrooms**.**

The EXIT signs in the facility consist of LED lamp-based fixtures with Wattages of 5.5 to 29.

Interior Lighting			
Fixture Types	**Wattage**	**% of Total Fixtures**	**Recommended for Replacement**
LED	5.5-29 W	100%	No

5.5.2 Exterior Site Lighting

The exterior lighting primarily consists entirely of LED fixtures containing 5.5W to 29W lamps.

Exterior Lighting Lighting			
Fixture Types	**Wattage**	**% of Total Fixtures**	**Recommended for Replacement**
LED	5.5-29 W	100%	No

5.6 Appliances

5.6.1 Kitchen Appliances

Breakroom Appliances			
Item	**Type**	**Estimated Age & Condition**	**ENERGY STAR Certified**
Refrigerator	28.7 cubic feet Freezer location: Bottom Manufacturer/s: GE Annual Consumption: 653 kWh	Seven (7) years old and in good condition.	Not ENERGY STAR Rated
Dishwasher	Manufacturer/s: GE Annual Consumption: 270 kWh	Seven (7) years old and in good condition.	ENERGY STAR Rated

REFRIGERATORS - PROPERTY WIDE	
Sample Representation	100% of appliances on site were observed as part of the sample.
Explanation of Discrepancy	None
Refrigerators Recommended for Replacement	The refrigerator in the kitchen.
Reason for Replacement	Equipment is approaching or has exceeded its EUL, and efficiency could be improved to achieve savings goals.

DISHWASHERS - PROPERTY WIDE	
Sample Representation	100% of appliances on site were observed as part of the sample.
Explanation of Discrepancy	None
Dishwashers Recommended for Replacement	None
Reason for Replacement	N/A

5.6.2 Laundry

There is a commercial washer and dryer (single unit, load once for both wash and dry) manufactured by Continental in the shop.

Laundry Equipment	
Equipment	**Comment**
Commercial Washing and Drying Machine	One (1); specifications listed in the Exhibit C, Mechanical Systems Inventory.

CLOTHES WASHERS - PROPERTY WIDE	
Sample Representation	100% of appliances on site were observed as part of the sample.
Explanation of Discrepancy	None
Clothes Washers Recommended for Replacement	None
Reason for Replacement	N/A

5.7 Process Equipment and Loads

No tenant process equipment was observed on site.

5.8 Other Systems

No other systems were noted on site as significant energy-consumers.

5.9 Onsite Energy Generation

There is currently a 40 kW PV system on-site. There is also a 25 kW propane fired generator.

6.0 RECOMMENDED ENERGY CONSERVATION MEASURES (ECMS)

6.1 Building Envelope

ECM: IMPROVE AIR SEALING

Green Alternative	Engage a BPI-accredited air sealing contractor to reduce the ACH50 rate to 4.9 in the South Wing. Recommended areas of focus include penetrations through exterior walls. Electrical outlets on exterior walls should be sealed with foam gaskets. Exterior door weather stripping should be replaced as needed.
Benefits Attained	Air sealing reduces heat loss in the winter and heat gain in the summer. Air sealing can reduce the risk of fire, and stop interior moisture from reaching attics. Comfort may improve as the air sealing reduces the transfer of odors, noise and animal pests between different parts of the building.
Assumptions	The ACH50 rate was measured to be 5.2 during blower-door testing.
Recommendation	This "green alternative" is recommended for energy saving purposes.

6.2 HVAC Systems

ECM: INSTALL HIGH EFFICIENCY PELELT BOILERS - HVAC Option 2

Green Alternative	Replace existing propane-fired boiler with a wood-pellet fired boiler with a combustion efficiency rating of at least 92%.
Benefits Attained	While replacing central boilers is an expensive measure, these units will need replacement in the coming years as they are reaching the end of their useful life. Replacing now with high efficiency alternatives provides significant cost savings and comfort benefits and reduces large future capital expense.
Assumptions	We modeled the savings using spreadsheet-based calculations. To calculate heating savings we assumed an improvement in efficiency from 93.2% TE to 92% combustion efficiency for affected units.
Recommendation	The option is recommended for decarbonization and resiliency reasons.

ECM: INSTALL HIGH EFFICIENCY ELECTRIC BAY HEATERS HVAC OPTION 1

Green Alternative	Replace existing garage heating system with new electric bay heaters with a minimum of 97% AFUE.
Benefits Attained	While replacing a heating system is an expensive measure, replacing the existing propane-fired heating system provides for a greener alternative.
Assumptions	We modeled the savings using spreadsheet-based calculations. To calculate heating savings we assumed an improvement in efficiency from 93.2% TE to 97% AFUE.
Recommendation	The option is recommended for decarbonization and resiliency reasons.

6.3 Domestic Water Systems

ECM: INSTALL HIGHER EFFICIENCY ELECTRIC WATER HEATERS

Green Alternative	Replace existing propane-fueled water heater with a higher efficiency point of use electric water heaters rated at 0.98 EF or higher.
Benefits Attained	While replacing domestic hot water units is an expensive measure, many of the units will need replacement in the coming years as they are reaching the end of their useful life. Replacing now with high efficiency alternatives provides significant cost savings and comfort benefits and reduces large future capital expense.
Assumptions	We modeled the savings using spreadsheet-based calculations. To calculate domestic hot water savings we assumed an improvement in efficiency from 0.95 EF to 0.98 EF.
Recommendation	This "green alternative" is recommended for energy saving purposes.

6.4 Appliances

ECM: REPLACE REFRIGERATORS

Green Alternative	Nova recommends installing one new ENERGY STAR®-qualified refrigerators (designed to consume 10% less than minimum federal efficiency standards) in place of the existing inefficient refrigerator. Refrigerators shall possess top-mounted freezers and be appropriately sized. Ice-maker and dispenser models are not recommended because they use 15% more energy than standard ENERGY STAR-qualified models and will increase the purchase price.
Benefits Attained	ENERGY STAR qualified refrigerators are equipped with high-efficiency compressors that have improved insulation; they also consume approximately 25% less energy than similar non-ENERGY STAR models. Models with top-mounted freezers use 10-25% less energy than bottom or side-by-side models.
Assumptions	We based the costs for this measure on common costs of equivalent sized ENERGY STAR-qualified refrigerators. The savings calculations assume existing refrigerator consumption at 653 kWh and proposed consumption at 403 kWh annually.
Recommendation	This "green alternative" is recommended for energy saving purposes.

