TOWNSHIP OF ESQUIMALT

BUILDING RETROFIT STUDY

ESQUIMALT RECREATION CENTRE, 527 FRASER ST

FEBRUARY 2026

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TOWNSHIP OF ESQUIMALT

PROJECT NO.: CA0051294.1761
DATE: FEBRUARY 2026

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1 EXECUTIVE SUMMARY

ENERGY AND GHG ANALYSIS

The Esquimalt Recreation Centre is a community recreation facility with an aquatics centre, weight room, gymnasium, and multi-purpose spaces, built in 1973 with a floor area of 4828 m^2.

The site used approximately 3,600,000 ekWh of energy at a cost of $167,000, for an energy intensity of 69.4 ekWh/ft^2.

The current GHG emissions are approximately **360** tCO2e, which is 38% less than the 2010 baseline of **584.9** tCO2e and 21% less than the 2023 baseline of **457** tCO2e.

ENERGY CONSERVATION AND GHG REDUCTION MEASURES

We identified a number of measures; these have been split up into the following categories:

— BAU

— Energy Conservation measures

— GHG Emissions Reduction Strategies

The following table summarizes the potential energy conservation measures.

MEASURE		POTENTIAL SAVINGS			COST/PAYBACK	
#	ENERGY CONSERVATION MEASURE	Energy (ekWh[1]/Yr)	Utility Cost ($/Yr)	Emissions Reduction (tCO_2e/Yr)	Opinion Of Cost	Simple Payback (years)
BAU						
6.1	Replace Dectron Unit	58,000	$3,800	1	$900,000	NA
6.2	Replace AHU-4 and AHU-5	15,000	-$2,500	17	$428,600	NA
	Totals (Rounded)	**73,000**	**$1,300**	**18**	**$1,328,600**	**NA**
Energy Conservation Measures						
7.1	Pool Cover - small pool/hot tub	1,200	$100	0	$5,600	56
7.2	Jubilee hall occupancy sensor/door interlock	13,500	$800	0	$5,100	6
7.3	BAS Recommissioning	90,000	$4,300	9	$22,000	5
7.4	VSD for Pool Pumps	200,000	$13,500	3	$67,500	5
7.5	Daylight sensors for atrium	5,200	$350	0	$5,600	16
	ECM Totals (Rounded)	**377,700**	**$20,000**	**30**	**$1,428,800**	**71**
GHG Reduction Measures						
8.1A	Heat pump boilers	950,000	$15,500	240	$1,900,000	123
8.1B	Heat pump boiler	500,000	$7,800	125	$1,200,000	154
8.2	Solar Water Heating	56,000	$1,650	10	$73,600	45

[1] ekWh – equivalent kilowatt hour.

The total potential savings will not equal the simple addition of the individual values. The integrated totals represent an estimate of the combined savings.

Cost savings are based on historic utility rates. Future utility rates are on the rise in many jurisdictions. Higher utility rates result in higher, more attractive cost savings from energy conservation.

To realize the benefits outlined in this report, the measures identified must be implemented. We have recommended a next step for each measure. Depending on the size, complexity, and volume of projects, you may need to prepare engineering designs and/or specifications, develop bid documents for competitive quotes, manage construction review and/or contract administration, commission systems, verify installation as intended, train operators on system changes, measure performance improvement, and analyze/prepare/administer incentive applications and associated reporting. WSP can provide the expertise and services that will lead to successful implementation of energy conservation measures.

2 INTRODUCTION

2.1 AUTHORIZATION

This report was prepared at the request of Steve Knoke, Director, Parks and Recreation Services at the Township of Esquimalt, in accordance with our proposal dated February 28, 2025.

2.2 BACKGROUND

Esquimalt Council has made climate action a strategic priority, declared a climate emergency, and set ambitious targets to reduce corporate greenhouse gas emissions (GHGs) by 45% from 2010 levels by 2030, and to becoming a 100% renewable energy community by 2050. Recently, Council resolved to complete a **GHG Reduction Building Feasibility Study** that would meet Federation of Canadian Municipalities (FCM) goals to identify a sequence of GHG reduction measures to reduce GHG emissions for community buildings by at least 50% within 10 years and by at least 80% (i.e. near net-zero GHG emissions) within 20 years from 2023 (the base year), while managing capital costs and reducing operating costs.

The completion of the Retrofit Feasibility Study would ultimately enable the municipality to integrate reductions in GHG emissions and energy use into longer-term asset management plans for managing the municipal buildings and attain future FCM funding to complete innovative capital projects.

The Township of Esquimalt contracted WSP to conduct Building Retrofit Studies on a portfolio of 5 buildings, with the primary focus on the two largest energy consumers and GHGs emitters.

- **Esquimalt Recreation Centre** (527 Fraser Street): Built in 1973. Gross floor area = 4828. Heated with gas. A community recreation facility with an aquatics centre, weight room, gymnasium, and multi-purpose spaces.
- **Archie Browning Sports Centre** (1151 Esquimalt Road): Built in 1960. Gross floor area = 6050 m^2. Heated with gas. This facility includes an ice arena, a six-sheet curling rink, lounge areas, and Esquimalt Parks and Recreation administrative offices.
- **Municipal Hall** (1229 Esquimalt Road): Built in 2002. Gross floor area = 935 m^2.Heated with gas and electric heat pump. The Hall, a three-storey building includes a council chamber, administrative offices, and satellite police offices.
- **Public Works** building (601 Canteen Road) Built in 1996. Gross floor area = 1150 square metres. Heated with gas. Home to Esquimalt's public works staff and the municipal fleet, including administration offices, mechanics shop, and stores.
- **Parks Nursery** building (1100 Craigflower Road) Built in 1979. Gross floor area = 223 m^2. Heated with gas. Home to Esquimalt's parks staff, including administrative offices, meeting /lunchroom and storage.

This report focuses on the **Esquimalt Recreation Centre,** 527 Fraser Street.

2.3 OPINION OF COSTS

The opinions of probable costs presented in this report should be considered preliminary budgets. They are intended to be sufficient for making educated investment decisions and obtaining preliminary project approval. Significant projects will typically require further investigation and design to accurately determine construction budgets and timing. Unless noted otherwise, we have assumed that all the measures identified in our report will be implemented as a single project. Actual costs may be higher if projects are implemented individually. Costs do not include HST.

For each option where an incentive may be available, we have included an estimate of the potential eligible incentive value, less the anticipated cost of incentive administration. You would need to apply for incentives before proceeding with any work. Incentive programs periodically change. The values presented are based on the program in effect at the time of our investigation. The incentives considered are described below.

2.4 PROJECT SAVINGS

Savings were developed using tabulated data, energy handbooks, the ASHRAE Handbook, weather data, WSP's previous project experience, supplier data sheets, and background information gathered during the site visits, as well as mechanical, electrical, and architectural plans provided by the clients. Equipment operation was based on schedules and control sequences provided by the client during the site visit. Savings were calculated using the latest rates provided by the energy suppliers.

2.5 UTILITY RATES

The utility rates used throughout this project to assess the savings from implementing energy conservation and decarbonization measures were the current rates published by the supplier. The rates used are summarized in the table below.

Table 2-1 Summary Utility Savings Rates

Electricity	BC Hydro: Large General Service Rate 1610 Consumption rate = $0.0653/kWh, Demand rate = $13.30/kW
Natural Gas	FORTIS BC: Large Commercial Rate Total rate (Supply, Delivery, Storage & transport) = $8.29/GJ
Water	City of Victoria Rate = $5.30 /100 ft^3, or $1.87 /m^3

2.6 INCENTIVES

The Federation of Canadian Municipalities (FCM) Community Buildings Retrofit (CBR) initiative helps to optimize the energy performance and reduce greenhouse gas (GHG) emissions of community buildings owned by municipalities and not-for-profit organizations. The CBR initiative is administered through FCM’s Green Municipal Fund (GMF).

FCM’s Community Buildings Retrofit initiative is a $167 million initiative that was made possible through a federal government contribution of $950 million in its 2019 budget. Applicants can stack CBR funding with funding from other programs, including programs available through provincial and territorial governments.

Grants for GHG reduction pathway feasibility studies help to integrate energy and GHG reductions into longer-term plans for managing community buildings. These studies will enable municipalities to identify a sequence of GHG reduction measures—the “GHG reduction pathway”—that will help to reduce GHG emissions for community buildings by at least 50% within 10 years and by at least 80% (i.e. near net-zero GHG emissions) within 20 years while managing capital costs and reducing operating costs. For a full list of eligibility requirements for the CBR initiative and GHG reduction pathway feasibility studies, see the application guide.

2.7 EMISSION ENERGY & CONVERSIONS FACTORS

The emission energy factors and conversion factors used in this report comes from NRCan and are summarized below:

Table 2-2 Emission Energy Factors and Conversions Factors

ENERGY	EMISSION FACTOR (TCO2/EKWH)	EMISSION FACTOR (TCO2E/GWH)	CONVERSION FACTOR
Electricity	0.000014	14.0	
Natural Gas	0.000185995	185.995	0.05167 tCO2/GJ

Updated projections for the future emissions factors for electricity were published in December 2025. The projected factors for British Columbia are listed below.

Table 2-3 Projected Emission Energy Factors for Electricity

YEAR	REGION	EMISSION FACTOR (TCO2E/GWH)*
2025	British Columbia	5.8
2026	British Columbia	7.2
2027	British Columbia	7.7
2028	British Columbia	8.2
2029	British Columbia	8.5
2030	British Columbia	5.7
2031	British Columbia	5.8
2032	British Columbia	5.4
2033	British Columbia	6.5
2034	British Columbia	7.4
2035	British Columbia	2.2

** Excluding Biomass and RNG CO2 emissions*

See ECCC Data Catalogue

3 BUILDING DESCRIPTION

GENERAL DESCRIPTION

Esquimalt Recreation Centre is a community recreation facility building in Esquimalt, British Columbia. Built in 1973, the building has an area of approximately 51,968 ft^2 (4,828 m^2), spread over 2 floors.

The building mainly houses aquatic centre, weight room, gymnasium, and multi-purpose spaces.

Table 3-1 General description of the Esquimalt Recreation Centre

NAME AND ADDRESS	ESQUIMALT RECREATION CENTRE – 527 FRASER STREET, ESQUIMALT, BC, V9A 6H7
Gross Floor Area	4838 m^2
Year Constructed	1973
Number of Levels	2
Cladding	The exterior walls are a combination of fluted concrete block walls and profiled metal cladding.
Parking	Outdoor parking space
Current Occupancy (%)	Full Occupancy
Building Usage	Aquatic centre, weight room, gymnasium and multi-purpose spaces

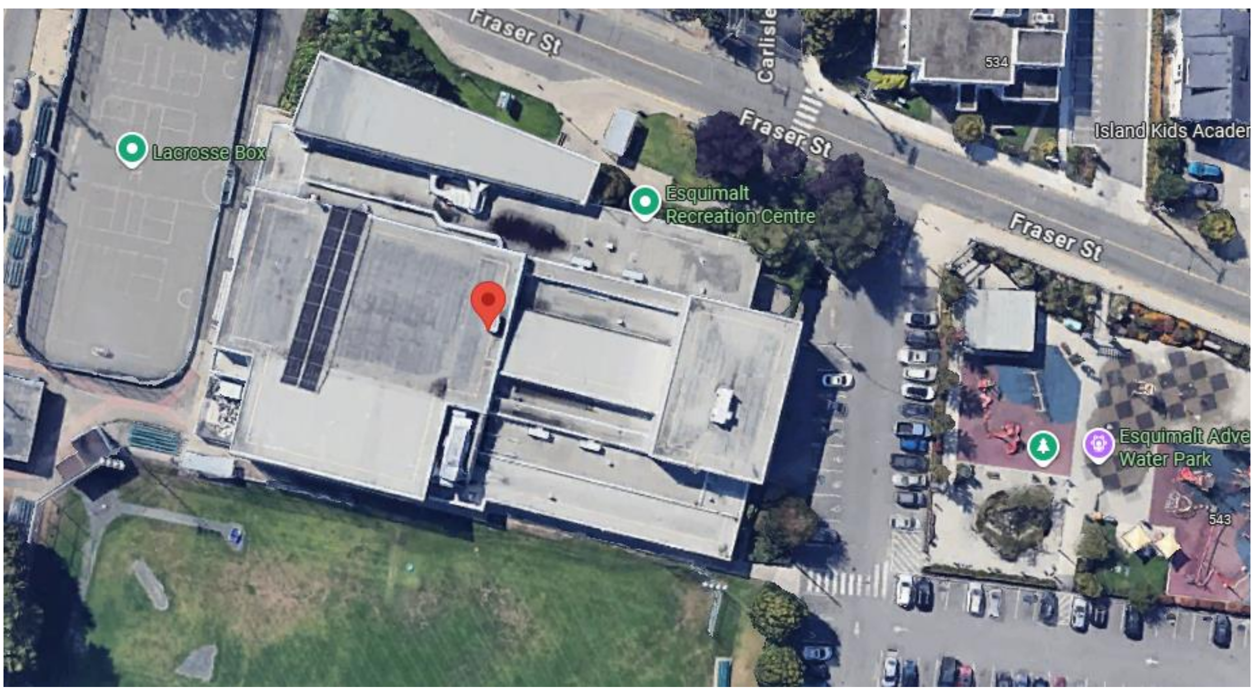

Figure 3-1 Aerial view of Esquimalt Recreation Centre

GENERAL SCHEDULES

The schedules considered for the Esquimalt Recreation Centre were retrieved from the documentation received and the site visit.

Table 3-2 Summary of the Schedule for the Esquimalt Recreation Centre

	ON	OFF	DAYS/WK	WK/YR
Occupancy - Week days	5:30	22:30	7	52
Ventilation	varies	varies	-	-
Lighting	5:30	22:30	7	52

3.1 BUILDING ENVELOPE

The original building is a combination of steel framed and concrete-framed walls. The 2004 addition features a steel frame with open web steel joists, partially supported by glulam timber beams and columns. There are three basement areas with concrete walls and slabs-on-grade.

The exterior walls are a combination of fluted concrete block walls and profiled metal cladding. Windows are double glazed in aluminum frames and installed in a curtain-wall configuration. There are multiple flat roof levels, all covered with modified bitumen membranes installed over insulation.

3.2 ELECTRICAL INFRASTRUCTURE

The main electrical service is supplied via an outdoor BC Hydro pad mounted transformer. The main electrical room is situated off the service corridor between the pool and fitness gym. This room contains the following electrical distribution systems:

- BC Hydro meter,
- Main switchgear unit, manufactured by Square D, rated at 1800A, 600V. This unit contains distribution breakers serving the transformer (300A), Panel HA (400A), Panel SDC-A (400A) and the steam generator (50A),
- Transformer, rated at 300KVA, stepping down the 600V service to 120/208V,
- Distribution panelboard, panel SDC-B, rated at 1200A, 600V,
- Smaller distribution panels, labelled LC and LD, each rated at 225A, 120/208V, and Energy controllers by Quadlogic and Pulse.

Other electrical distribution systems are situated throughout the facility, including:

Penthouse mechanical room with the following equipment serving the HVAC systems:

- two distribution panels rated at 225A, 120/208V,
- a larger distribution panel rated at 400A, 600V for the larger HVAC systems, and
- various motor starters.

Basement boiler room with the following electrical systems serving the heating and domestic water systems:

- Three distribution panels, rated 225A, 120/208V, and
- Various motor starters and pump disconnect switches.

Basement pool equipment room with the following electrical systems serving the pool:

- Two large distribution panels, rated at 600A, 600V,
- One smaller distribution panel, rated 225A, 120/208V, and
- Various motor starters and pump disconnect switches.

Corridors and smaller service rooms have various smaller distribution panels, typically rated 225A, 120/208V.

The basement workshop contains an old disconnect switch, rated 200A, 600V, presumably serving the gymnasium roof-top air handling unit (noted confirmed on site).

On the roof there is also a 200A, 600V disconnect switch serving the pool dehumidification unit.

3.3 VENTILATION SYSTEMS

Ventilation in Esquimalt Recreation Centre is provided mainly by 6 air handling units. These serve the natatorium, west side of the facility, east side of the facility, gymnasium, fitness centre and the pool filter room. AHU-1 is equipped with heat recovery ventilator to recover heat from natatorium. There are also 9 exhaust fans.

Table 3-3 Ventilation Systems

SYSTEM ID	AREA SERVED	SCHEDULE	NOMINAL FLOW (CFM)	FAN POWER (HP)	DESCRIPTION
			SUPPLY	SUPPLY	
AHU-1	Natatorium	Always on	32,000	25	Model Dectron RBH332-8
AHU-2	Facility West Side	Always on		5	Model Sheldons Eng. Limited 2H18 HOR
AHU-3	Facility East Side	Always on		5	Model Sheldons Eng. Limited 1430 HOR
AHU-4	Gymnasium	0600-2330			Model Engineered Air DJ40
AHU-5	Fitness Centre	0500-2230			Model Engineered Air DJ40
AHU-6	Filter Room	Always on			Model McQuay
RF (x4)	AHU 2	Always on			
RF (x4)	AHU 3	Always on			
SF-1	Elevator Machine Room				Model Cook 90 ASPT
SF-2	Boiler Room	Always on			Model Cook 150 ASPT

Figure 3-2 AHU-03 and HRV on AHU-1

The AHU-1 unit is a Dectron Unit which serves the natatorium. It is original from 2004 and was designed to dehumidify the air while recovering heat to the pools. The inside of the unit is rusting and it currently is not able to provide sufficient dehumidification and maintain negative pressure to the natatorium. The supply fan VFD is also not working, the unit is currently running at constant speed. AHU-1 is planned to be replaced in 2026.