6.5 Resilience Options

ECM: LEVEL TWO ELECTRIC VEHICLE CHARGER

Green Alternative	We analyzed the property for a potential electric vehicle charging station based on available parking space, and found the property has availability for one (1) charging station.
Benefits Attained	By providing onsite electric charging station, the site will promote the use of EV chargers in the area, reducing vehicle emissions in the area. Additionally, the chargers will likely increase foot traffic in the area, providing economic benefits to the town.
Assumptions	The charger installed would be a level two (2) electric vehicle charger.
Recommendation	This "green alternative" is recommended for decarbonization and resiliency reasons.

7.0 GLOSSARY OF ABBREVIATIONS

This report may use abbreviations to describe various site or building system components. Not all abbreviations may be applicable to this report. Frequently used abbreviations are listed and defined below.

ABBREVIATIONS			
Acronym	**Description**	**Acronym**	**Description**
AC	Air Conditioner	HRV	Heat-Recovery Ventilator
ACH	Air Changes per Hour	HSPF	Heating Seasonal Performance Factor
ACH50	Air Changes per Hour at 50 Pascals Building Pressure	HUD	U.S. Department of Housing and Urban Development
ACHN	Natural Air Changes per Hour	HVAC	Heating, Ventilation and Air Conditioning
AEE	Association of Energy Engineers	HWS	Hot Water Supply
AFUE	Annual Fuel Utilization Efficiency	IAQ	Indoor Air Quality
AHU	Air Handling Unit	IBC	International Building Code
ANSI	American National Standards Institute	IECC	International Energy Conservation Code
ASHP	Air Source Heat Pump	IES	Illuminating Engineering Society of North America
ASHRAE	American Society of Heating, Refrigeration and Air-Conditioning Engineers	IMEF	Integrated Modified Energy Factor
ASTM	American Society for Testing and Materials	IPLV	Integrated Part Load Value
BEAP	Building Energy Assessment Professional (ASHRAE)	ISO	Polyisocyanurate
BESA	Building Energy Simulation Analyst (Association of Energy Engineers)	IWF	Integrated Water Factor
BMS	Building Management System	kBTU	One Thousand British Thermal Units
BPI	Building Performance Institute	kW	Kilowatt
BPI-BA	Building Performance Institute Certified Building Analyst	kWh	Kilowatt-Hour
BPI-MFBA	Building Performance Institute Certified Multifamily Building Analyst	LED	Light Emitting Diode
BTL	Building Tightness Limit	LEED	Leadership in Energy and Environmental Design
BTU	British Thermal Unit	LEED AP(BD&C)	LEED Accredited Professional - Building Design & Construction
BTUH	British Thermal Units per Hour	Low-E	Low Emissivity
CAZ	Combustion Air Zone	LPG/LP Gas	Liquefied Petrolium Gas (ex - Propane)
CDD	Cooling Degree Days	MAU	Makeup Air Unit
CEA	Certified Energy Auditor (Association of Energy Engineers)	MEF	Modified Energy Factor
CEC	California Energy Commission	MEP	Mechanical, Electrical and Plumbing
CEER	Combined Energy Efficiency Ratio	MH	Metal Halide

ABBREVIATIONS			
Acronym	**Description**	**Acronym**	**Description**
CEF	Combined Energy Factor	MMBTU	One Million British Thermal Units
CEM	Certified Energy Manager (Association of Energy Engineers)	MTCO2e	Metric Tons Carbon Dioxide Equivalent
CF	Cubic Feet	MVG	Minimum Ventilation Guideline
CFL	Compact Fluorescent Lamp	MVL	Minimum Ventilation Level
CFM	Cubic Feet per Minute	NABCEP	North American Board of Certified Energy Practitioners
CFM50	Measured Air Flow through Blower Door at 50 Pascals	NAHB	National Association of Home Builders
CMVP	Certified Measurement & Verification Professional (Association of Energy Engineers)	NFPA	National Fire Protection Association
CO	Carbon Monoxide	NFRC	National Fenestration Rating Council
CO2	Carbon Dioxide	NRA	Net Rentable Area
CO2e	Carbon Dioxide Equivalent	NREL	National Renewable Energy Laboratory
COP	Coefficient of Performance	NRSF	Net Rentable Square Feet
CPVC	Chlorinated Polyvinyl Chloride	ODS	Oxygen Depletion Sensor
CRI	Color-Rendering Index	OSB	Oriented Strand Board
CUFT	Cubic Feet	OSHA	Occupational Safety and Health Administration
DB	Dry-Bulb (Temperature)	PCA	Property Condition Assessment
DHW	Domestic Hot Water	PCR	Property Condition Report
DLC	DesignLights Consortium	PPM	Parts per Million
DWH	Domestic Water Heater	PSC	Permanent Split Capacitor
DX	Direct Expansion	PSI	Pounds per Square Inch
ECM	Electronically Commutated Motor	PTAC	Packaged Terminal Air Conditioner
EER	Energy Efficiency Ratio	PTHP	Packaged Terminal Heat Pump
EF	Energy Factor	PVC	Polyvinyl Chloride
EIFS	Exterior Insulation and Finish System	R-	R-Value
EMF	Electro Magnetic Field	RAC	Room Air Conditioner
EMS	Energy Management System	RESNET	Residential Energy Services Network
EPA	Environmental Protection Agency	RPM	Revolutions per Minute
EPDM	Ethylene Propylene Diene Monomer	RTU	Rooftop Unit
EPS	Expanded Polystyrene	RUL	Remaining Useful Life
ERV	Energy-Recovery Ventilator	R-Value	Thermal Resistance
EUI	Energy Use Intensity	SC	Shading Coefficient
EUL	Expected Useful Life	SEER	Seasonal Energy Efficiency Ratio
EWEM	Energy and Water Efficiency Measure	SF	Square Feet
FCU	Fan Coil Unit	SHGC	Solar Heat-Gain Coefficient
FHA	Forced Hot Air	SIR	Savings to Investment Ratio
FHR	First Hour Rating	SOG	Slab on Grade
FHW	Forced Hot Water	TE	Thermal Efficiency

ABBREVIATIONS			
Acronym	**Description**	**Acronym**	**Description**
FPM	Feet per Minute	TPO	Thermoplastic Polyolefin
FT	Feet	TRV	Thermostatic Regulator Valve
GA	Gross Area	TTD	Thermostatic Tub Diverter
gal	Gallons	U-	U-Factor (U-Value)
GBA	Gross Building Area	UBC	Uniform Building Code
GFCI	Ground Fault Circuit Interrupter	UL	Underwriters Labaratories
GPC	Gallons per Cycle	USGBC	U.S. Green Buildung Council
GPF	Gallons per Flush	UV	Ultraviolet
GPM	Gallons per Minute	V	Volt
GSHP	Ground Source Heat Pump	VAV	Variable Air Volume
HDD	Heating Degree Days	VFD	Variable Frequency Drive
HERS	Home Energy Rating System	VOC	Volatile Organic Compound
HHW	Heating Hot Water	W	Watt
HID	High-Intensity Discharge (Lighting)	WB	Wet-Bulb (Temperature)
HP	Horsepower	WH	Watt-hour
HPB	High Performance Building	WRT	With Reference to
HPBD	High-Performance Building Design Professional (ASHRAE)	WUI	Water Use Intensity
HPS	High-Pressure Sodium	XPS	Extruded Polystyrene

8.0 RECOMMENDED OPERATIONS AND MAINTENACE PLAN

BEST PRACTICES TO IMPROVE ENERGY PERFORMANCE

LOW-COST O&M CHECKLIST

Use the following checklist of low-cost O&M practice to identify opportunities, assign responsibility and track progress toward goals at your facility.

	Opportunity Exists	Target Reduction	Who is Responsible?	Target Date to Complete	Actual Date Completed	Notes
OPERATIONS & MAINTENANCE						
Ensure all equipment is functioning as designed	Y					
Calibrate thermostats	Y					
Adjust dampers	Y					
Implement janitorial best practices	Y					
Properly maintain existing equipment	Y					
Review ENERGY STAR Registry of Labeled Buildings for ideas	Y					
OCCUPANTS' BEHAVIOR						
Turn off equipment	Y					
Institute an energy awareness program	Y					
Adopt a procurement policy for ENERGY STAR qualified equipment	Y					
Maximize use of daylight	Y					
Install task lighting	Y					
Train staff	Y					
LIGHTING						
Change incandescents to CFLs	Y					
Change T12s to T8 or T5	Y					
Install occupancy sensors in back-of-the house, infrequently used areas						
Install high efficiency LED exit signs						
Periodically clean the bulbs with a dry cloth	Y					
De-lamp where illumination is excessive	Y					
Only use lights that are needed	Y					

www.energystar.gov/benchmark

E-mail: energystarbuildings@epa.gov

	Opportunity Exists?	Target Reduction	Who is Responsible?	Target Date to Complete	Actual Date Completed	Notes
KITCHENS						
Pre-heat ovens no more than 15 minutes prior to use						
Keep refrigerator coils clean and free of obstructions	Y					
Bleach clean with warm water	Y					
Use fan hood only when cooking						
Purchase ENERGY STAR commercial cooking equipment	Y					
COMPUTERS AND OFFICE EQUIPMENT						
Utilize power down feature on computers	Y					
Purchase ENERGY STAR office equipment	Y					
Install energy control devices on vending machines						
HVAC AND PLANT SYSTEMS						
Adjust thermostats for seasonal changes and occupancy	Y					
Balance air and water systems	Y					
Replace boiler burners	Y					
Unblock air flow from unit ventilators	Y					
Clean centrifugal chiller water tubes						
Clean and repair chilled water plants or package units						
Repair leaking steam traps						
Repair pipe and vessel insulation from steam and hot water distribution lines						
Repair malfunctioning dampers on unit ventilators						
Chemically treat feedwater						
Annually test combustion efficiency	Y					
Clean and lubricate moveable surfaces and check actuator movement and set-points in the damper and economizer						
Perform boiler tune-ups	Y					
Clean filters and fans	Y					
Clean air conditional evaporator and condenser coil fins	Y					
Align and adjust belts	Y					

	Opportunity Exists?	Target Reduction	Who is Responsible?	Target Date to Complete	Actual Date Completed	Notes
HVAC AND PLANT SYSTEMS (CONTINUED)						
Check for air leaks in equipment cabinets and ducts						
Ensure proper operation of air damper	Y					
Clean condenser and evaporator coils	Y					
Properly charge refrigerant	Y					
Install VFDs and energy efficient motors	Y					
FANS						
Clean fan blades	Y					
Inspect bearings	Y					
Adjust/change belts	Y					
Check fan current	Y					
BUILDING ENVELOPE						
Regularly inspect doors and windows for air leaks	Y					
Periodically inspect building for water leaks	Y					
Check the caulking and weather stripping for leaks	Y					
WATER HEATING						
Adjust water temperature to lower legal limit	Y					
Periodically check the hot water systems for leaks	Y					
Test the burners of gas or oil fired water heaters annually	Y					
Periodically flush fixtures to prevent bacteria growth	Y					
Annually flush storage-type hot water tanks	Y					
Periodic maintenance on the hot water system	Y					
Install or repair pipe insulation	Y					

EXHIBIT A: PHOTOGRAPHIC RECORD

Photographs

Elevation North

Elevation East

Elevation South

Elevation West

West Entry Door

Triple Glazed Window

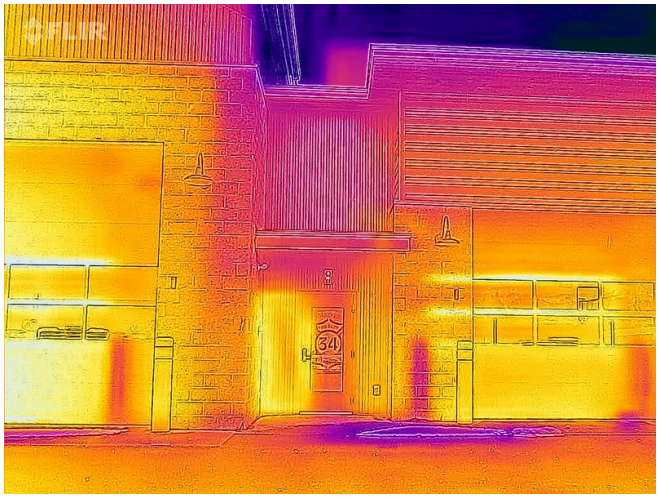
South Wall Window in the East Garage Loft