A heat recovery ventilator was added on top of the unit to recover heat from the exhaust air to the fresh air stream.

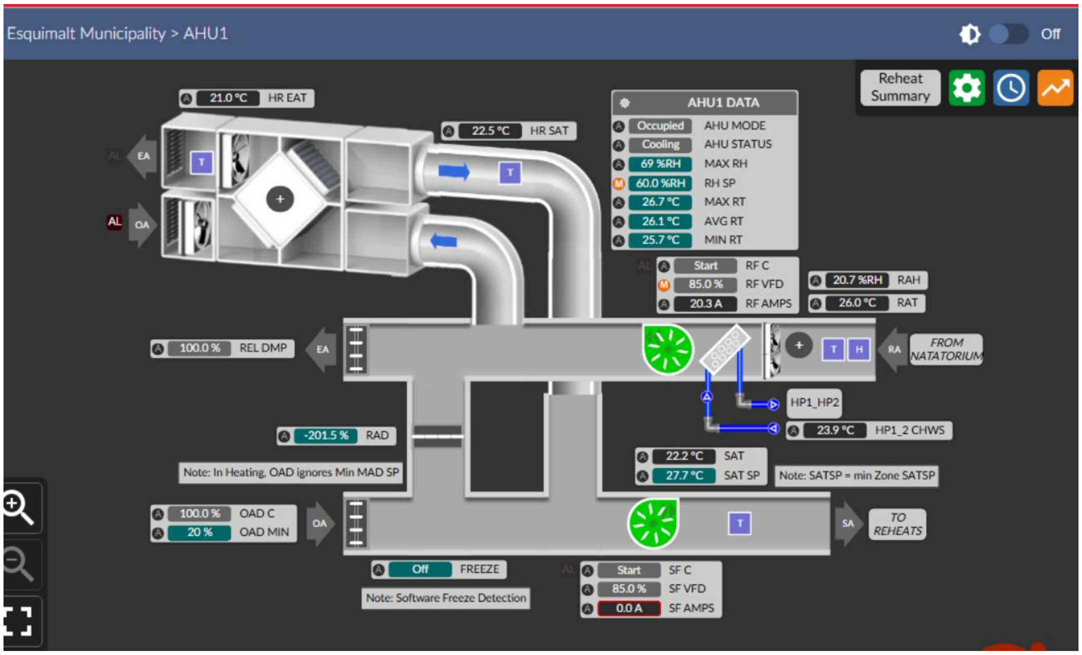

Figure 3-3 AHU-01 BAS Screenshot

Table 3-4 Exhaust Systems

SYSTEM ID	AREA SERVED	SCHEDULE	NOMINAL FLOW (CFM)	FAN POWER (HP)	DESCRIPTION
			SUPPLY	SUPPLY	
EF-1	Family Change room	Manual Control	964	0.5	- Model Cook 16 CVB
EF-2	Gymnasium storage	Manual Control	286	0.125	- Model Cook 90 ACEM
EF-3	Children area washrooms	Manual Control	286	0.125	- Model Cook 100 ACEM
EF-4	Public washrooms	Manual Control	1091	0.333	- Model Cook 120 ACE
EF-5	Elevator machine room				- Model Greenheck CUE - 099 - A
EF-6	Change rooms	Manual Control			- Model Cook 180 AC
EF-7	Reception and offices				- Model Cook 160 CV
EF-8	Chemical Storage room	Local thermostat control			- Model Cook
EF-9	Pool Storage Room	Manual Control			- Model Cook

3.4 SPACE, POOL AND DOMESTIC HOT WATER HEATING

Heating is mainly provided by hot water supplied from the central heating plant. The plant supplies hot water for AHU coils, reheat coils for AHU-2 and AHU-3, pool heating as well as DHW. Heating is also supplemented by water-to-water heat pumps.

The units AHU-4 for the gymnasium and AHU-5 for the fitness center are equipped with natural gas fired heating coils. Electric reheat coils are also provided in the pool deck.

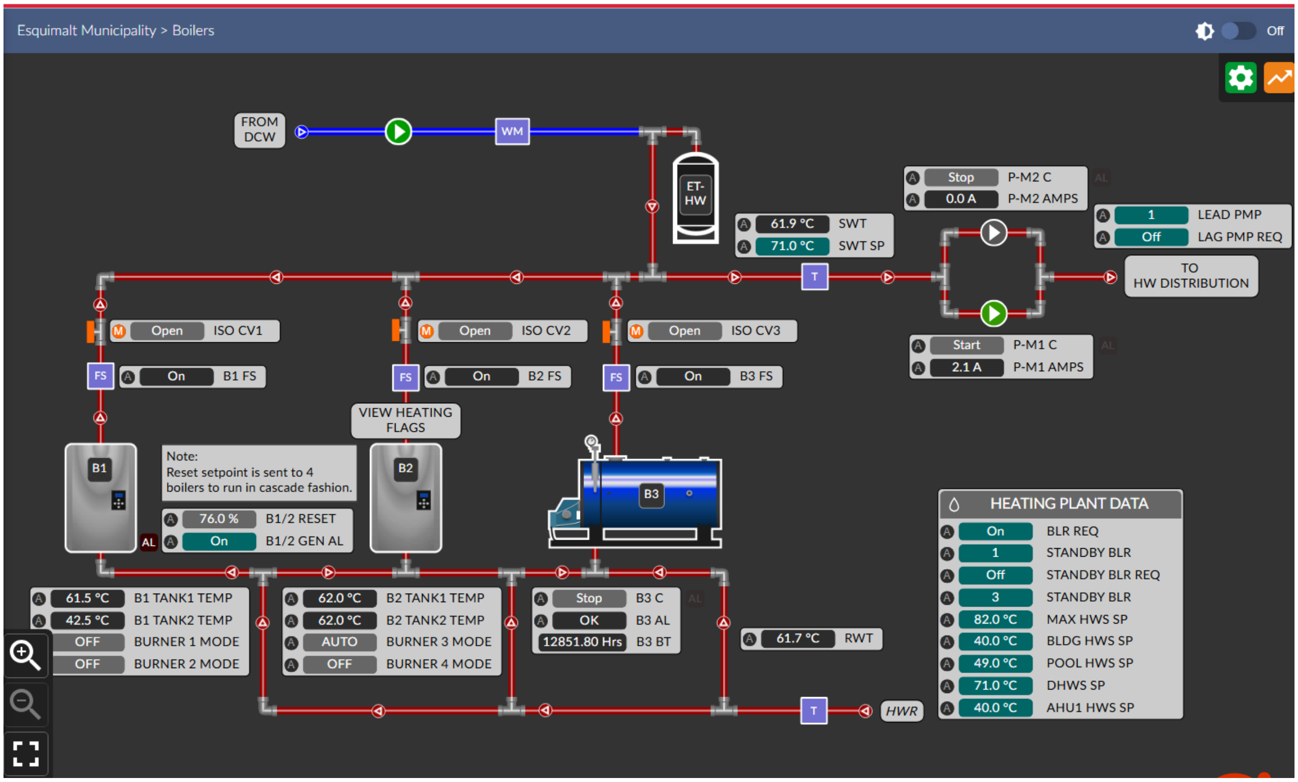

Figure 3-4 Flow diagram of the Central Boiler Plant

Table 3-5 Heating Boilers

SYSTEM ID	CAPACITY (MBH)	ENERGY TYPE	EFFICIENCY	YEAR INSTALLED	DESCRIPTION
B1	3000	Natural gas	96.1%	2024	- Model Viessman CA3B 3.0 - gas condensing boiler
B2	3000	Natural gas	96.1%	2024	- Model Viessman CA3B 3.0 - gas condensing boiler
B3	2713	Natural gas		2004	- Model Weil McLain H-988-WF

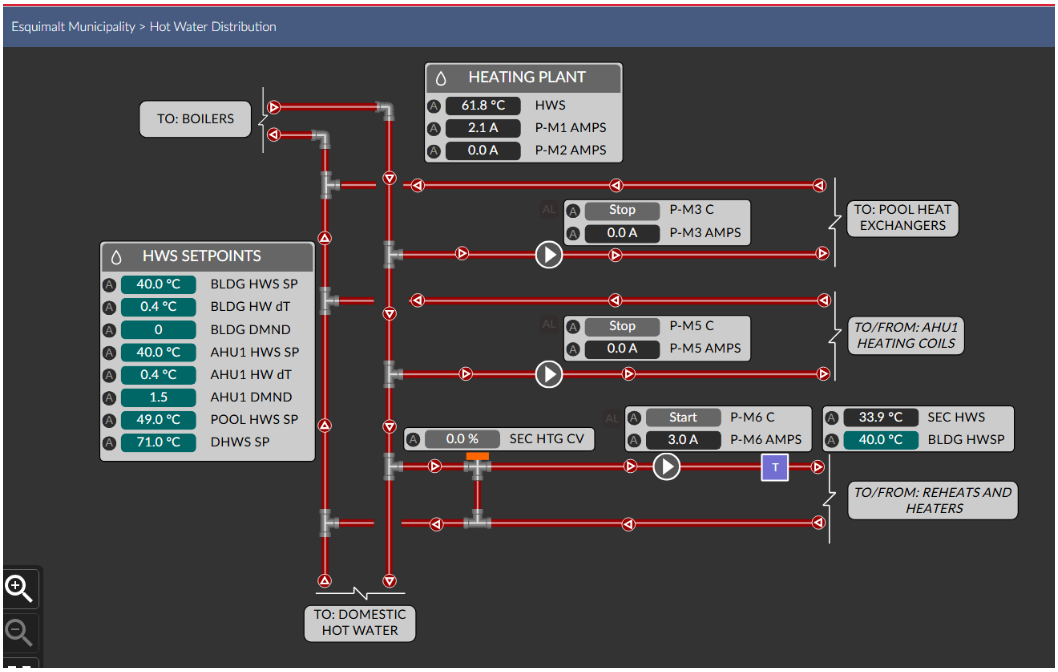

Figure 3-5 Flow diagram of Hot Water Distribution

Pool heating is supplied by the central heating plant through 4 heat exchangers for each of the pools - main pool, leisure pool, tots pool and the whirlpool.

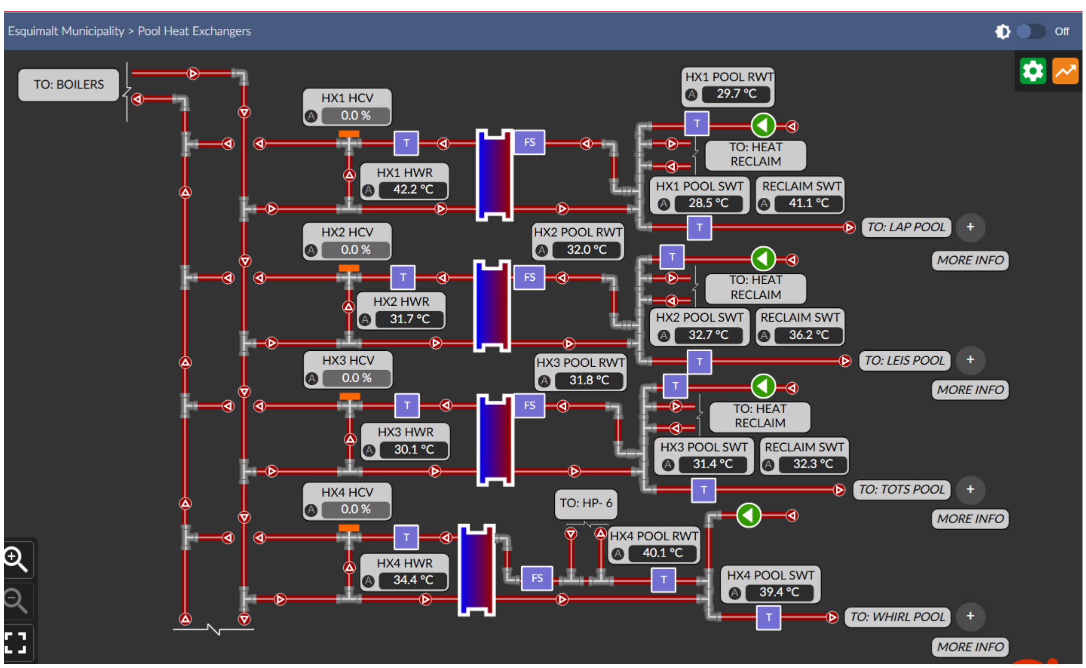

Figure 3-6 Flow diagram of Pool Heat Exchangers

Heat Pumps

Water to water heat pumps HP-1 and HP-2 are connected to AHU-1 through a glycol loop to recover heat from return air of the natatorium for pool heating through 3 heat exchangers. HP-1 and HP-2 are from Florida Heat Pump Manufacturing and are located in the fan room.

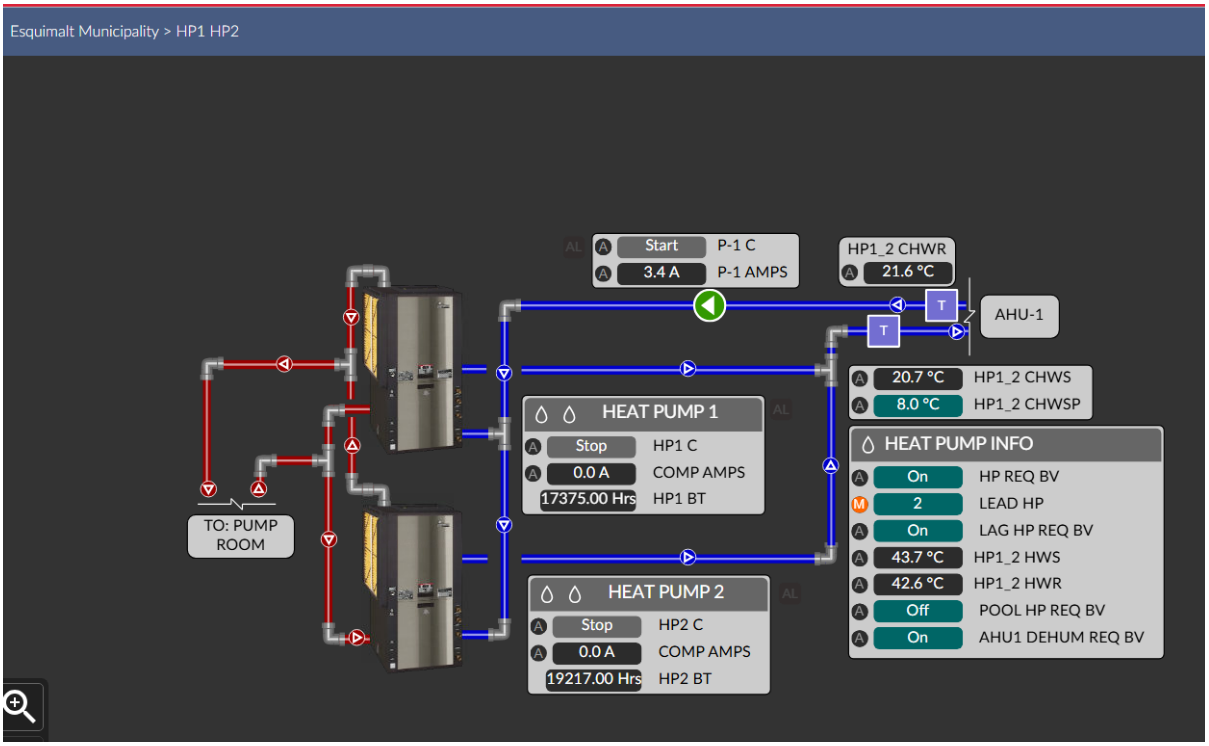

Figure 3-7 Flow diagram of Heat Pump 1 and 2

Air to water heat pumps HP-5 and HP-6 recover heat from room 17 and boiler room for main and whirlpool pool heating.