Triple Glazed Window

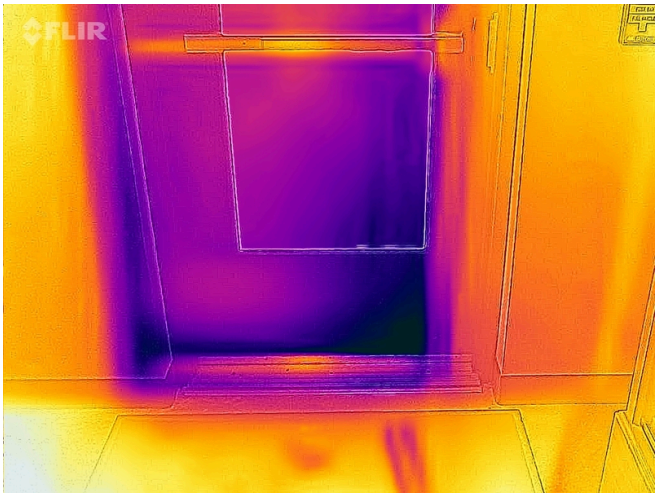
Draft Around West Garage South Entry Door

Drafty Entry Door; South Wall of the West Garage

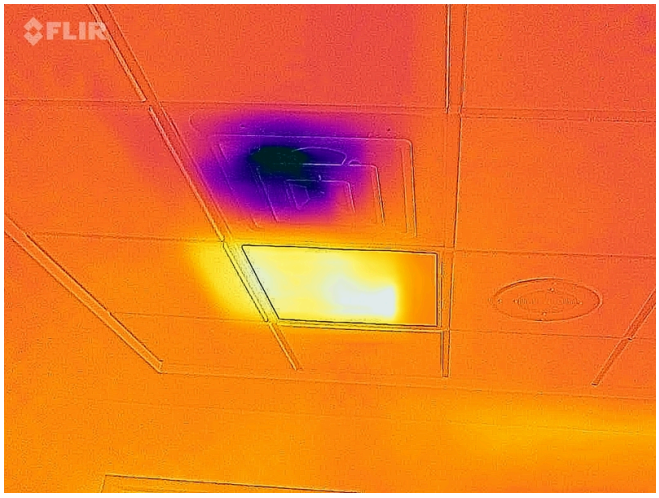
Electrical and Solar PV



IR North Wall Garage Stree Front Entry Between Overhead Doors



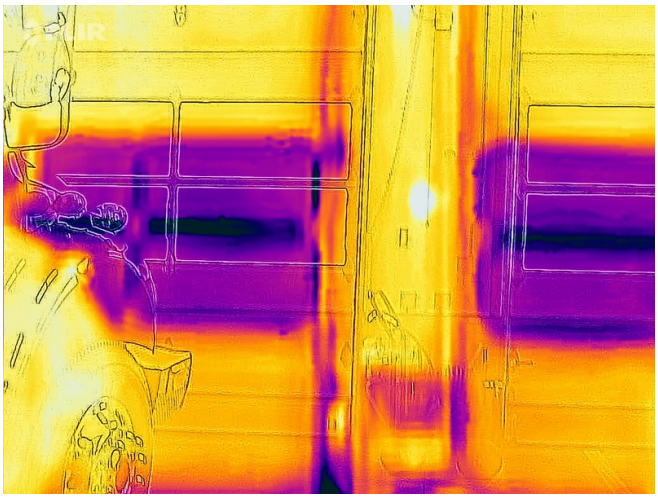
IR West Main Entry Door



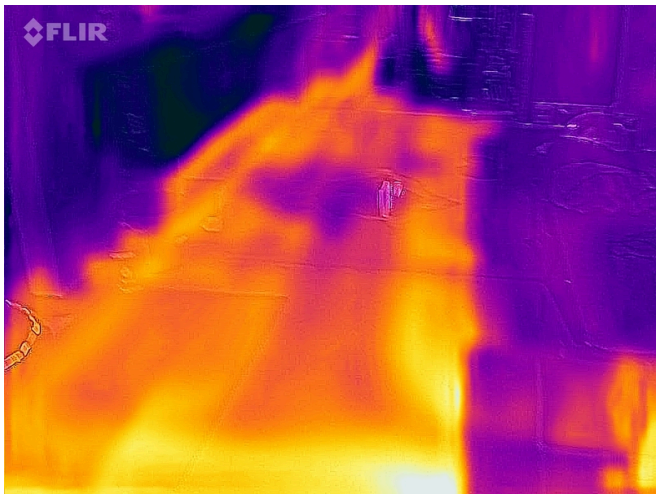
IR Ceiling in the Training Room

IR East Wall in the Garage

IR West Entry Door in the West Garage



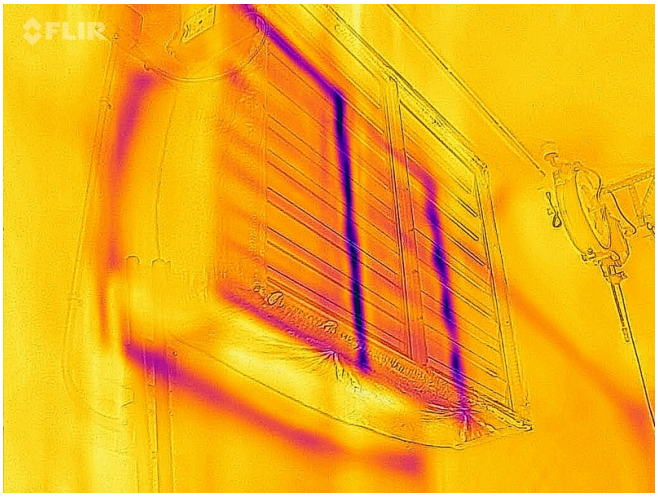
IR North Wall Between Overhead Doors in the Garage



IR West Garage Radiant Floors

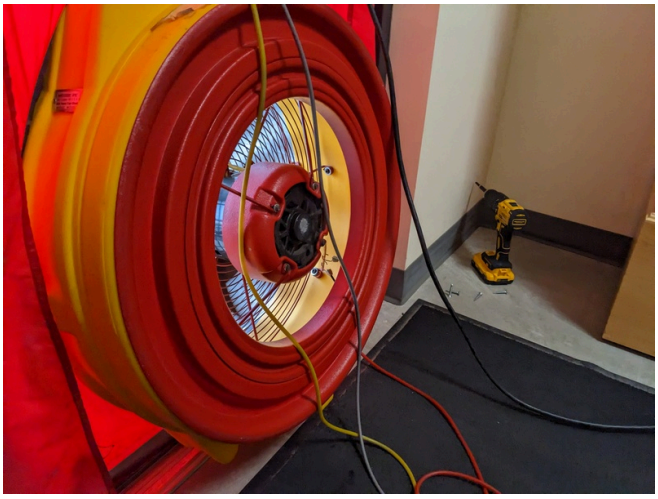
IR South Entry Door in the West Garage

IR Radiant Floor and the South Entry Door from the West Garage



IR West Wall Ventilation Louvers

Blower Door Setup

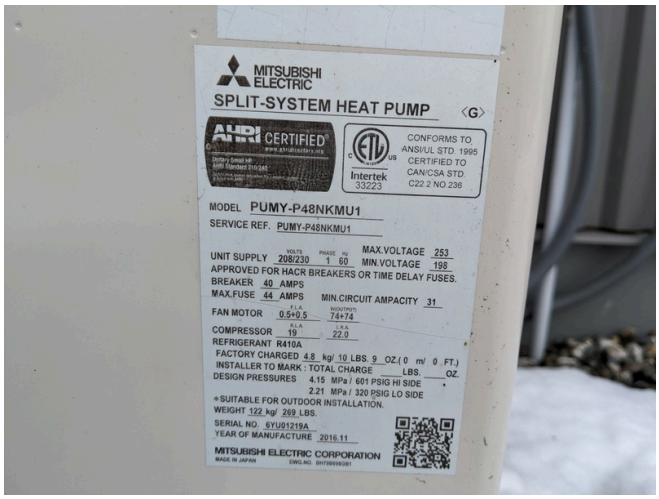


Blower Door Setup: Test Two

Blower Door Final Result

Blower Door Final Result: 1,730 CFM at -50 PA for the Whole Building

East Wall Condenser



VRF Condenser by Mitsubishi; Model: PUMY-P48NKMU1

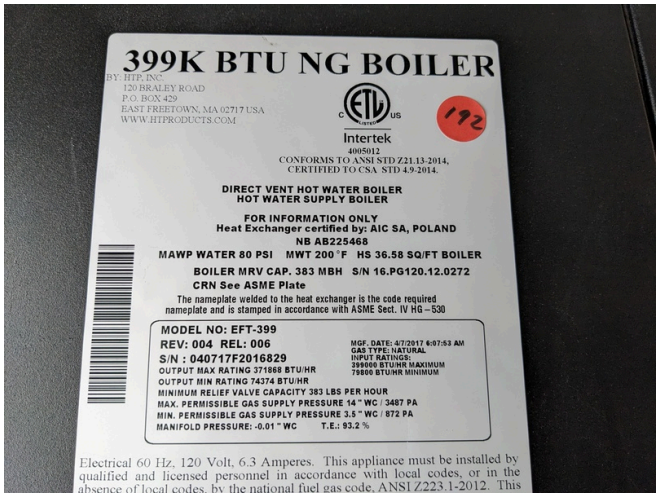
Evaporator

Ductless Evaporator by Mitsubishi; Model: PKFY-P30NKMU-E2

Ductless Evaporator

Ductless Evaporator by Mitsubishi; Model: PKFY-P08NHMU-E2

Mechanical Room Boiler and Hydronic Distribution



Boiler by HTP; Model: EFT-399

Vehicle Exhaust Air Filter by Air Vac

ERV by Renew Aire

ERV by Renew Aire Nameplate

Lighting in the West Entry Foyer

Lighting in the Training Room

LED Light Fixture in the Training Room

Garage Coat Room

East Garage Ceiling Lighting

Outside Lighting

Outside Lighting

19 W Outside Light

Clothes Washer

Clothes Washer by Continental; Model: EH020PA1024122001

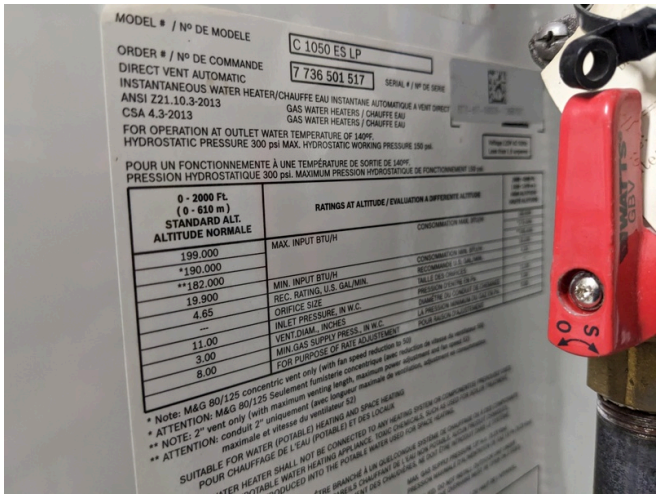
Lighting in the Kitchen

Refrigerator by GE; Model: GNE29GSKGSS

Kitchen

Dishwasher by GE; Model: GLDT696J00SS

DHW Boiler in the Mechanical Room



DHW Boiler by Bosch; Model: C 1050 ES LP

1.5 GPM Rated Flow at the Kitchen Faucet

2.5 GPM Showerhead

1.0 GPM Urinal

1.28 GPF Toilet

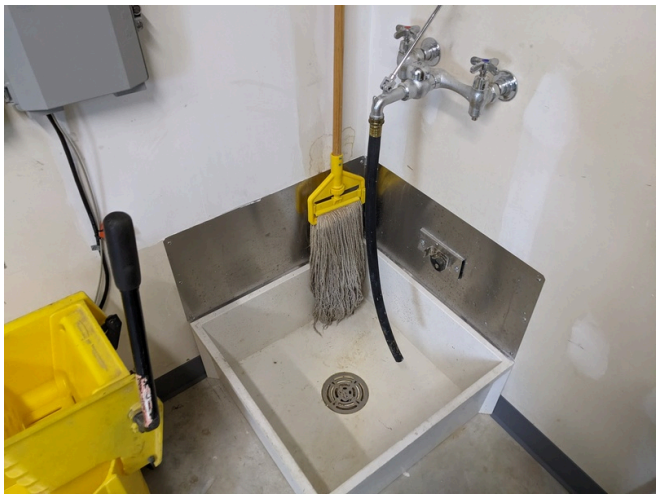
1.5 GPM Restroom Faucet

1.2 GPM Restroom Faucet

1.28 GPF Toilet

1.2 GPM Restroom Faucet

2.5 GPM Showerhead



Mop Sink in the Mechanical Room

EXHIBIT B: SITE AND FLOOR PLANS

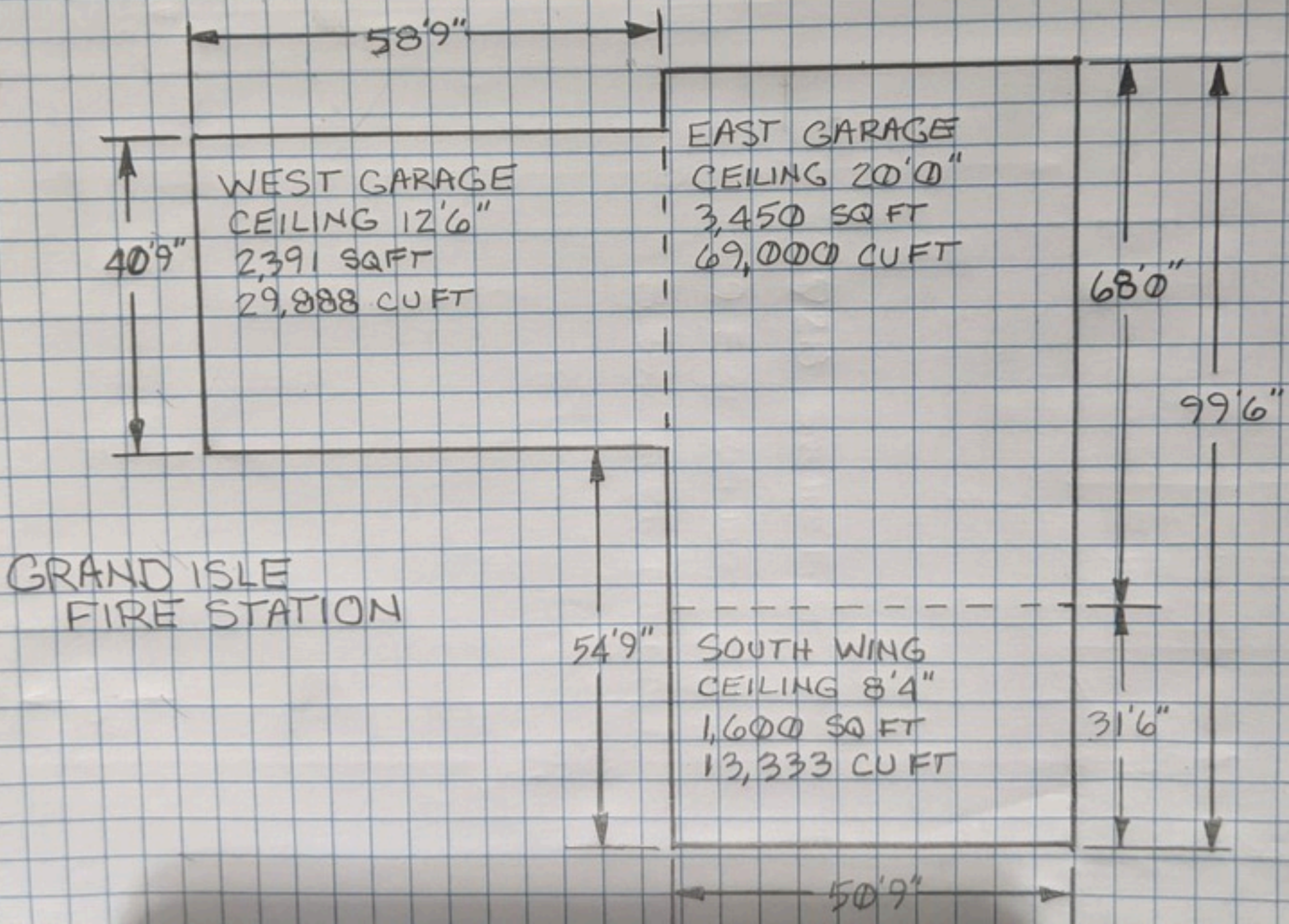

58'9"
WEST GARAGE
CEILING 12'6"
2,391 SQFT
29,888 CU FT
40'9"
EAST GARAGE
CEILING 20'0"