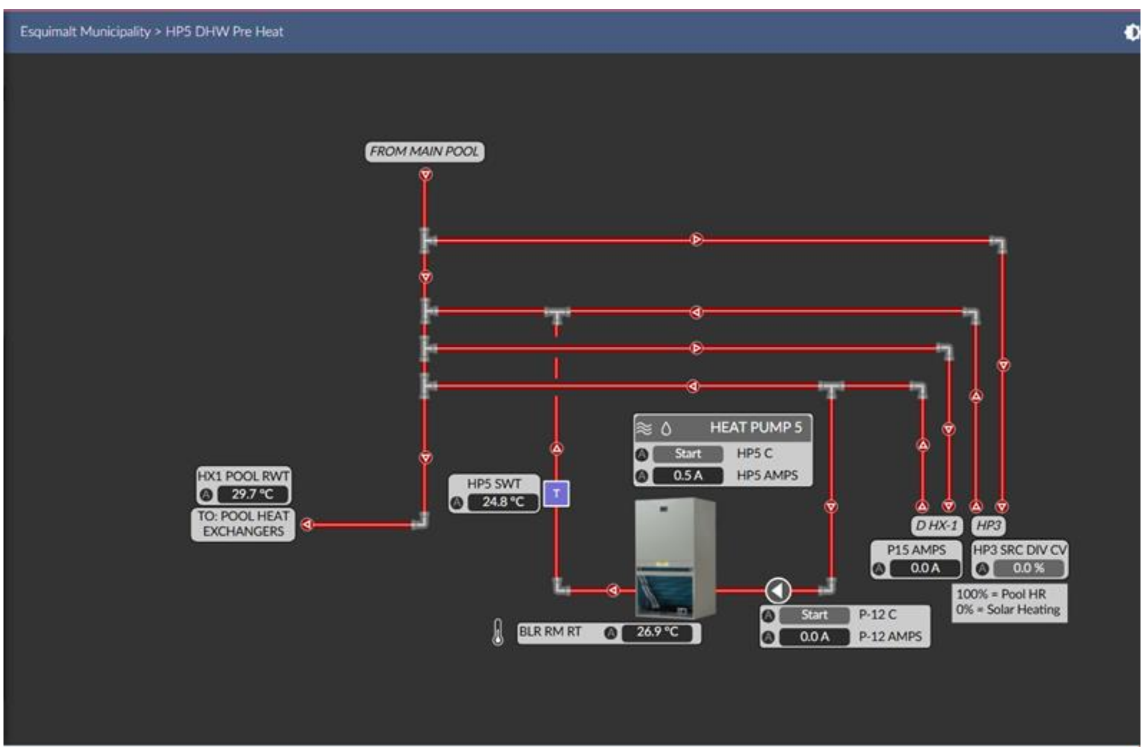

Figure 3-8 Flow diagram of Heat Pump 5

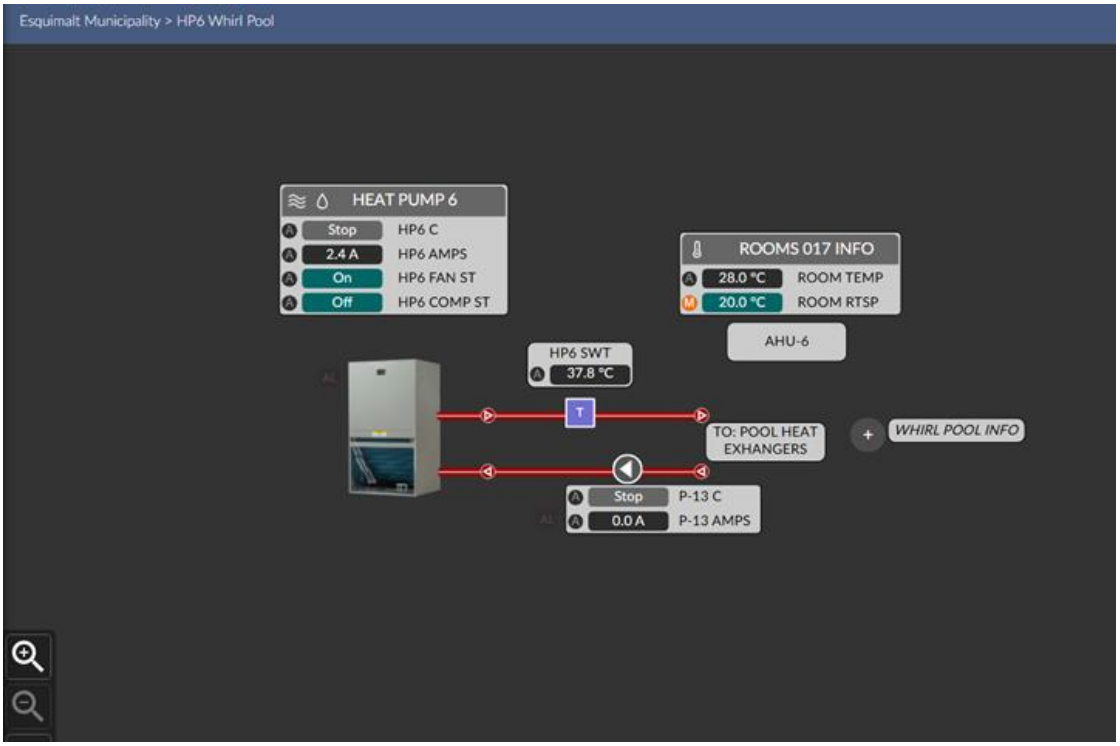

Figure 3-9 Flow diagram of Heat Pump 6

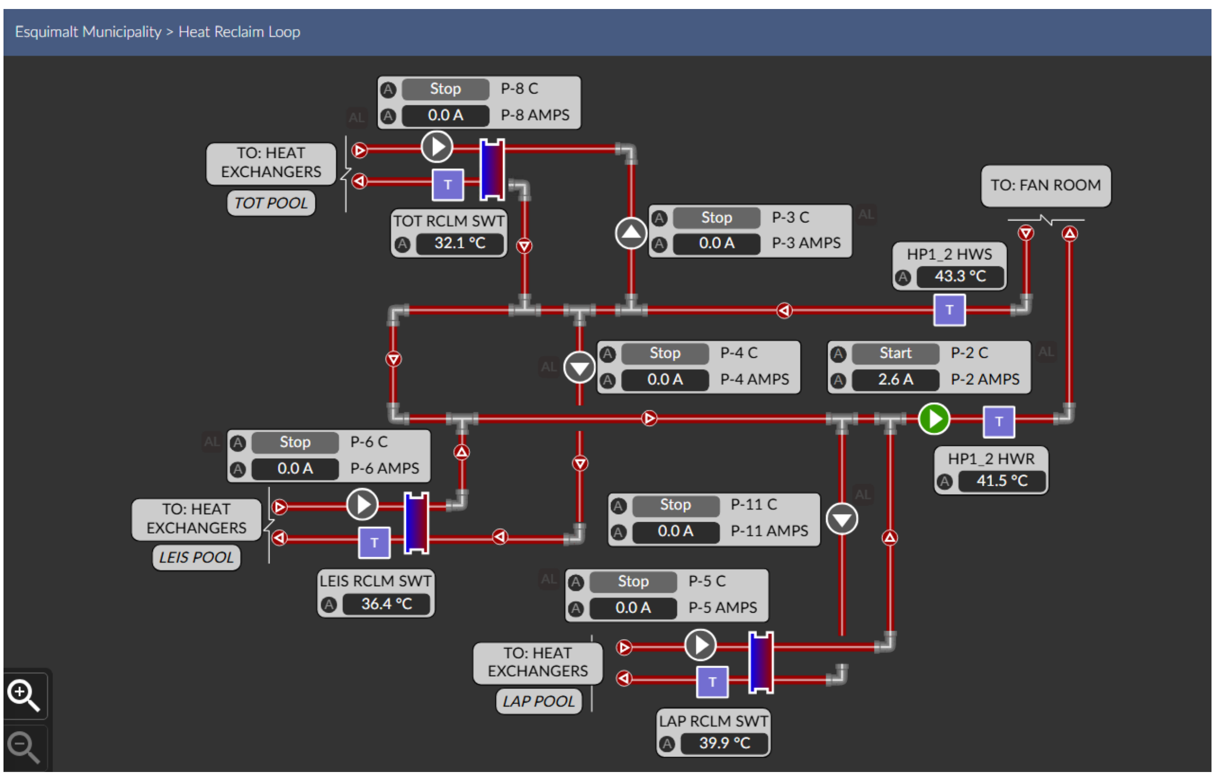

Figure 3-10 Flow diagram of Heat Reclaim Loop

Domestic hot water is supplied by the central heating plant with water-to-water heat pump HP-3 to reclaim heat from the main pool in winter and supply hot water from the solar collection system in summer. The solar collection system and HP-3 is currently not operating.

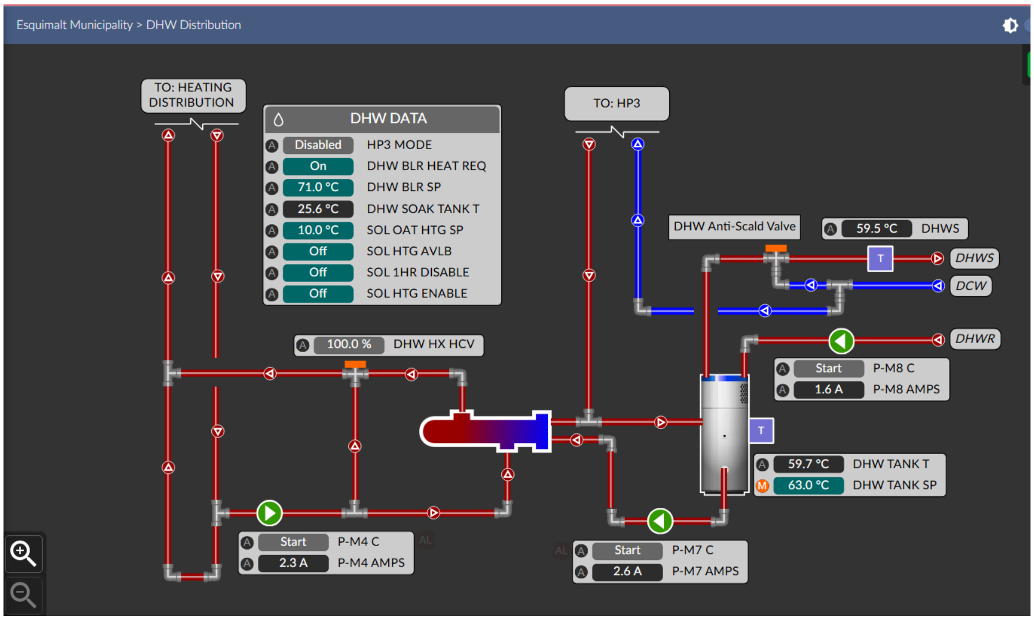

Figure 3-11 Flow diagram of DHW

The central heating plant includes 2 boiler supply pumps P-M1 and P-M2, 1 duty and 1 standby, to supply hot water from the boilers to pool heat exchangers, AHUs heating coils and domestic hot water loop. The pool water loop includes 1 supply pump P-M3,5 pool circulation pumps PP-1, PP-2, PP-6, PP-15 and PP-22, 9 pool features pumps PP-3, PP-4, PP-9, PP-11, PP-11A, PP-12, PP-14A, PP-14B and PP-31 6 small circulator pumps. The pool water loop also includes pumps P1, P29 and P32 for HP-1 and HP-2 glycol loop, pump P2 for the heat exchanger loop for heat recovered by HP-1 and HP-2. Circulator pumps P12 and P13 run to enable heat recovery from heat pump HP-5 and HP-6 for pool water heating and pump P15 for heat recover from heat pump HP-5 for domestic water heating. The pool water loop also includes pumps P7, P9, P10 and P14 for the solar collector system which is currently not in operation.

Table 3-6 3Pumps – Heating Systems

PUMP ID	AREA SERVED	SCHEDULE	POWER (HP)	DESCRIPTION
P-M1	Boiler Supply Pump	Space, pool and DHW heating	2	- Model Armstrong
P-M2	Boiler Supply Pump	Space, pool and DHW heating	2	- Model Armstrong
P-M3	Pool Heating Supply Pump	Pool heating	3	- Model Armstrong
P-M4	DWH Supply Pump	DHW heating	0.75	- Model Armstrong
P-M5	AHU-1 Hot water supply pump	Space heating	0.75	- Model Armstrong
P-M6	AHU-2,3 HW supply pump	Space heating	1	- Model Armstrong
P-M7	DHW Tank Circulation Pump	DHW heating	0.25	- Model Bell & Gossett
P-M8	DHW Re-Circulation Pump	DHW heating	0.17	- Model Bell & Gossett
PP-1	Main Pool Vacuum Pump/Motor	Pool heating	1	- Model Sta-rite

PUMP ID	AREA SERVED	SCHEDULE	POWER (HP)	DESCRIPTION
PP-2	Whirlpool Circulation Pump/Motor	Pool heating	15	- Model Techtop
PP-3	Whirlpool Water Features Pump/Motor	Pool heating	15	- Model WEG
PP-4	Lifestyle Pool Water Features Pump/Motor	Pool heating	3	- Model Techtop
PP-6	Tots Pool Circulation Pump/Motor	Pool heating	10	- Model Osborne
PP-9	Tots Pool Water Features Pump/Motor	Pool heating	5	- Model AP Aurora
PP-11	Lazy River Jets Pump/Motor	Pool heating	25	- Model Osborne
PP-11A	Lazy River Vortex Pump/Motor	Pool heating	25	- Model Osborne
PP-12	Sheet Flow Pump/Motor	Pool heating	5	- Model Marathon
PP-14A	Popkorn Pump/Motor	Pool heating	2	- Model Techtop
PP-14B	Bubbler Pump/Motor	Pool heating	2.5	
PP-15	Lifestyle Pool Circulation Pump/Motor	Pool heating	3	- Model Osborne
PP-21/P15	Heat Recovery Pump/Motor	Pool heating	3	
PP-22	Lap Pool Circulation Pump/Motor	Pool heating	25	- Model Osborne
PP-31	Tots Pool Water Features Pump/Motor	Pool heating	1	- Model Techtop
	Acid Feed Pumps	Pool heating		- Model Pulsafeeder
	Chlorine Feed Pumps	Pool heating		- Model Pulsafeeder
P1	Support heat exchanger loop for Tot, Lifestyle, and Main Pools via heat recovery.	Pool heating		
P2	Support heat exchanger loop for Tot, Lifestyle, and Main Pools via heat recovery.	Pool heating		
P3	Small Circulator Pumps - Tot pool Loop Side Return	Pool heating	0.20	
P4	Small Circulator Pumps - Loop Side return	Pool heating	0.50	
P5	Small Circulator Pumps - Lap Pool Loop side supply	Pool heating	0.82	
P6	Small Circulator Pumps - Lifestyle Pool Supply	Pool heating	0.36	
P7	Small Circulator Pumps for solar system	Not in use	0.20	
P8	Small Circulator Pumps - Tot pool Return	Pool heating	0.36	
P9	Solar Collection Pump	Not in use		
P10	Transfers heat from the soak tank to HX-2 for DHW preheat	Not in use		
P11	Small Circ Pump - Lap Pool Loop side supply	Pool heating	0.82	
P12	Small Circulator Pumps	Pool heating		
P13	Small Circulator Pumps	Pool heating		
P14	Supports HP-3 for DHW soak tank heating.	Not in use		

PUMP ID	AREA SERVED	SCHEDULE	POWER (HP)	DESCRIPTION
P29	Glycol Pump	Pool heating		
P32	Glycol Pump	Pool heating		

3.5 BUILDING AUTOMATION SYSTEM

Esquimalt Recreation Centre's ventilation and hot water systems are controlled and monitored by a building automation system. AHUs, heat pumps, boilers, hot water circulation pumps for both domestic and pool water are all included. Equipment is scheduled in the building automation system to match the operation of the building, and setback during nighttime.

The BAS is operated from a workstation that is equipped with the "enteliWEB" networked remote access system. The system is serviced by ITC. Seven control panels were noted in the following locations:
- Basement boiler room, primarily controlling boilers and pumps etc.
- Basement pool filter room, primarily controlling pumps and AHU6
- Main electrical room, primarily controlling AHU5
- Janitors room on main floor, primarily controlling reheat zones
- Maintenance office on main floor, primarily controlling AHU4
- Mechanical penthouse (fan room), primarily controlling AHU 2 and AHU3
- At roof level, primarily controlling AHU1

Lighting systems are not controlled by the BAS.

3.6 SOLAR WATER HEATING SYSTEM

Solar water heating tubes are located on the roof of the natatorium; the solar water heating system was designed to supply hot water in summer through heat pump HP-3. The system has not been used in years due to freezing of water in the tubes and low efficiency of the system.

Figure 3-12 Solar Water Heating Panels

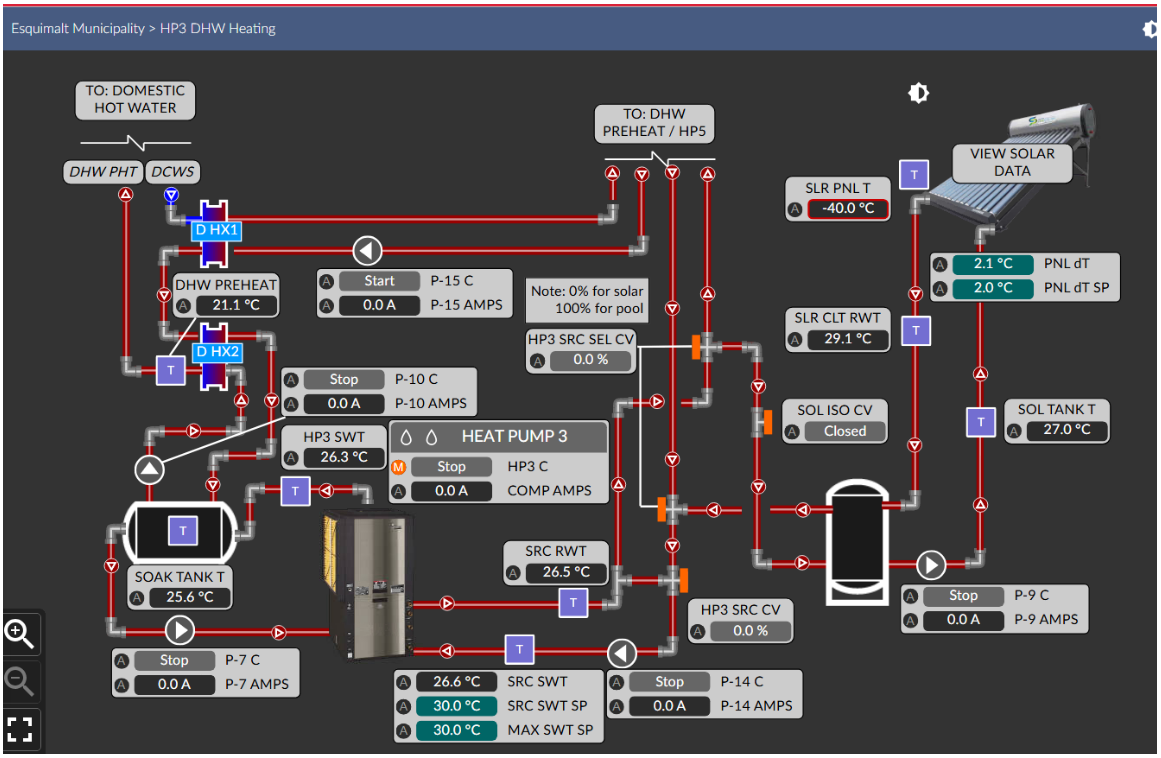

Figure 3-13 Flow diagram of **Solar Water Heating System**

3.7 LIGHTING

Interior lighting are primarily LED lamps. A few service rooms are still with fluorescent lamps. Lighting is mainly manual controlled with a few service rooms equipped with motion sensors.