3,450 SQ FT
69,000 CU FT
68'0"
99'6"
GRAND ISLE
FIRE STATION
54'9"
SOUTH WING
CEILING 8'4"
1,600 SQ FT
13,333 CU FT
31'6"
50'9"

EXHIBIT C: MECHANICAL EQUIPMENT INVENTORY

PUMPS AND MOTORS						
Equip. Location	**Service**	**Make**	**Model #**	**Size (HP)**	**Quantity**	**VFD Control (Y/N)**
RECOMMENDED FOR REPLACEMENT						
None						
NOT RECOMMENDED FOR REPLACEMENT						
Boiler Room	Hydronic Floor Heat	Grundfos	UPS26-99FC	1/4	Four (4)	Yes
Boiler Room	Hydronic Floor Heat	Taco	0012-F4-IFC	1/8	One (1)	Yes

HEATING EQUIPMENT												
Equip. Location	**Area Served**	**System Type**	**Make**	**Model #**	**Capacity**	**Cap. Units**	**Efficiency**	**Eff. Units**	**Year**	**Qty**	**Fuel**	**Dist.**	**RUL**
RECOMMENDED FOR REPLACEMENT													
Boiler Room	Entire Building	Boiler	HTP	EFT399	399	kBTUh	93.2%	AFUE	2017	One (1)	Propane	Hydronic Floor	Eight (8) years
NOT RECOMMENDED FOR REPLACEMENT													
South Wing	South Wing	Mini Split Condenser	Mitsubishi	PUMY-P48NKMU1	Four (4)	Ton	11	HSPF	2016	One (1)	Electric	Ductless Heat Pump	Eight (8) years

COOLING EQUIPMENT												
Equip. Location	**Area Served**	**System Type**	**Make**	**Model #**	**Capacity**	**Cap. Units**	**Efficiency**	**Eff. Units**	**Year**	**Qty**	**Dist.**	**RUL**
RECOMMENDED FOR REPLACEMENT												
None												
NOT RECOMMENDED FOR REPLACEMENT												
South Wing	South Wing	Mini Split Condenser	Mitsubishi	PUMY-P48NKMU1	Four (4)	Ton	SEER HSPF	16.5 11.0	2016	One (1)	Ductless Heat Pump	Eight (8) years
South Wing	South Wing	Mini Split Evaporater	Mitsubishi	PKFY-P30NKMU-E2	2.5	Ton	SEER HSPF	16.5 11.0	2016	One (1)	Ductless Heat Pump	Eight (8) years
Outside	South Wing	Mini Split Evaporater	Mitsubishi	PKFY-P08NKMU-E2	.66	Ton	SEER HSPF	16.5 11.0	2016	One (1)	Ductless Heat Pump	Eight (8) years