3.8 PLUG LOADS

The plug loads include office equipment in the office, and 3 vending machines in the atrium.

4 EXISTING ENERGY PERFORMANCE

4.1 EXISTING ENERGY PERFORMANCE AND GHG EMISSIONS

4.1.1 ANNUAL UTILITY USAGE AND COSTS

The Esquimalt Recreation Centre is supplied with energy and water from these sources:
- Electricity from BC Hydro
- Natural gas from Fortis BC
- Water from the City of Victoria – 3 meters

The utility usage and costs are summarized below. A baseline period of May 2024 through April 2025 was selected as this is after the boiler plant replacement and best reflects the current conditions.

Table 4-1 4-2 Baseline Data (May 2024 – April 2025)

Utility	Consumption		Equivalent Consumption		Cost	Savings Rate		Use Intensity (ekWh/ft^2)
Electricity Consumption	1,803,827	kWh	1,803,827	kWh	$27,654	$0.0653	$/kWh	34.72
Electricity Demand	3,265	kW			$43,425	$13.30	$/kW/mo	
Natural Gas	6,486	GJ	1,801,592	ekWh	$80,284	$8.29	$/GJ	34.68
Water	9,612	m^3			$15,798	$1.87	$/m3	
		Total	**3,605,418**	**ekWh**	**$167,161**			**69.40**

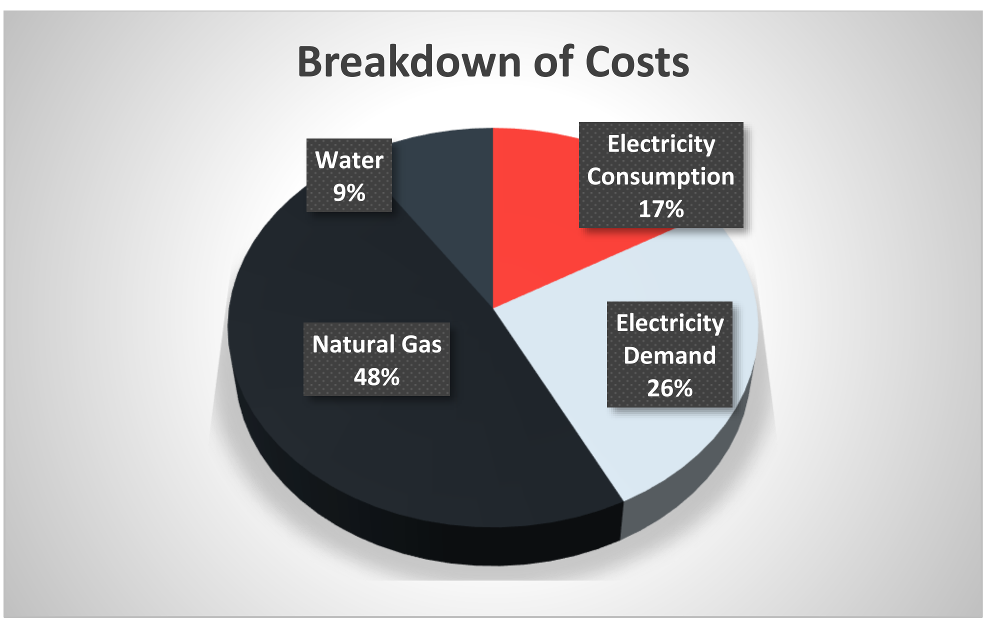

Figure 4-1 Breakdown of Costs

The monthly energy usage shows mostly baseload but with a distinct increase in winter months, which is expected.

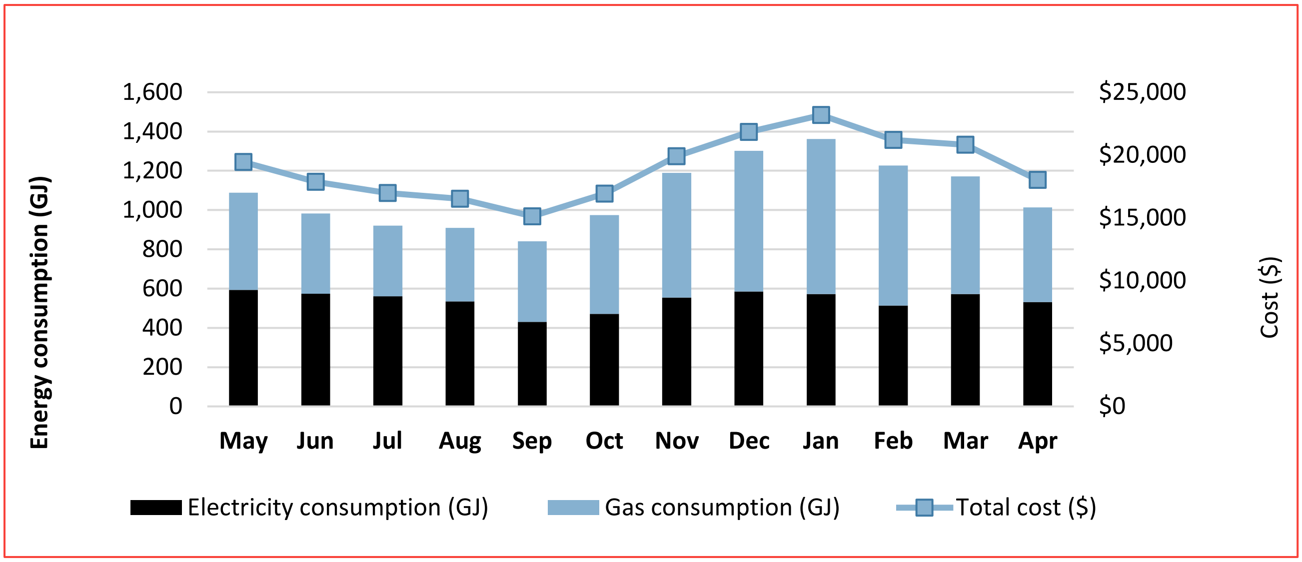

Figure 4-2 Monthly Energy Consumption and Cost

4.1.2 ANNUAL GHGS

The annual GHG emissions for the Esquimalt Recreation Centre during the baseline period of May 2024 through April 2025 is summarized below. The bulk of the emissions come from natural gas consumption.

Table 4-3 4-4 GHG Emissions Data (May 2024 – April 2025)

Utility	Consumption		% of Total Energy	GHG Emissions (tCO2e)	% of Total GHG Emissions	GHG Emissions Intensity (kg CO_2e/ft^2)
Electricity	1,803,827	kWh	50.03%	25	7%	0.49
Natural Gas	6,486	GJ	49.97%	335	93%	6.45
Total			**100%**	**360**	**100%**	**6.94**

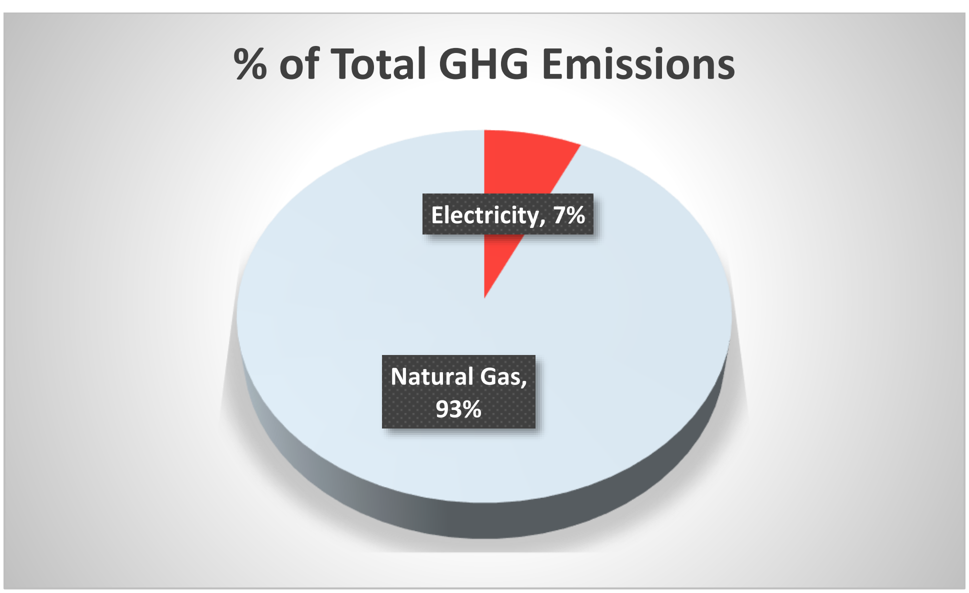

Figure 4-3 GHG Emissions Breakdown

4.1.3 ELECTRICITY

The Esquimalt Recreation Centre consumed 1,800,000 kWh of electricity from May 2024 to April 2025 with a peak power demand of 288 kW in December and a total cost of $71,000.

The following figure shows the monthly electricity consumption and power demand. Electricity is mainly baseload but with some seasonal variation. Consumption and demand are lowest in the fall, in September and October. This corresponds to the annual shut down in September where the pool is closed for maintenance and was fully drained down.

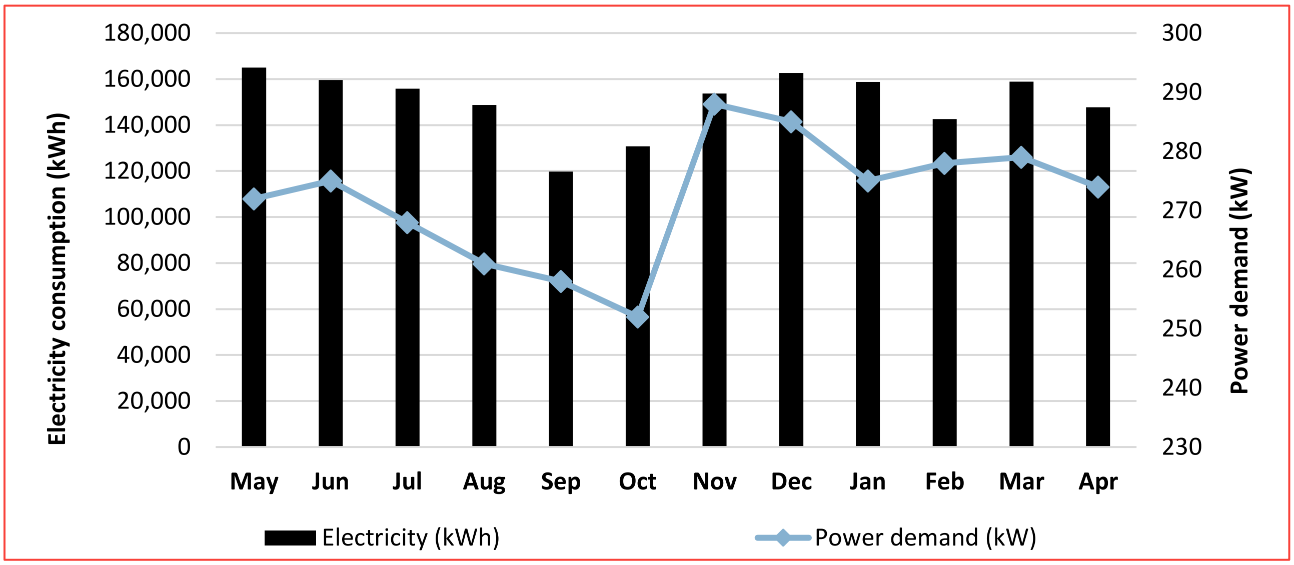

Figure 4-4 Monthly Electricity Consumption and Demand

The electricity consumption does not correlate with degree days – heating and/or cooling. Heating loads are addressed mainly by natural gas. Cooling is not a significant load. Variations due to maintenance procedures mask any weather effects.

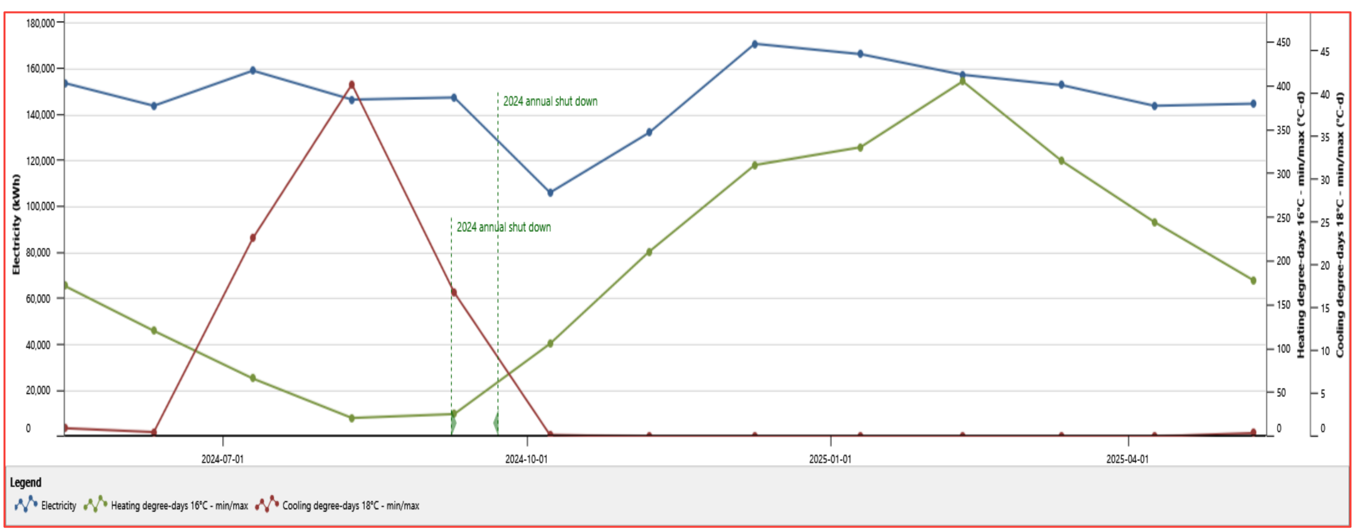

Figure 4-5 Monthly Electricity Consumption with Heating and Cooling Degree Days

Interval Data

Hourly meter interval data was obtained from BC Hydro and analyzed. A typical week shows daily regular profiles where weekdays and weekends have the same usage. This is expected as this is a heavily used facility with long operating hours. The daily profiles also indicate that equipment is scheduled off at night, if only for a few hours.

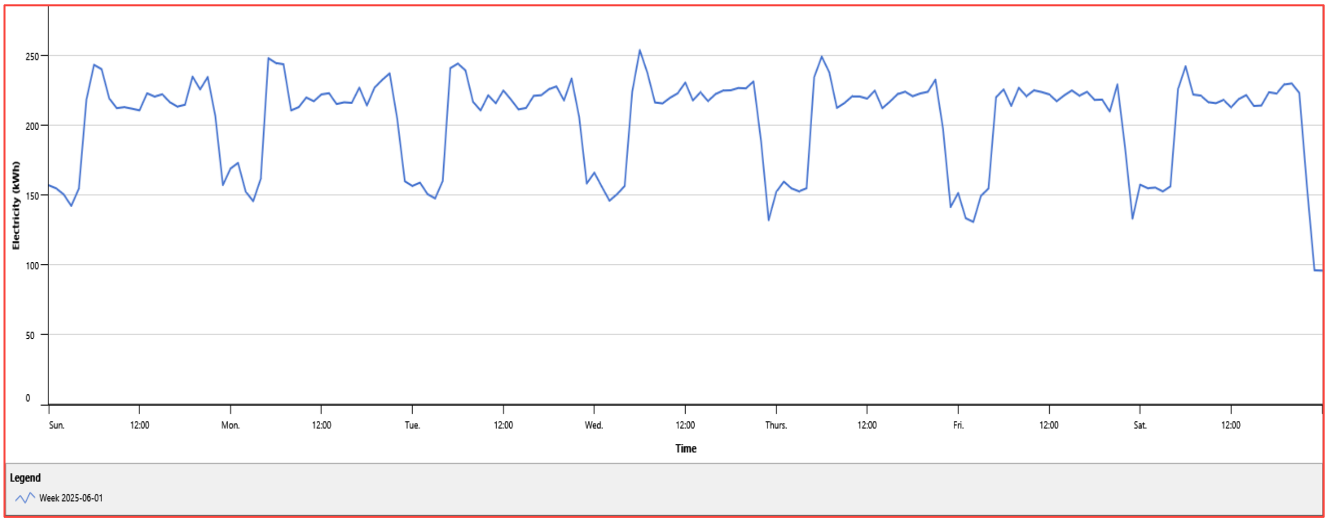

Figure 4-6 Weekly Electricity Consumption June 1 – 7, 2025

Data was only available from March 31 onward. This data is graphed as a heatmap, where all of interval data is displayed. The top right shows the beginning, March 31, ending in the bottom right with June 30. The days of the week run along the bottom. The greater the usage, the darker the square.

Dark bands indicate the daily profile, which is very consistent, indicating that much equipment is off during unoccupied hours. Equipment typically starts very early and shuts down very late on a daily basis. Slightly lighter bands are seen on holidays such as Easter Sunday, indicating holiday schedules are in place.

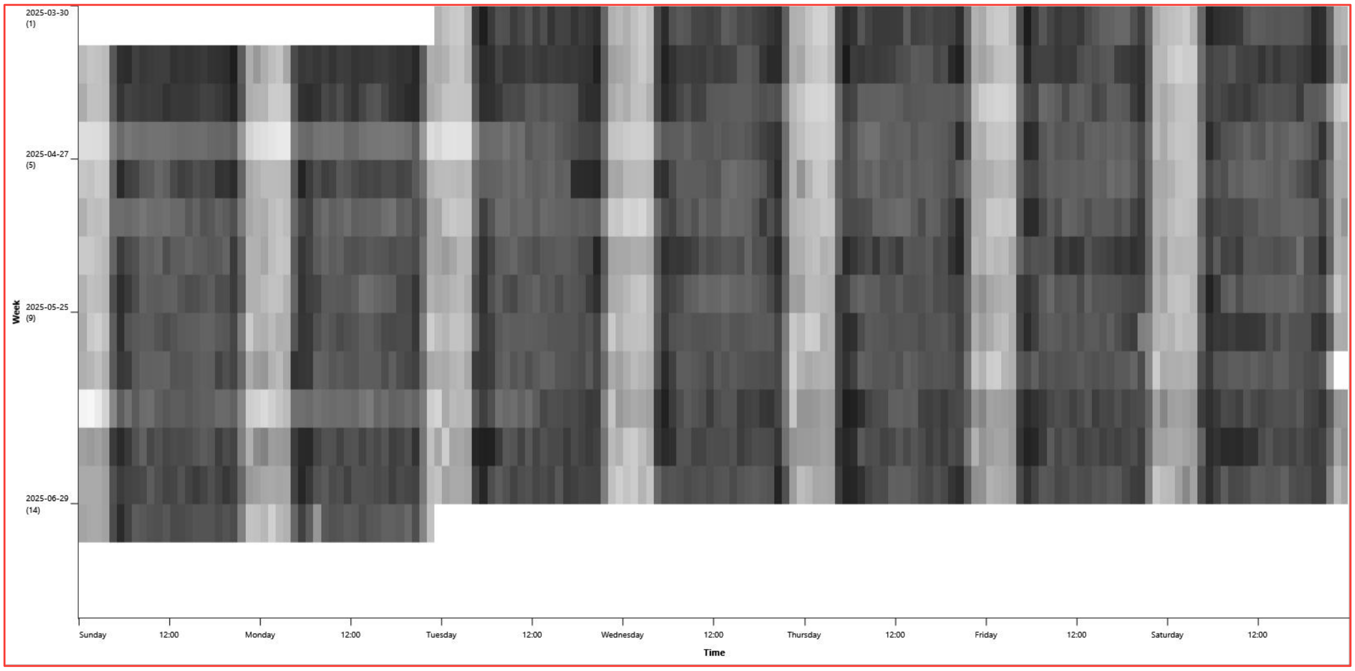

Figure 4-7 Heatmap of Electricity Consumption March 31 – June 30, 2025

4.1.4 NATURAL GAS

The Esquimalt Recreation Centre consumed 6,486 GJ of natural gas from May 2024 to April 2025 with a total cost of $80,284. Natural gas is used for heating the building as well as the pool water and domestic hot water. The consumption peaks in the winter months but is still very high in the summer months as seen in the monthly graph below.

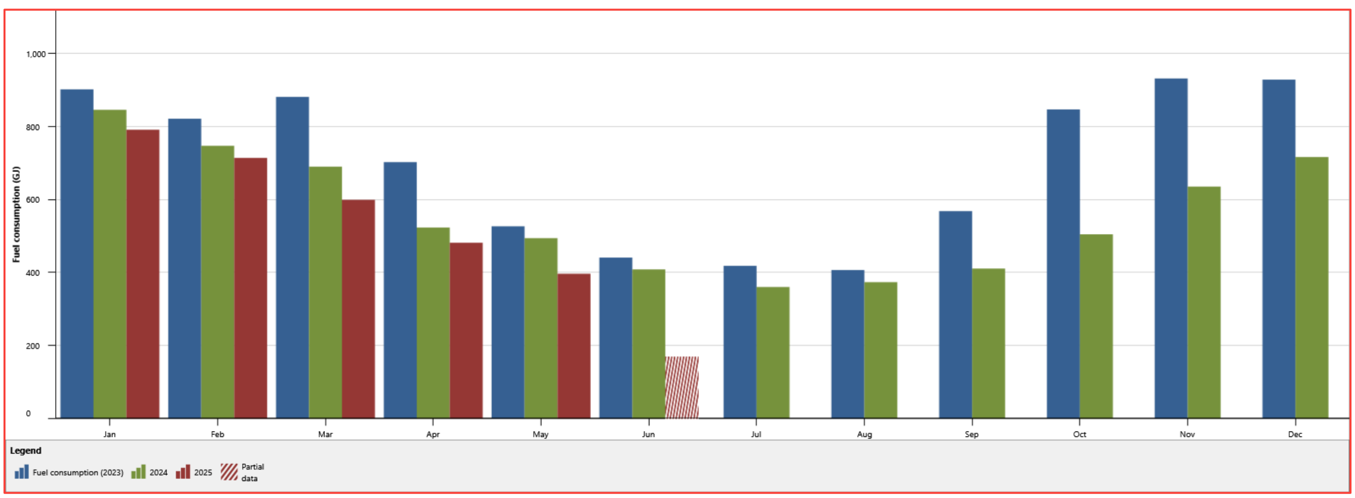

Figure 4-8 Monthly Natural Gas Consumption

The consumption is visibly less starting in 2024, even when accounting for weather. This is due to the replacement of the heating boilers in late fall of 2023 through the beginning of 2024. The new boilers are more efficient, saving energy.

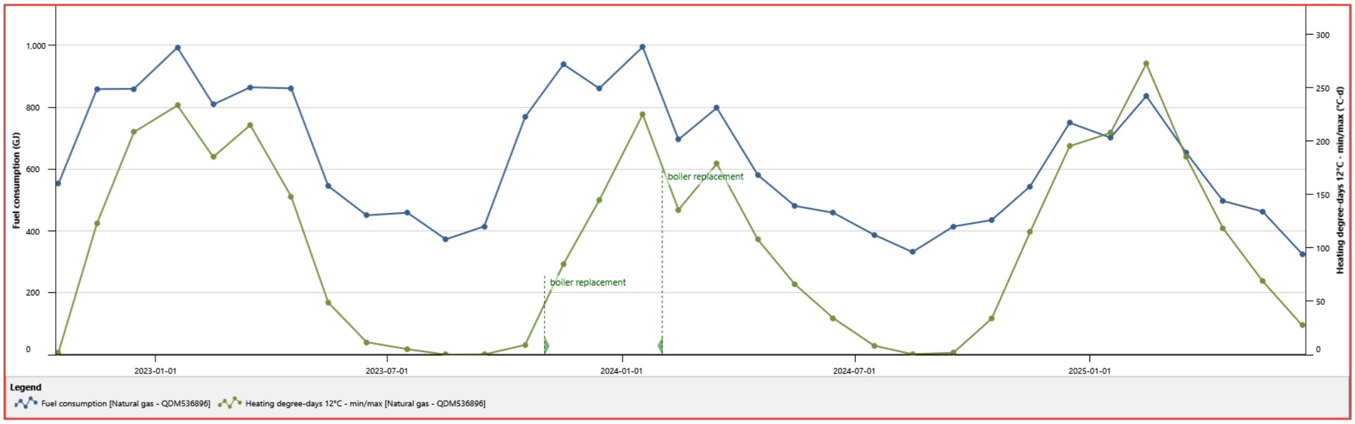

Figure 4-9 Monthly Natural Gas Consumption and Heating Degree Days

The baseline period of May 2024 through April 2025 was selected as this is after the boiler plant replacement.

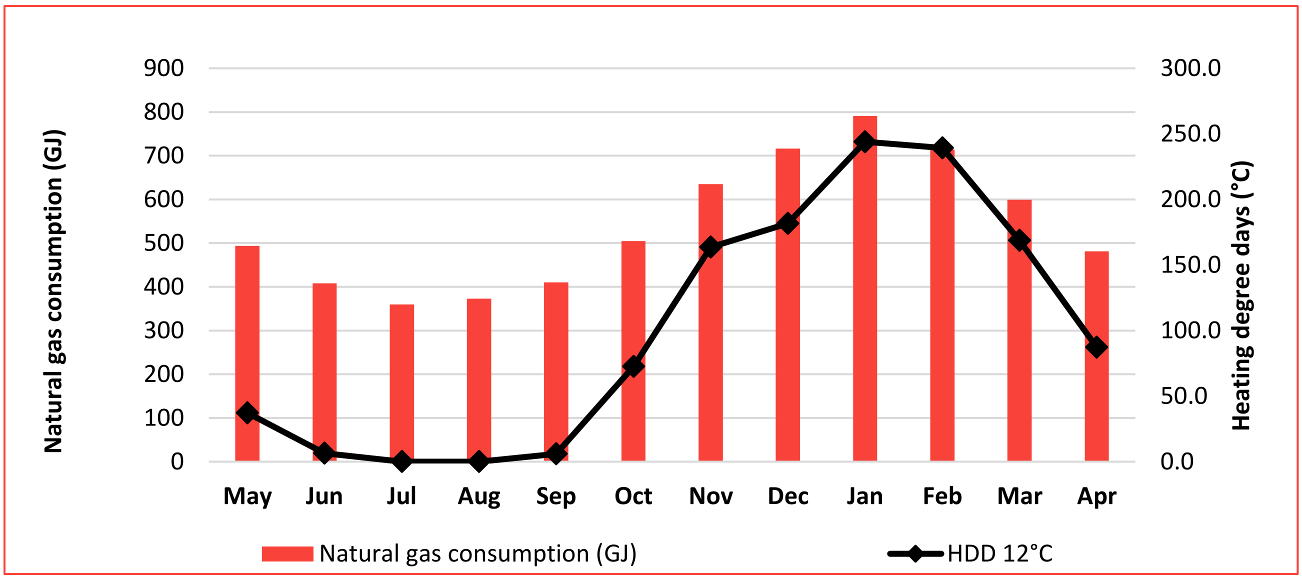

Figure 4-10 Baseline Natural Gas Consumption and HDD

The usage has an excellent correlation with heating degree days.

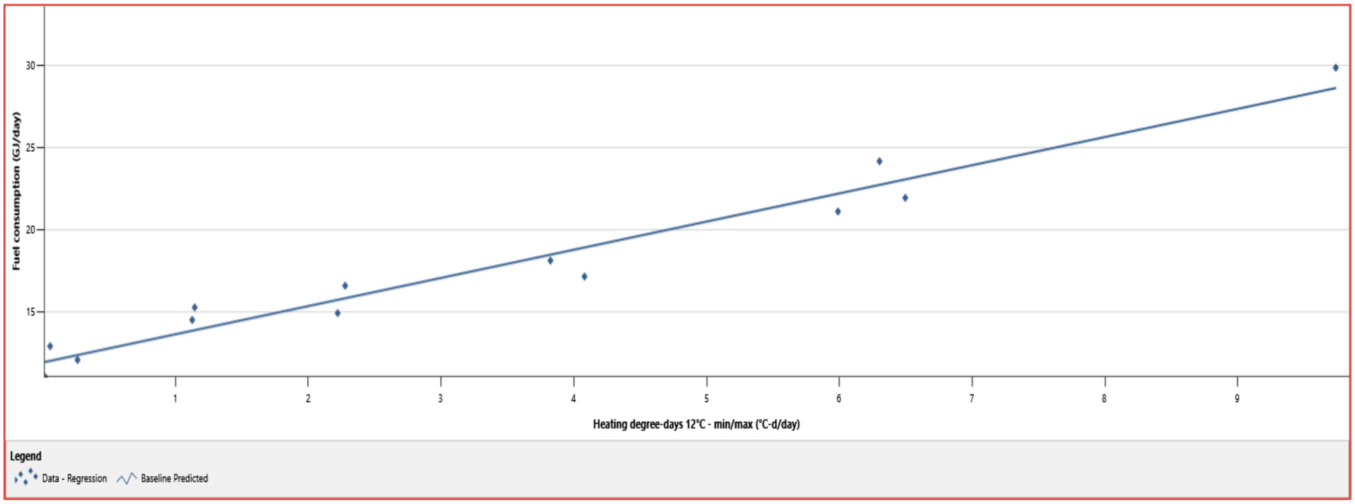

Figure 4-11 Baseline Natural Gas Consumption and HDD

Equation

Data table	Natural gas - QDM536896
Dependent variable (Y)	Fuel consumption (GJ)
Independent variable (x)	Heating degree-days 12°C - min/max (°C-d)
Method	Daily
Weighted	Yes

Regression results

$Y = 1.7111*x+11.9435$

$R^2 = 0.9561$

The results of the regression analysis indicate that approximately 67% is baseload and 33% is for building heating.

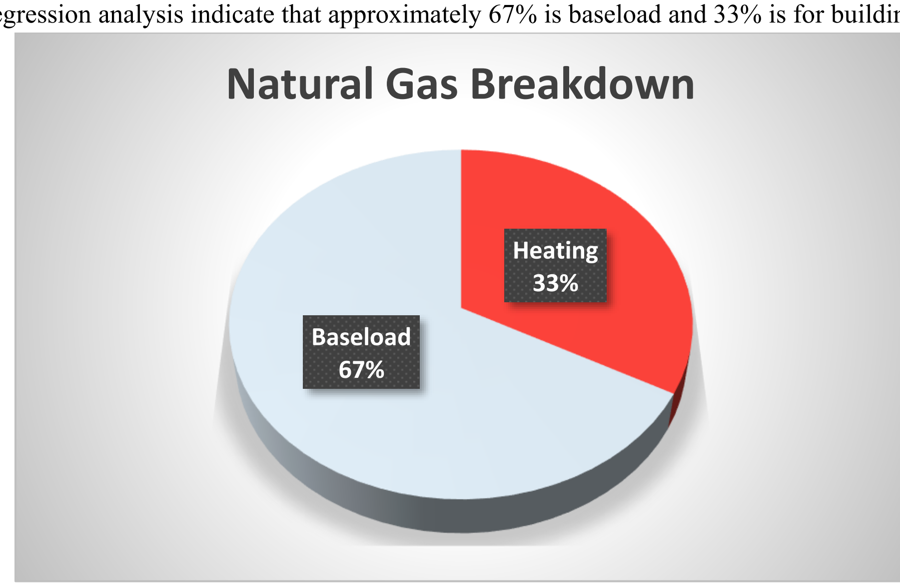

Figure 4-12 Natural Gas Consumption Breakdown

4.1.5 WATER

All water consumed at the building is potable water provided by the City of Victoria through a local distribution network. There are 3 water meters associated with this address (A-15696687, A-70126314 and B-70126314B). This analysis only includes the main water meter, B-70126314B. The A-15696687 meter is reported to be the external usage which is mainly the splash pad and not part of this scope. The A-70126314 meter has minimal usage in 2022 but nothing since. Water is only invoiced 3 times per year, generally every 120 days.

The analysis period for water is February 2024 to February 2025, to represent a most recent typical year. The water consumption was about 3,500 CCF or 9,900 m^3 and about $15,800. With total floor area of 4828 m^2, this total annual water consumption amounts to a water use intensity of 2.05m^3/m^2 and water cost index of \$3.27/m^2.

The figures below show the annual water use from February 2022 to February 2025.