DHW EQUIPMENT												
Equip. Location	**Area Served**	**Make**	**Model #**	**Capacity (BTU or kWh)**	**Efficiency**	**Direct or Indirect**	**Tank Size**	**Recirc. Pump HP**	**Year**	**Qty**	**Fuel**	**RUL**
RECOMMENDED FOR REPLACEMENT												
Mechanical Room	Entire Building	Bosch	C 1050 ES LP	199 kBTUh	0.95 EF	Direct	None	None	2017	One (1)	Propane	Eight (8) years
NOT RECOMMENDED FOR REPLACEMENT												
None												

INTERIOR SITE LIGHTING									
Fixture Location	**Fixture Type**	**Lamp Type**	**Fixture Count**	**Lamp Count Per Fixture**	**Existing Lamp Wattage**	**Proposed Lamp Wattage**	**Control Type**	**Daily Run Hours**	**Type of Upgrade**
RECOMMENDED FOR REPLACEMENT									
None									
NOT RECOMMENDED FOR REPLACEMENT									
West Side Garage	LED	LED	Nine (9)	One (1)	50	None	On/Off	One (1)	None
West Side Garage	LED	LED	Four (4)	One (1)	100	None	On/Off	One (1)	None
Closet Between Garages	LED	LED	Two (2)	One (1)	50	None	OS	One (1)	None
East Side Garage	LED	LED	Eighteen (18)	One (1)	100	None	On/Off	One (1)	None
East Side Garage	LED	LED	Nine (9)	One (1)	100	None	On/Off	One (1)	None
Mechanical Room	LED	LED	Two (2)	Two (2)	50	None	On/Off	One (1)	None
Hall to South Wing	LED	LED	Four (4)	One (1)	32	None	OS	One (1)	None
Shop	LED	LED	Two (2)	One (1)	26	None	OS	One (1)	None
Restrooms	LED	LED	Two (2)	One (1)	32	None	OS	One (1)	None
Dispatch	LED	LED	Two (2)	One (1)	48	None	OS	One (1)	None
Chief's Office	LED	LED	Four (4)	One (1)	32	None	On/Off	One (1)	None
Training Room	LED	LED	Six (6)	One (1)	32	None	On/Off	One (1)	None
Training Room	LED	LED	Three (3)	One (1)	48	None	On/Off	One (1)	None
Training Room Closet	LED	LED	One (1)	One (1)	26	None	OS	One (1)	None
Kitchen	LED	LED	Two (2)	One (1)	48	None	OS	One (1)	None
Hall to Kitchen	LED	LED	One (1)	One (1)	32	None	OS	One (1)	None
Restroom with Shower	LED	LED	Two (2)	One (1)	32	None	On/Off	One (1)	None
Front Office	LED	LED	Two (2)	One (1)	48	None	OS	One (1)	None
Front Office Closet	LED	LED	One(1)	One (1)	32	None	OS	One (1)	None
Entry Foyer	LED	LED	One (1)	One (1)	32	None	24/7	One (1)	None

EXTERIOR SITE LIGHTING									
Fixture Location	**Fixture Type**	**Lamp Type**	**Fixture Count**	**Lamp Count Per Fixture**	**Existing Lamp Wattage**	**Proposed Lamp Wattage**	**Control Type**	**Daily Run Hours**	**Type of Upgrade**
RECOMMENDED FOR REPLACEMENT									
None									
NOT RECOMMENDED FOR REPLACEMENT									

EXTERIOR SITE LIGHTING									
Fixture Location	**Fixture Type**	**Lamp Type**	**Fixture Count**	**Lamp Count Per Fixture**	**Existing Lamp Wattage**	**Proposed Lamp Wattage**	**Control Type**	**Daily Run Hours**	**Type of Upgrade**
To Flagpole	LED	LED	One (1)	One (1)	25	None	PC	Twelve (12)	None
Front Overhead Doors	LED	LED	Eight (8)	One (1)	19.5	None	PC	Twelve (12)	None
Front Door Red Light	LED	LED	One (1)	One (1)	5.5	None	On/Off	One (1)	None
Left Side Door	LED	LED	One (1)	One (1)	Twenty (20)	None	On/Off	One (1)	None
Left Side PV Inverters	LED	LED	One (1)	One (1)	Twenty (20)	None	On/Off	One (1)	None
Back Door	LED	LED	One (1)	One (1)	Twenty (20)	None	On/Off	One (1)	None
Doors to Patio near Parking Lot	LED	LED	Two (2)	One (1)	Twenty (20)	None	On/Off	One (1)	None

REFRIGERATORS							
Location	**Make**	**Model #**	**Year**	**kWh/Year**	**Size (ft3)**	**Qty**	**RUL**
RECOMMENDED FOR REPLACEMENT							
Kitchen	GE	GNE29GSKGSS	2017	653	28.7	One (1)	Five (5) years
NOT RECOMMENDED FOR REPLACEMENT							
None							

DISHWASHERS							
Location	**Make**	**Model #**	**Year**	**kWh/Year**	**Gal. per Cycle**	**Qty**	**RUL**
RECOMMENDED FOR REPLACEMENT							
None							
NOT RECOMMENDED FOR REPLACEMENT							
Kitchen	GE	GLDT696J00SS	2017	270	2.5	One (1)	One (1) year

CLOTHES WASHERS									
Location	**Make**	**Model #**	**Year**	**kWh/Cycle**	**Gallons Per Cycle**	**Qty**	**Style/ Config.**	**Volume (CF)**	**RUL**
RECOMMENDED FOR REPLACEMENT									
None									
NOT RECOMMENDED FOR REPLACEMENT									
Shop	Continental Washer and Dryer	EH020PA102 4122001	2015	0.8	Sixteen (16)	One (1)	Front Load	2.8	Six (6) years

FLOW RATE SUMMARY - SAMPLE			
Location	**Fixture Type**	**Qty**	**Flow (GPM or GPF)**
RECOMMENDED FOR REPLACEMENT			
Restroom	Showerhead	Two (2)	2.5 GPM
Restroom	Faucet	Three (3)	1.2 GPM
NOT RECOMENDED FOR REPLACEMENT			
Restroom	Toilet	Three (3)	1.28 GPF
Restroom	Urinal	One (1)	0.125 to 1.0 GPF
Kitchen	Faucet	One (1)	1.5 GPM
Garage	Hose Bib; Unrestricted Faucet	Three (3)	3.5 GPM

Nova Group

RESUMES OF PROJECT TEAM

EMPLOYEE RESUME

USING BUSINESS AS A FORCE FOR GOOD

KEELY FELTON, CEA
CHIEF SUSTAINABILITY OFFICER

PROFESSIONAL EDUCATION
Bachelor of Arts, Animal Behavior, Haverford College, Haverford, Pennsylvania, 2001