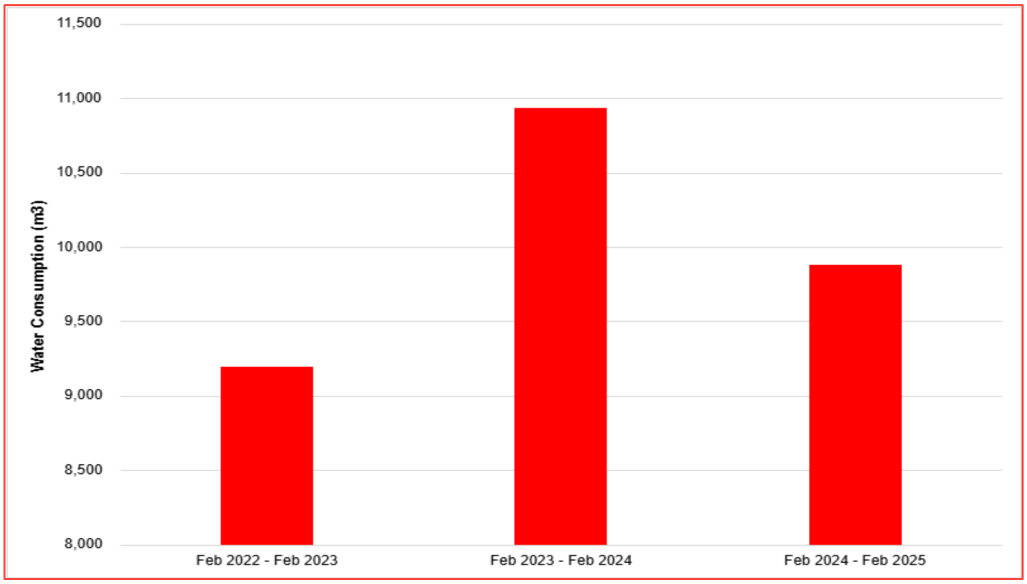

Figure 4-13 Annual Water Consumption

Table 4-5 4-6 Annual Water Consumption Summary and WUI

Year	Water Consumption (m^3)	Water Use Intensity (WUI) (m^3/m^2)
2022	9,197	1.90
2023	10,930	2.26
2024	9,880	2.05

The following water consuming sub-systems exist in the building:

SUB-SYSTEMS	ANNUAL WATER USE ESTIMATE (M^3)	% BUILDING TOTAL
Fixtures/ Fittings	4,219	43%
Swimming Pool	5,661	57%
Total	9,880	

Based on water consumption data provided by the client and onsite observation, we have determined the following total potable water use breakdown:

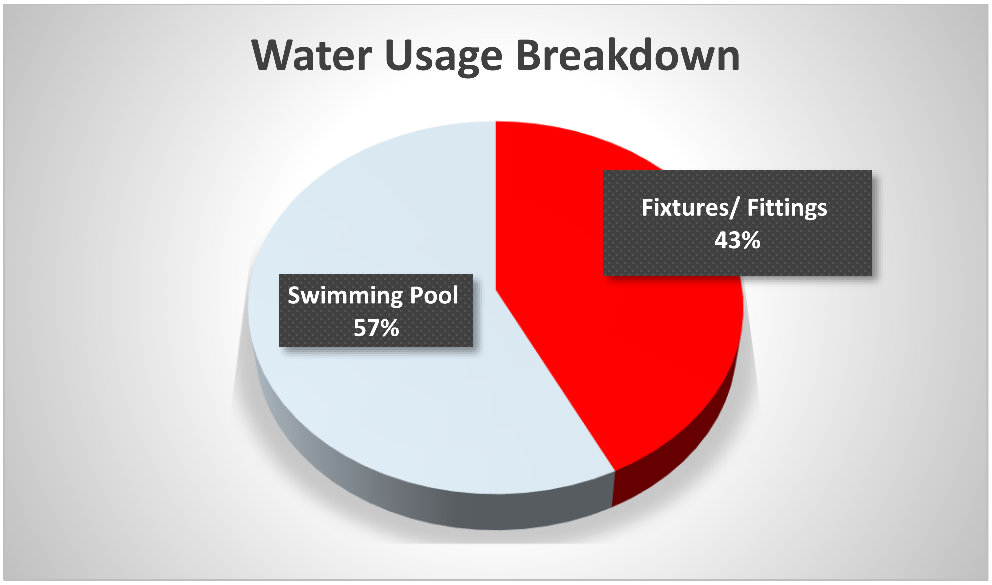

Figure 4-14 Water Consumption Breakdown

4.2 ENERGY PERFORMANCE BENCHMARKING

For context, we have compared the building's energy use intensity (EUI) with the 2019 Survey of Commercial and Institutional Energy Use for Recreation Centres of 27.6 ekWh/ft^2. The EUI of the Esquimalt Recreation Centre is worse than this average. This means that the building uses more energy for its size than the majority of Canadian recreation centres.

But average for recreation centres includes facilities that do not have swimming pools. Instead, the EUI was compared to a database of similar recreation centres with swimming pools with an average EUI of 47 ekWh/ft^2. Although the EUI is higher than that average, it is not as great a difference.

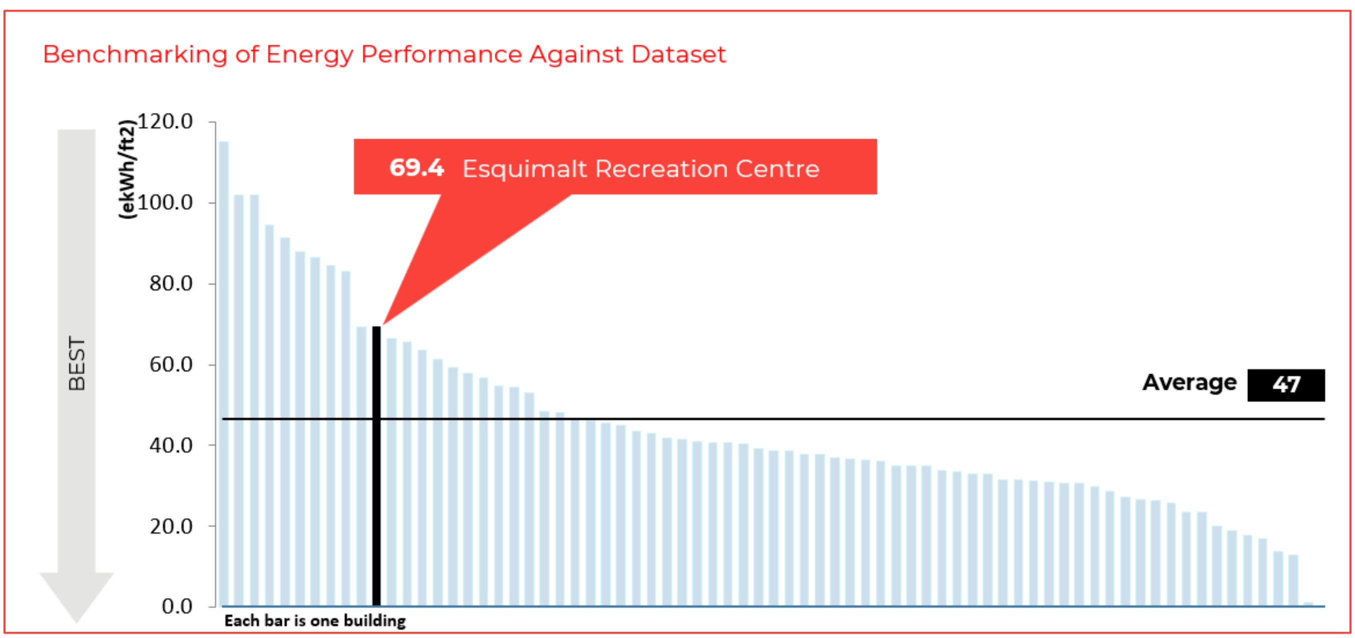

Figure 4-15 Benchmark of Recreation Centres with Swimming Pools

4.3 END-USE-BREAKDOWN

The following graph shows the estimated energy end-use breakdown for the Esquimalt Recreation Centre.

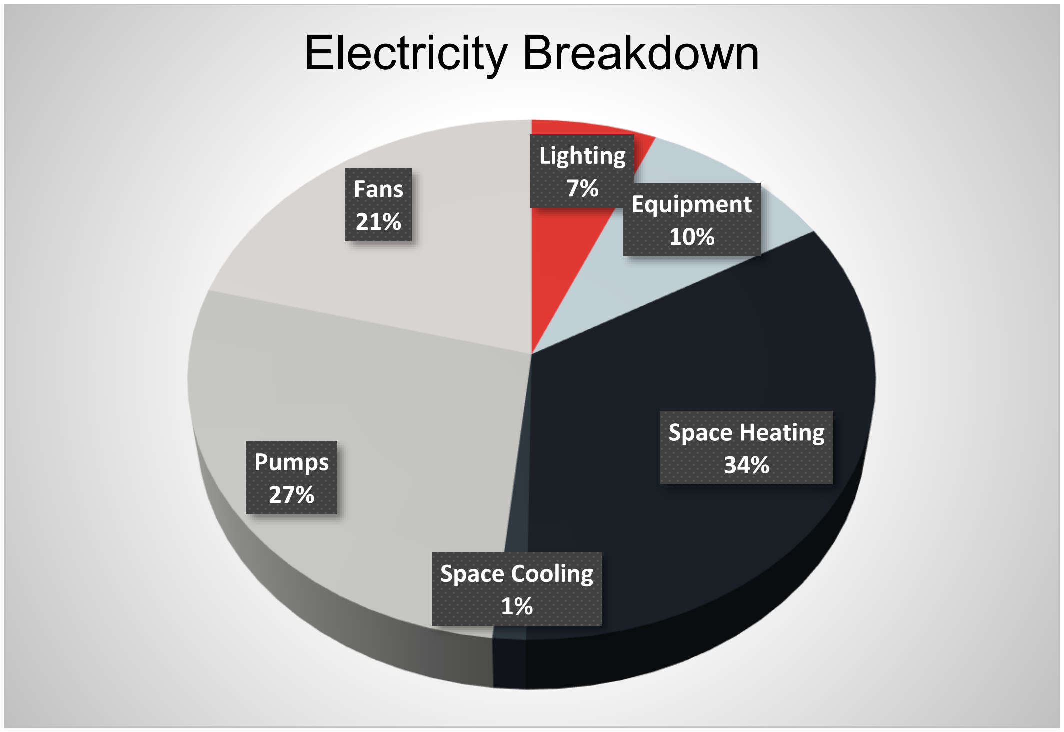

Figure 4-16 Electricity End Use Breakdown

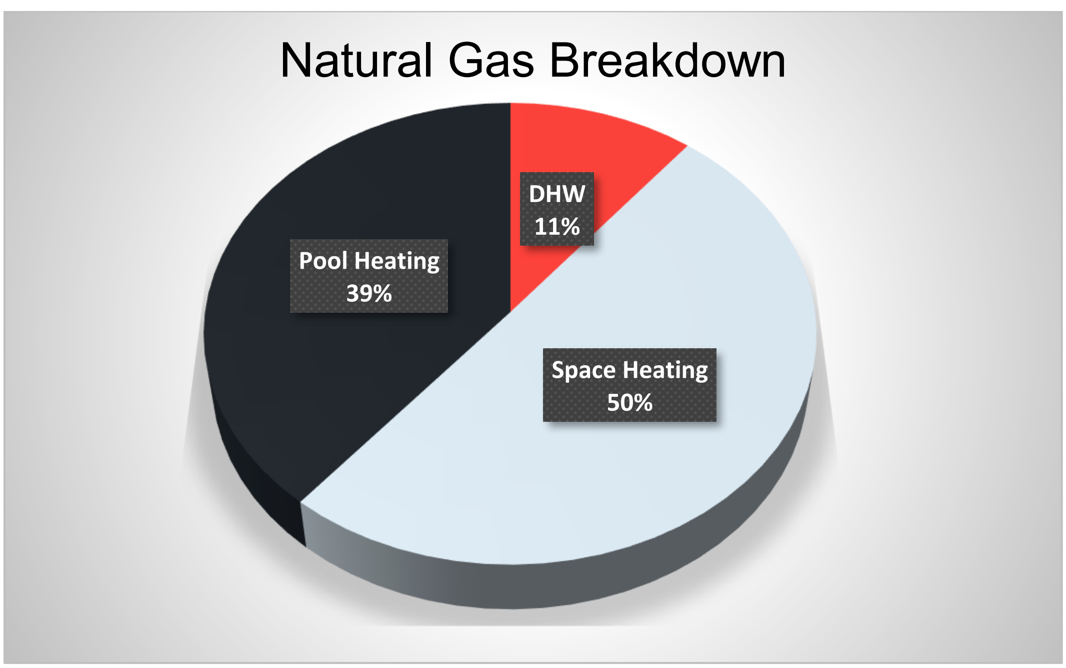

Figure 4-17 Natural Gas End Use Breakdown

5 KEY FINDINGS

The key findings of the Building Retrofit Study are captured below. The findings from our investigation have been divided into the following categories:

1. Business as usual or **BAU** measures

   This is scheduled or anticipated work that will impact energy usage and GHG emissions but is not necessarily optimized. It is like-for-like or standard equipment replacement for equipment at end of life or necessary replacements due to equipment failures. These measures include

   - Replace Dectron Unit
   - Replace AHU-4 & AHU-5 (2029)

2. Energy Conservation Measures

   These are energy conservation measures or **ECMs** that are not in the BAU.

   - Pool Cover (small pool)
   - Jubilee Hall Door Interlock
   - BAS Recommissioning
   - Pool Pump VSDs
   - Atrium Daylight Sensors

3. GHG Reduction Measures

   Measures or strategies to reduce carbon or **GHG** emissions.

   - Heat Pump Boiler
   - Solar Water Heating

6 BUSINESS AS USUAL MEASURES

Business as usual or BAU measures are scheduled or anticipated work that will impact energy usage and also GHG emissions. It is like-for-like or standard equipment replacements that are typically done for equipment that is approaching its end of life or not functioning properly.

6.1 REPLACE DECTRON UNIT

6.1.1 OPPORTUNITY

The pool air handling unit, AHU1, is a ventilation and dehumidification unit manufactured by Dectron, installed in 2004. The unit is equipped with a heat recovery ventilator to preheat the outside air using the exhaust. An energy upgrade in approximately 2012 included the installation of the two water-to-water heat pumps HP1 and HP2. These provide supplemental heating to reheat coils within the air distribution system ductwork for various parts of the recreation centre.

The unit is operational but approaching the end of its useful life. The interior has extensive corrosion of the casing and frame. There have been significant repairs to the floor panels and that mechanical components to keep the unit operating. It is reported that the variable speed drives on the fan motors are not working, causing air pressurization issues.

6.1.2 SCOPE OF MEASURE

Replacement of this unit is scheduled for 2026. The new unit will include improved control strategies such as free cooling capability, but it is not expected to result in significant savings from the 2023 baseline.

Table 6-1 Replace Dectron Unit Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
58,000 ekWh/yr	2%	$3,800 /yr	1 tCO2e	0.2%	$900,000	NA

6.2 REPLACE AHU-4 & AHU-5

6.2.1 OPPORTUNITY

There are two roof-top air handling units, AHU-4 and AHU-5, manufactured by Engineered Air in 2004. These units have natural gas fired heating. AHU-4 serves various interior areas such as the seniors' lounge and amenity rooms, while AHU-5 is dedicated to the fitness gym.

6.2.2 SCOPE OF MEASURE

The two units are exposed to weathering. They have an expected service life of about 25 years at which point the units are replaced. It is expected that the new units will be heat pumps or employ electric heating.

Table 6-2 Replace AHU-4 & AHU-5 Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
15,000 ekWh/yr	0.4%	-$2,500 /yr	17 tCO_2e	5%	$428,600	NA

7 ENERGY CONSERVATION MEASURES

There are new energy conservation measures or ECMs that are not included the BCA.

7.1 POOL COVER

7.1.1 OPPORTUNITY

Currently, there are no pool covers at the Recreation Centre.

7.1.2 SCOPE OF MEASURE

In discussions with maintenance staff, it was agreed to add a pool cover for the small pool or hot tub. This cover would be manually applied at night by staff and removed in the morning before opening to the public. Since the cover is only for the small pool, the savings is small.

Table 7-1 Pool Cover Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
1,200 ekWh/yr	0%	$100 /yr	0	0%	$5,600	NA

7.2 JUBILEE HALL DOOR INTERLOCK

7.2.1 OPPORTUNITY

Jubilee Hall is the main gymnasium area and is used extensively. It is noted that the patrons often open the doors to the outside to improve temperature or air flow.

Figure 7-1 Jubilee Hall

7.2.2 SCOPE OF MEASURE

It was suggested by the operations staff to interlock the heating with the doors. When the doors are opened, the heating is shut off. This will discourage opening the doors on cold days.

Table 7-2 Jubilee Hall Door Interlock

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
13,500 ekWh/yr	0%	$800 /yr	0	0	$5,100	6 years

7.3 BAS RECOMMISSIONING

7.3.1 OPPORTUNITY

The building automation system (BAS) monitors and controls the operation of the HVAC systems and central heating plant, including the pool water heating system, boiler plant, air handlers, dehumidifier, heat recovery systems and other heating systems. It also included the solar heating system, which is not currently in use.

The BAS is operated from a workstation that is equipped with the "enteliWEB" networked remote access system. The system is serviced by ITC. Upgrades were done in 2019.

7.3.2 SCOPE OF MEASURE

Over time, inefficiencies or poor operating practices can creep into the control systems setpoints and sequencing. Recommissioning the HVAC equipment and controls is recommended including reviewing the overall operation of the systems and identifying energy-saving opportunities.

Energy saving strategies include unoccupied setback of space temperatures, scheduling where possible and trending to confirm heat recovery to the pools, etc.

Table 7-3 BAS Recommissioning Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
90,000 ekWh/yr	3%	$4,300 /yr	9 tCO_2e	2.5%	$22,000	5 years

7.4 POOL PUMP VSDS

7.4.1 OPPORTUNITY

The circulation pumps for the pools are constant speed and operate continuously. They are only shut down for maintenance. These pumps keep the water clean by circulating the water through the filters.

Table 7-4 Pool Pumps

System ID	Pool	Service Area	Power (HP)	Flow (US gpm)
PP-22	Lap Pool	Circulation Pump	25	**700**
PP-2	Whirl Pool (hot tub)	Circulation Pump	15	**300**
PP-6	Tots Pool	Circulation Pump	10	**200**
PP-15	Lifestyle Pool	Circulation Pump	25	**675**

7.4.2 SCOPE OF MEASURE

The pumps do not always need to maintain maximum flow. If the water is clean, the pumping can be reduced to the minimum turnover rate of 8 hours. It is not unusual to oversize pumps for their application.

It is recommended to fit the pool pumps with variable speed drives. These would modulate the flow to maintain the turnover rate when the water is clear. Should the water require it, the circulate rate can be increased back to 100%. Given the long hours of operation, the electricity savings are notable.