CERTIFICATIONS/QUALIFICATIONS
- Association of Energy Engineers (AEE) Certified Energy Auditor (CEA)
- AEE Certified Measurement and Verification Professional (CMVP), expired 2019
- Multifamily Building Analyst Training (to BPI-MFBA standard) – 36 hours
- TRUE Advisor Training Program
- Certified Water Efficiency Professional Training Program
- Certificate of Proficiency in Building Benchmarking, Consortium for Building Energy Innovation and the Department of Energy
- Certified Green Globes Professional
- Green Globes Fellow
- Certified GreenPoint Rater, Existing Home Multifamily
- Certified GreenPoint Rated, New Home
- BREEAM USA In-Use Assessor
- ASTM E1527 Environmental Site Assessment (ESA) for Commercial Real Estate Certificate
- HAZWOPER 8-hour Refresher (OSHA 29 CFR, Part 1910.120)

SELECTED EXPERIENCE
Ms. Felton oversees Nova Energy Group, a division within Nova Group, GBC. The group delivers, on average, 30 energy and water audits in addition to other green deliverables per month. In this capacity, she issues and reviews reports for the agency green lending programs (Fannie Mae Green Rewards, Freddie Mac Green Up, and HUD) while working closely with Nova's debt clients to make sure that all pertinent information is communicated throughout the due diligence process.

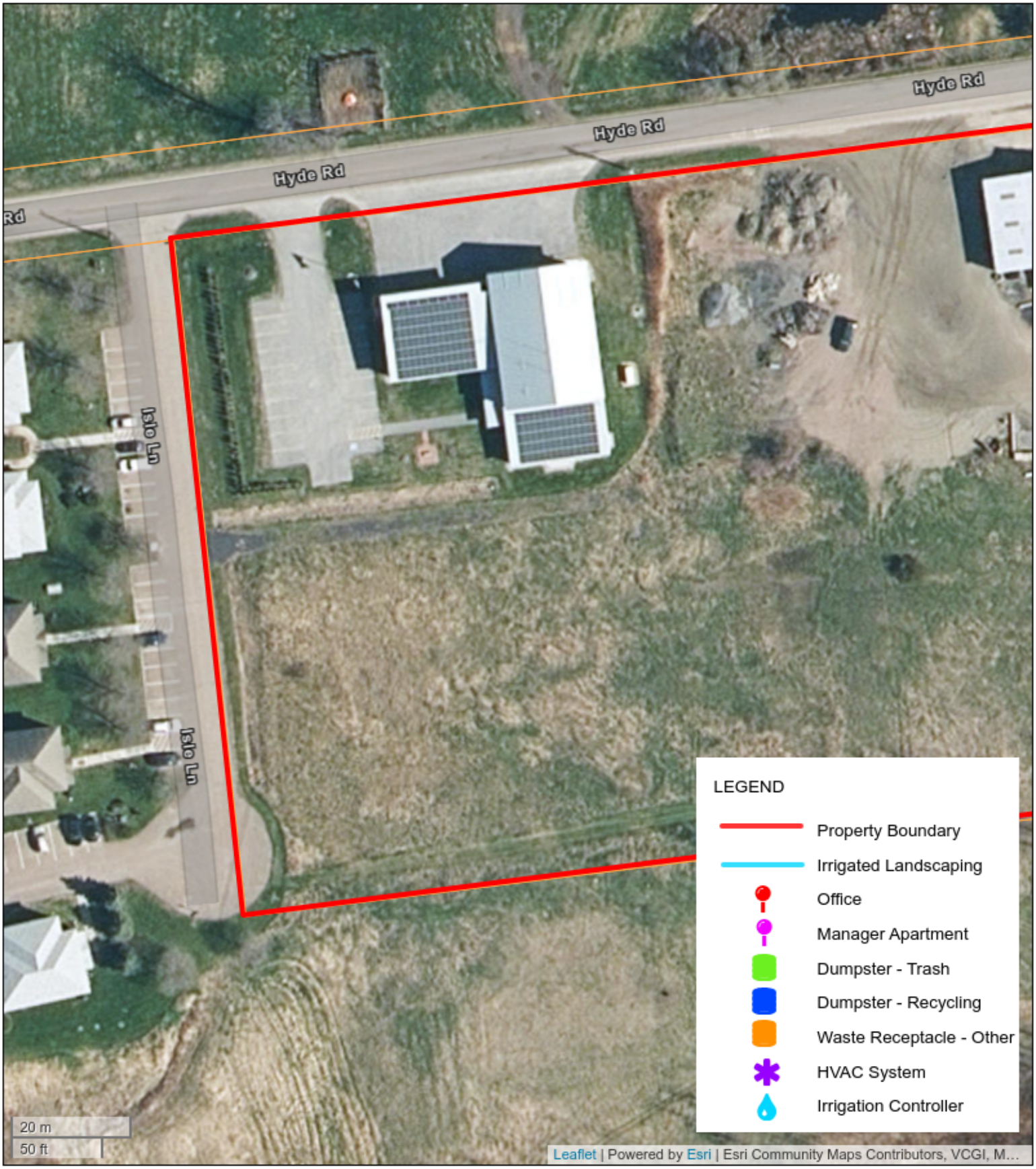
Additionally, Ms. Felton enjoys long-term relationships with property owners meeting more targeted energy and water goals with the group's equity energy work. These services include energy benchmarking and ongoing monitoring of utility consumption, energy modeling, strategic energy planning, project management, measurement and verification of energy savings, and ESG services.

Ms. Felton obtained her Certified Energy Auditor and Certified Measurement and Verification Professional certifications from the Association of Energy Engineers. She is highly experienced with utility data analysis for a broad spectrum of multifamily properties. Additionally, she is proficient in the use of ENERGY STAR's Portfolio Manager for obtaining benchmark scores and certification. Ms. Felton is certified as a Green Globes Professional, GreenPoint Rater, and BREEAM USE In-Use Assessor.

PROFESSIONAL ORGANIZATIONS
- Association of Energy Engineers (AEE)
- Urban Land Institute (ULI)
- Build it Green
- Green Building Initiative (GBI), Board of Directors

Nova Group

PARCEL MAP



Property Details Map

Grand Isle - Fire Station
17 Hyde Road
Grand Isle, VT
Project Number: SE24-1853

Nova Group


Nova
Group
Carbon
Neutral
Report
novagroupgbc.com/carbonneutral