Table 7-5 Pool Pump VSDs Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
200,000 ekWh/yr	6%	$13,500 /yr	3 tCO2e	0.8%	$67,500	5 years

7.5 ATRIUM DAYLIGHT SENSORS

7.5.1 OPPORTUNITY

The atrium is a large brightly lit area but currently does not have any daylight controls. It is suggested that daylighting sensors could be added to turn off the lighting when not needed.

Table 7-6 MEASURESavings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
5,200 ekWh/yr	0%	$350 /yr	0 tCO2e	0%	$5,600	16 years

8 GHG REDUCTION MEASURES

Although the energy usage in the facility is evenly split 50/50 between electricity and natural gas, the vast majority of the GHG emissions (93%) come from natural gas consuming equipment. Substantial reductions in GHG emissions can only be achieved by measures that reduce or eliminate this equipment.

Table 8-1 List of Natural Gas Consuming Equipment

SYSTEM ID	DESCRIPTION
B1 B2	Viessman Model #CA3B 3.0, natural gas condensing boiler, 2024 Viessman Model #CA3B 3.0, natural gas condensing boiler, 2024
B3	Weil McLain, cast iron, natural gas boiler (back-up, not used), 2004
AHU-4 AHU-5	Engineered Air DJ40 with natural gas furnace coil, 2004 Engineered Air DJ40 with natural gas furnace coil, 2004

The AHU-4 and AHU-5 are expected to be replaced in the near future and are listed in the BAU measures.

The following measures will reduce carbon or GHG emissions.

8.1 HEAT PUMP BOILER

8.1.1 OPPORTUNITY

The current heating boilers are new condensing boilers, installed in 2024. As these have many years of useful life ahead of them, it is not practical to look at replacing this equipment in the near future.

In order to reduce GHG emissions, the heating boilers could be supplemented using heat pump technology. This would take the form of air source heat pump boilers. These can supply hot water at high temperature as needed.

Unlike natural gas boilers, the capacity of heat pump boilers is affected by the outside air temperature. As it gets colder outside, the capacity and efficiency decrease. Therefore, it is recommended to use this type of boiler where there is natural gas back up, as is the case at this site.

The third boiler B3 is original and not in use. This could be removed and new heat pump boiler located in that space.

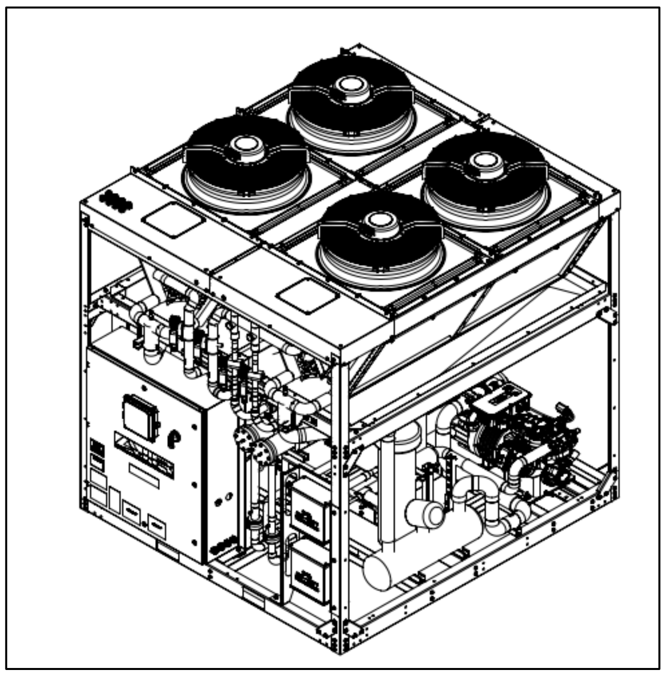

Figure 8-1 ASB-50

8.1.2 SCOPE OF MEASURE

Install a heat pump boiler system to the existing plant to displace the existing heating boilers as much as possible.

Option 1 would consist of two air source boilers which can displace 75% of the design load.

Table 8-2 Heat Pump Boilers Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
950,000 ekWh/yr	27%	$15,500 /yr	240 tCO2e	67%	$1,922,000	NA

An alternate option is to install only one air source heat pump boiler. The installation costs are very similar for one boiler versus two but the savings are much less. This is presented for information only.

Table 8-3 Heat Pump Boiler Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
500,000 ekWh/yr	13%	$7,800 /yr	125 tCO2e	34%	$1,200,000	NA

8.2 SOLAR WATER HEATING

8.2.1 OPPORTUNITY

A solar water heating system was installed on the roof years ago but sustained cracks in the pipes in cold weather such that it is not usable. There remains considerable unobstructed roof area and interior infrastructure to support a solar water heating system.

8.2.2 SCOPE OF MEASURE

It is proposed to install vacuum tube solar water heating panels to supplement the DHW in conjunction with the heating boilers.

Table 8-4 Solar Water Heating Savings

ENERGY SAVINGS	% ENERGY SAVINGS	COST SAVINGS	GHG SAVINGS	% GHG SAVINGS	OPINION OF COST	SIMPLE PAYBACK
56,000 ekWh/yr	2%	$1,650 /yr	10 tCO2e	3%	$73,600	NA

8.3 WORKSHOP SUMMARY

The measures and GHG reduction scenarios were presented and reviewed in a final workshop in January 2026. It was noted that the main source of GHG emissions - the natural gas heating boilers - are new and therefore not a candidate for replacement. Instead, it is recommended to investigate methods to reduce or supplement the heating boilers.

The main recommendation is to investigate installing supplementary high temperature heat pump boilers. High temperature heat pump boilers are a relatively new technology that can deliver heating water for use in buildings using sequenced air source heat pumps. Traditional heat pumps were not able to provide high temperature heating water as is needed in the building.

Unlike typical boilers, the capacity of a heat pump boiler changes with the outside air temperature – as it gets colder outside, the boiler capacity drops. It is recommended to use these boilers where there is natural gas backup, such as the Esquimalt Recreation Centre.

Other measures such as solar water heating are not able to make significant GHG reductions.

Building envelope improvements are costly and do not result in the large natural gas savings or GHG reductions that are needed.

9 GHG REDUCTION STRATEGIES

Esquimalt Council has made climate action a strategic priority, declared a climate emergency, and set ambitious targets to reduce corporate greenhouse gas emissions (GHGs).

As part of this report, it is required to develop and evaluate the following six GHG reduction pathway scenarios:

1) Short-term retrofit (5 years) – Achieving a 45% GHG reduction from **2010** levels.
2) Medium-term retrofit (10 years) – Achieving a 50% GHG reduction from **2023** levels.
3) Long-term retrofit (20 years) – Achieving an 80% GHG reduction from **2023** levels (near net-zero).
4) Short-term deep retrofit (5 years) – Achieving a 50% GHG reduction from **2023** levels.
5) Maximum site potential – Identifying the greatest possible GHG reductions, regardless of cost.
6) Optimized outcome – Balanced approach of aggressive GHG reduction with asset management objectives.

From the **2010** Energy Audit report, the GHG emissions were **584.9 tCO2e**. From the utility data, the **2023** GHG emissions were **457** tCO2e. The most current GHG emissions were **360** tCO2e. The old heating boilers were replaced in 2024 with new condensing boilers. This resulted in the emissions reductions seen since 2023.

9.1 GHG REDUCTION SCENARIOS

9.1.1 SCENARIO 1

The first GHG reduction pathway scenario is

1) Short-term retrofit (5 years) – Achieving a **45%** GHG reduction from **2010** levels.

From the **2010** Energy Audit report, the GHG emissions were **584.9 tCO2e**. The most current GHG emissions were **360** tCO2e which is a **38%** reduction in emissions since 2010 – achieving most of the target of the first scenario. The remaining reductions to the achieve the target can be met by implementing the BAU measures, the ECMs and by the improved electrical grid emissions factors.

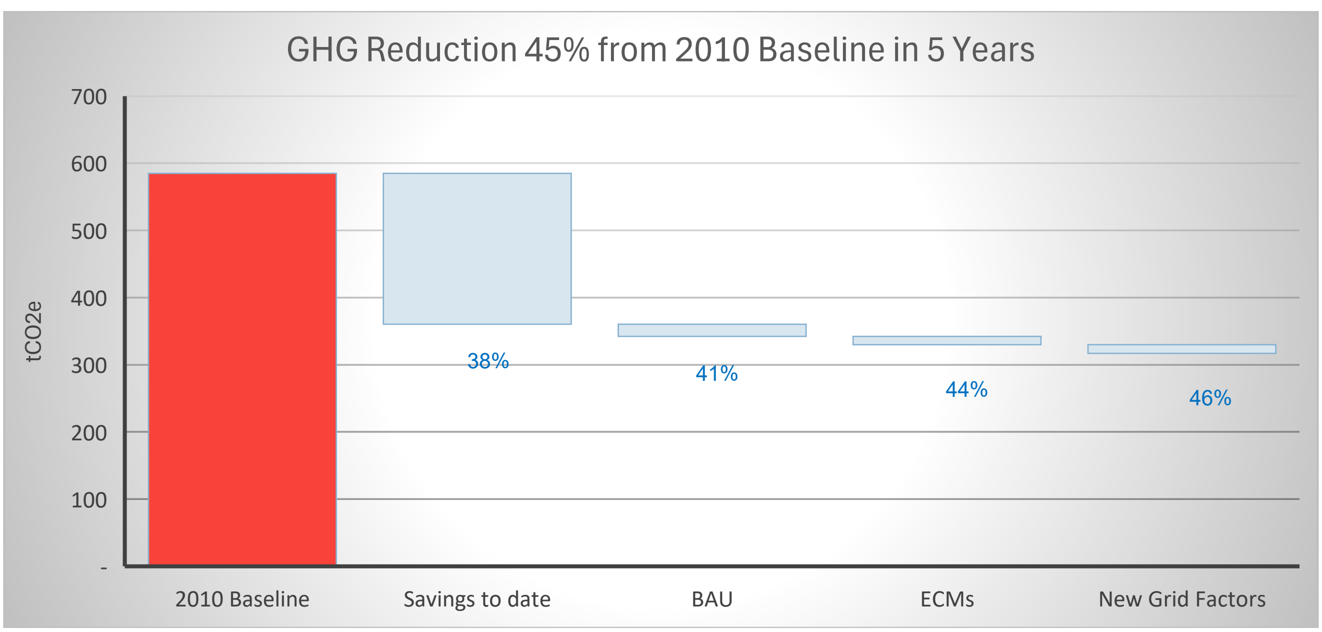

Figure 9-1 GHG Reduction Scenario 1

9.1.2 SCENARIO 2

The second GHG reduction pathway scenario is

2) Medium-term retrofit (10 years) – Achieving a **50%** GHG reduction from 2023 levels.

From the utility data, the **2023** GHG emissions were **457** tCO2e. The most current GHG emissions were **360** tCO2e which is a **21%** reduction in emissions since 2023.

To achieve the remaining reductions required under this scenario, a combination of operational improvements, capital upgrades, and external grid decarbonization is required. The proposed pathway includes the following elements:

- BAU measures, including scheduled equipment replacements aligned with asset lifecycle planning;
- ECMs listed in Section 7
- GHG reductions from lower grid emissions factors, as projected by ECCC.
- Heat Pump Boiler

When combined, these measures result in a total GHG reduction of approximately 59% relative to the 2023 baseline, exceeding the scenario target of 50%.

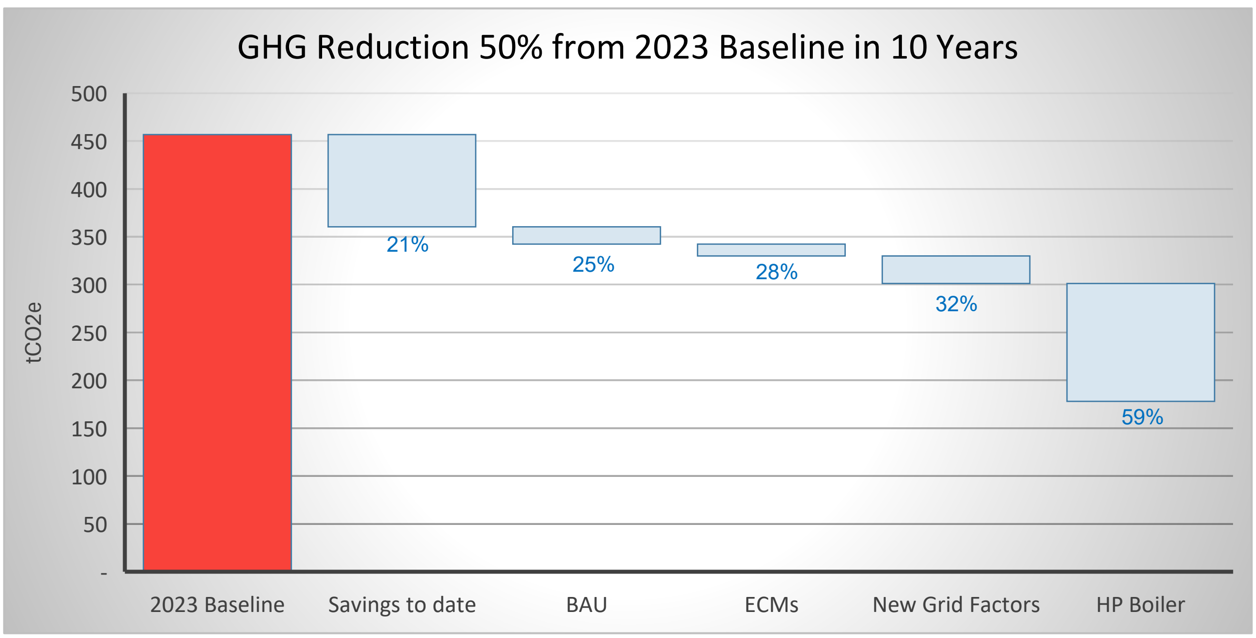

Figure 9-2 GHG Reduction Scenario 2

Figure 9-3 illustrates the Mid Term (10-Year) Retrofit Scenario/Pathway by showing both the timing of capital investments and the resulting evolution of building greenhouse gas (GHG) emissions over time. The figure combines a bar chart and dashed line to distinguish between financial implementation and emissions performance outcomes.

The vertical bars represent the capital cost of different sets of measures implemented in specific years over the scenario horizon. Each bar corresponds to a given implementation year and reflects the aggregate cost of the measures scheduled for that year, grouped by measure type (e.g., business-as-usual upgrades, retrofit measures, or other capital interventions). The bar chart therefore illustrates when investments occur and how capital spending is distributed over time, rather than emissions reductions directly.

The dashed line represents the annual GHG emissions of the building for each year, expressed in absolute emissions (tCO_2e). This emissions trajectory changes over time as a result of two combined effects:

1. Implementation of measures shown in the bars, which reduce on-site fuel consumption or improve system efficiency
2. Changes in electricity grid emission factors, reflecting the projected decarbonization of the provincial electricity supply over time.

As measures are implemented in specific years, step-changes in the dashed line indicate the incremental emissions reductions attributable to those measures. Between implementation years, gradual declines in the dashed line reflect reductions driven by grid decarbonization, even in the absence of new on-site interventions.

By presenting costs and emissions together, Figure 9-3 demonstrates how capital investments translate into emissions reductions over time. The figure shows that, through a combination of scheduled capital upgrades and declining grid emission intensity, building GHG emissions decrease steadily and ultimately exceed the Scenario 2 target of a 50% reduction from the 2023 baseline, reaching approximately a 59% reduction by the end of the medium-term period.

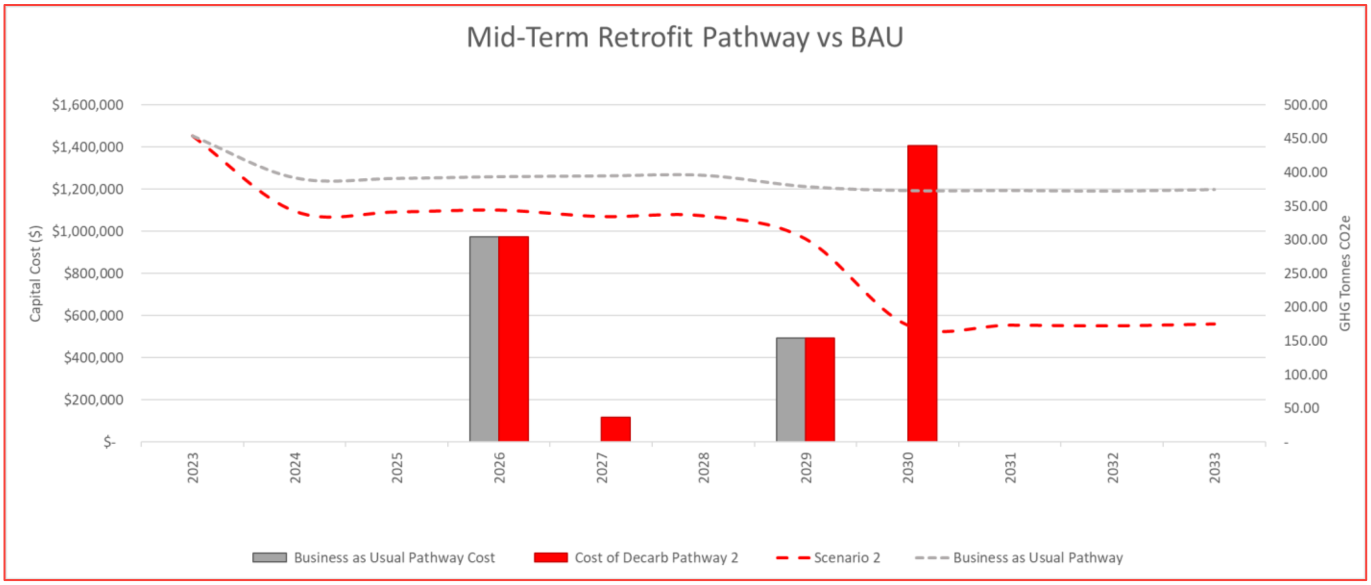

Figure 9-3 GHG Reduction Scenario 2 Pathway vs BAU

9.1.3 SCENARIO 3

The third GHG reduction pathway scenario is

3) Long-term retrofit (20 years) – Achieving an 80% GHG reduction from 2023 levels (near net-zero).

Based on utility data, the **2023 baseline GHG emissions were 457 tCO_2e**. Current building operations result in approximately **360 tCO_2e**, representing a **21% reduction** from 2023. While this reduction reflects recent efficiency improvements (including the 2024 boiler replacement noted elsewhere in the report), additional measures are required to meet the long-term target.

Further measures are required to achieve the goal. The following pathway to low GHG emissions includes

- BAU measures
- ECMs listed in Section 7
- GHG reductions from lower grid emissions factors, as projected by ECCC.
- Heat Pump Boilers

When implemented as a combined pathway, these elements achieve an estimated 86% reduction in GHG emissions relative to the 2023 baseline, exceeding the Scenario 3 target of 80%.

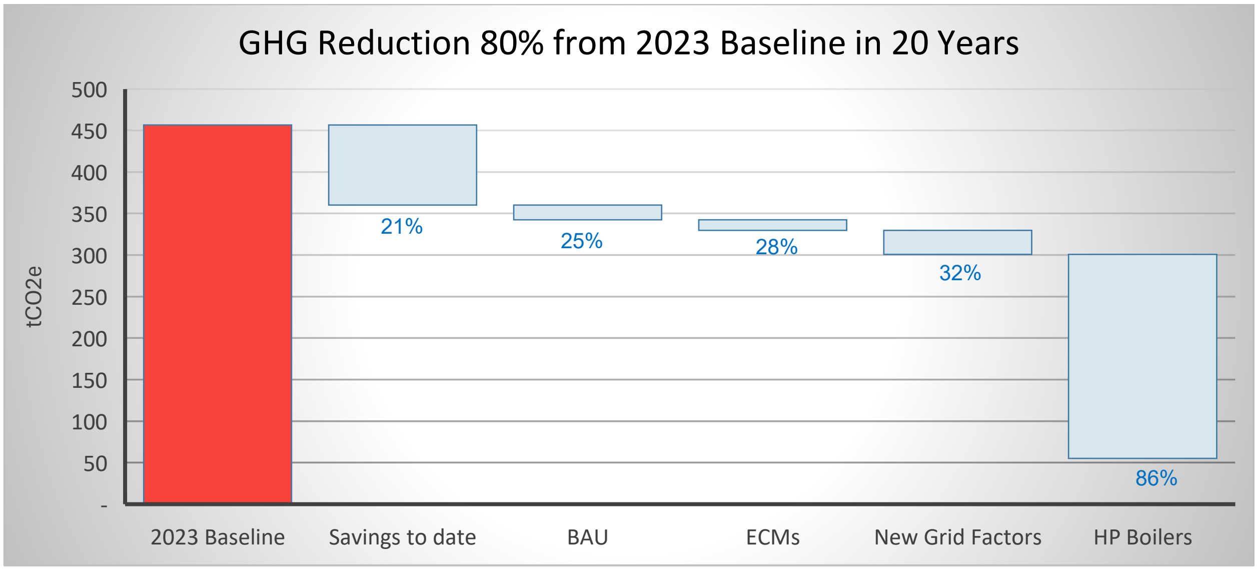

Figure 9-4 GHG Reduction Scenario 3

Figure 9-5 compares the long-term retrofit pathway to the business as usual (BAU) pathway by illustrating the relationship between capital investment timing and resulting greenhouse gas (GHG) emissions over the 20-year study period.
The bars represent annual capital costs associated with each pathway, while the dashed lines show the corresponding annual GHG emissions (tCO_2e). Grey bars and dashed lines represent the BAU pathway, and red bars and dashed lines represent the long-term retrofit pathway.

Under the BAU pathway, capital expenditures are primarily associated with asset renewal and lifecycle replacements. While these investments maintain building functionality, the associated GHG emissions decline only gradually over time. Most of the emissions reduction in the BAU case is driven by projected reductions in electricity grid emission factors, rather than by significant on-site decarbonization.

In contrast, the long-term retrofit pathway includes larger, earlier investments associated with decarbonization measures, producing clear step changes in annual emissions following implementation years. After major measures are in place, emissions continue to decline more gradually due to ongoing grid decarbonization. Overall, the comparison demonstrates that coupling strategic capital upgrades with electrification and efficiency measures achieves substantially lower and more sustained emissions outcomes than BAU alone, enabling the facility to exceed the long-term target and approach near net-zero performance.

Overall, the figure demonstrates that while both pathways benefit from grid decarbonization, the long-term retrofit pathway achieves substantially lower and more sustained GHG emissions by coupling strategic capital investments with system-level fuel switching and efficiency improvements. This highlights the importance of early and targeted investment to achieve deep, long-term emissions reductions beyond what can be realized through BAU actions alone.

In summary, the Long-Term Retrofit (20-Year) scenario demonstrates that deep decarbonization of the Esquimalt Recreation Centre is technically achievable within the existing building constraints. By combining planned asset renewals, energy conservation measures, electrification through heat pump boilers, and continued electricity grid decarbonization, this pathway exceeds the near net-zero target, achieving an estimated 86% reduction in GHG emissions relative to the 2023 baseline. While this scenario requires sustained capital investment over time, it provides a clear, credible roadmap for achieving long-term climate objectives and significantly outperforming the Business-as-Usual pathway in terms of emissions reduction.

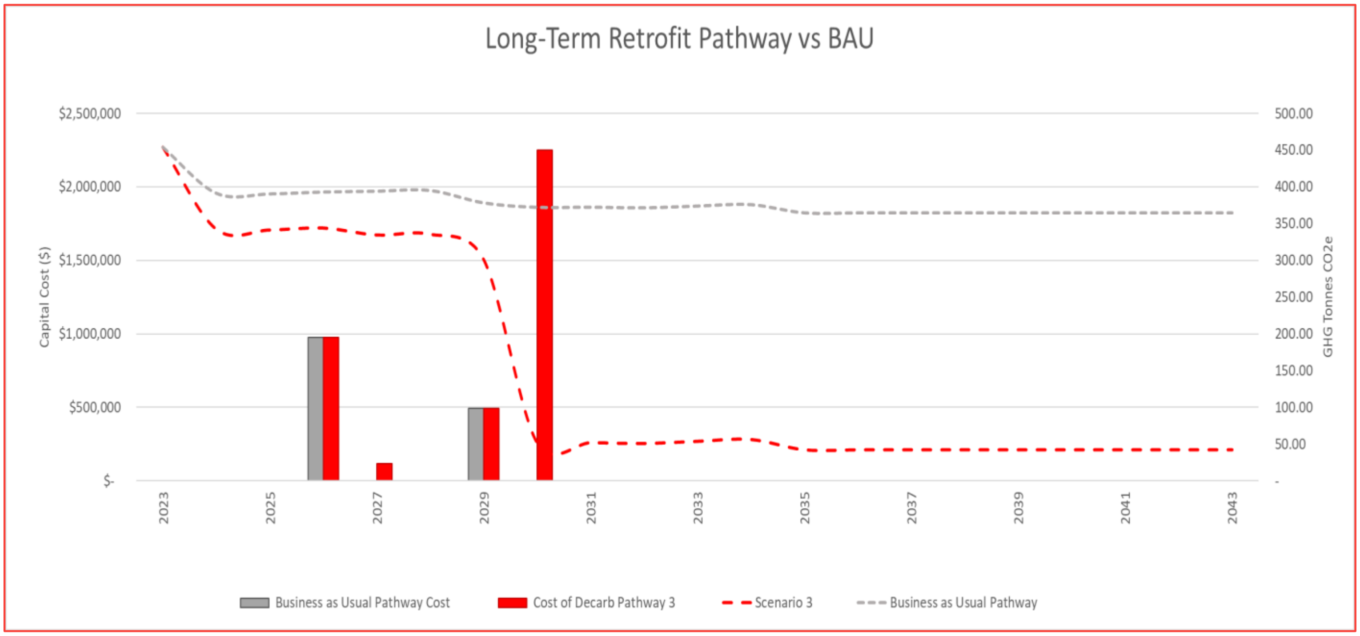

Figure 9-5 GHG Reduction Scenario 3 Pathway vs BAU

9.1.4 SCENARIO 4

The fourth GHG reduction pathway scenario is

4) Short-term deep retrofit (5 years) – Achieving a 50% GHG reduction from **2023** levels.

Based on utility data, the **2023 baseline GHG emissions were 457 tCO_2e**. Current operations result in approximately **360 tCO_2e**, representing a **21% reduction** from the 2023 baseline. While this reduction reflects recent efficiency improvements, additional and accelerated measures are required to meet the Scenario 4 target within a compressed timeframe.

Unlike other scenarios that rely on a broader combination of measures and longer implementation periods, the Short-Term Deep Retrofit pathway focuses on rapid emissions reduction through front-loaded capital investment, supplemented by projected improvements in electricity grid emission factors.

The pathway includes:

- GHG reductions from lower grid emissions factors, as projected by ECCC
- Heat Pump Boiler

The combination of measures achieves 51% reduction from the 2023 baseline

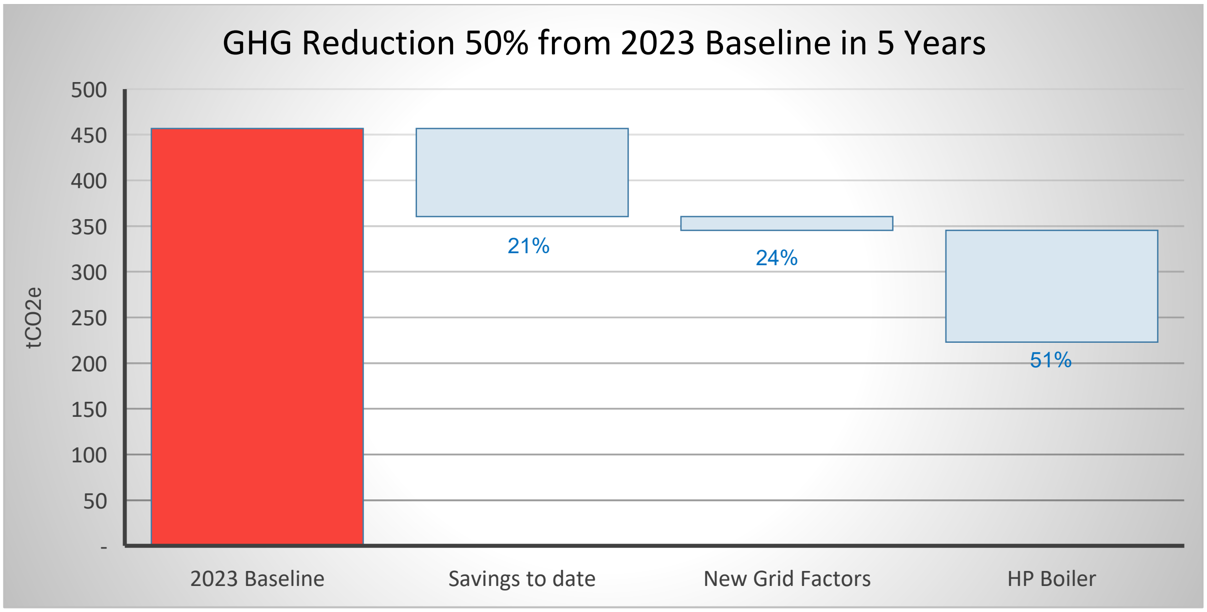

Figure 9-6 GHG Reduction Scenario 4

Figure 9-7 illustrates the short-term deep retrofit pathway in comparison to the business as usual (BAU) pathway, highlighting how accelerated capital investment influences greenhouse gas (GHG) emissions over a compressed, five-year timeframe.

Consistent with earlier figures, the bars indicate annual capital expenditures, while the dashed lines show the resulting annual GHG emissions (tCO_2e) for each pathway. The BAU pathway is shown in grey, and the short-term deep retrofit pathway is shown in red.

In the BAU case, capital spending is limited to planned asset renewal activities. Emissions decline gradually under this pathway, with reductions occurring primarily as a result of projected improvements in electricity grid emission factors rather than substantive changes to on-site systems.

The short term deep retrofit pathway, by contrast, is characterized by intensive, front loaded capital investment, reflecting the rapid deployment of multiple high-impact decarbonization measures within a short period. These investments drive immediate and significant reductions in GHG emissions, evident as steep downward shifts in the red dashed line following major implementation years. This contrasts with the more gradual emissions trajectory observed under the BAU pathway.

Overall, the figure demonstrates that the short-term deep retrofit pathway prioritizes speed of emissions reduction, achieving meaningful GHG savings much earlier than the BAU approach. While this pathway requires higher near-term capital outlays, it enables rapid progress toward short-term climate targets and accelerates the transition toward lower-emissions operation.

The Short-Term Deep Retrofit scenario demonstrates that achieving a 50% reduction in GHG emissions within five years is feasible but requires accelerated implementation of high impact decarbonization measures and higher near-term capital investment. By prioritizing rapid fuel switching through heat pump boilers and leveraging grid decarbonization, this pathway delivers meaningful emissions reductions significantly faster than the BAU approach. While more capital intensive in the short term, this scenario provides a viable option for meeting aggressive near-term climate targets where speed of emissions reduction is a primary objective.

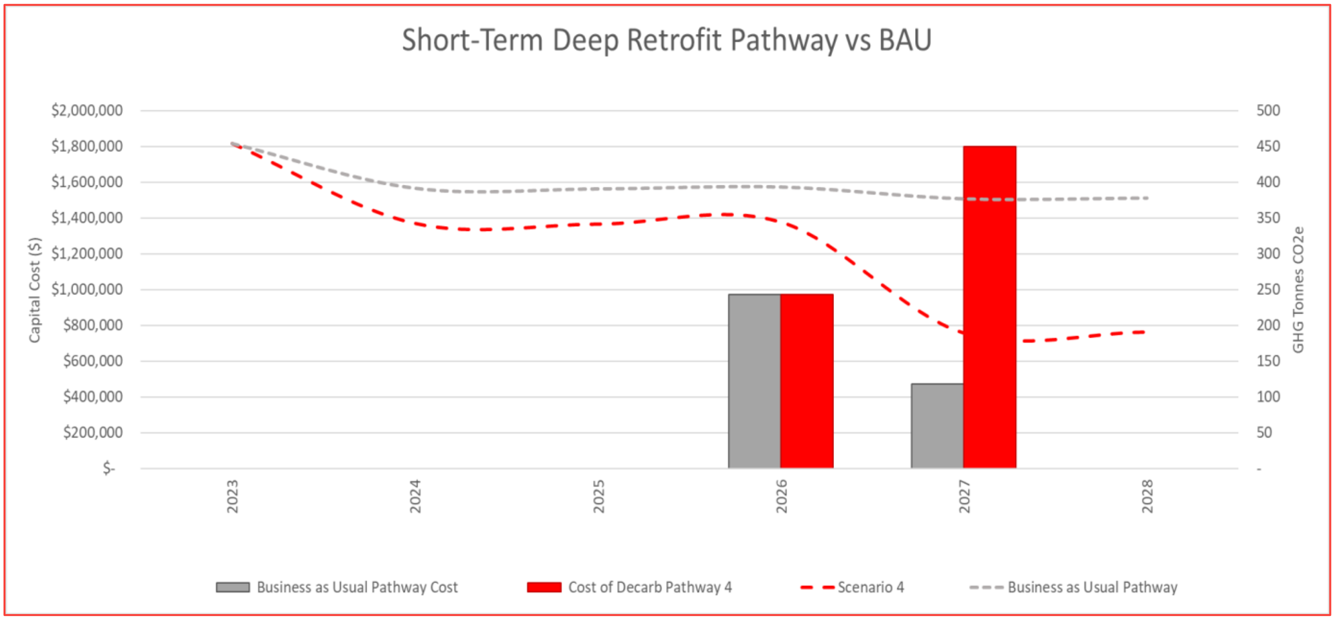

Figure 9-7 GHG Reduction Scenario 4 Pathway vs BAU

9.1.5 SCENARIO 5

The fifth GHG reduction pathway scenario is

5) Maximum site potential – Identifying the greatest possible GHG reductions, regardless of cost.

Based on utility data, the **2023 baseline GHG emissions were 457 tCO_2e**. Current building operations result in approximately **360 tCO_2e**, representing a **21% reduction** from the 2023 baseline. Achieving substantially deeper reductions requires the implementation of all technically feasible measures, including those with higher capital costs or lower cost-effectiveness.

Further measures are required to achieve the goal. The following pathway to low GHG emissions includes

- BAU measures
- ECMs listed in Section 7
- GHG reductions from lower grid emissions factors, as projected by ECCC.
- Solar Water Heating System
- Heat Pump Boilers

When combined, these measures achieve an estimated 86% reduction in GHG emissions relative to the 2023 baseline, approaching near net-zero performance. While this level of reduction is similar to that achieved in the Long-Term Retrofit scenario (Scenario 3), this pathway differs in intent by prioritizing maximum emissions reduction over cost optimization or phased implementation.

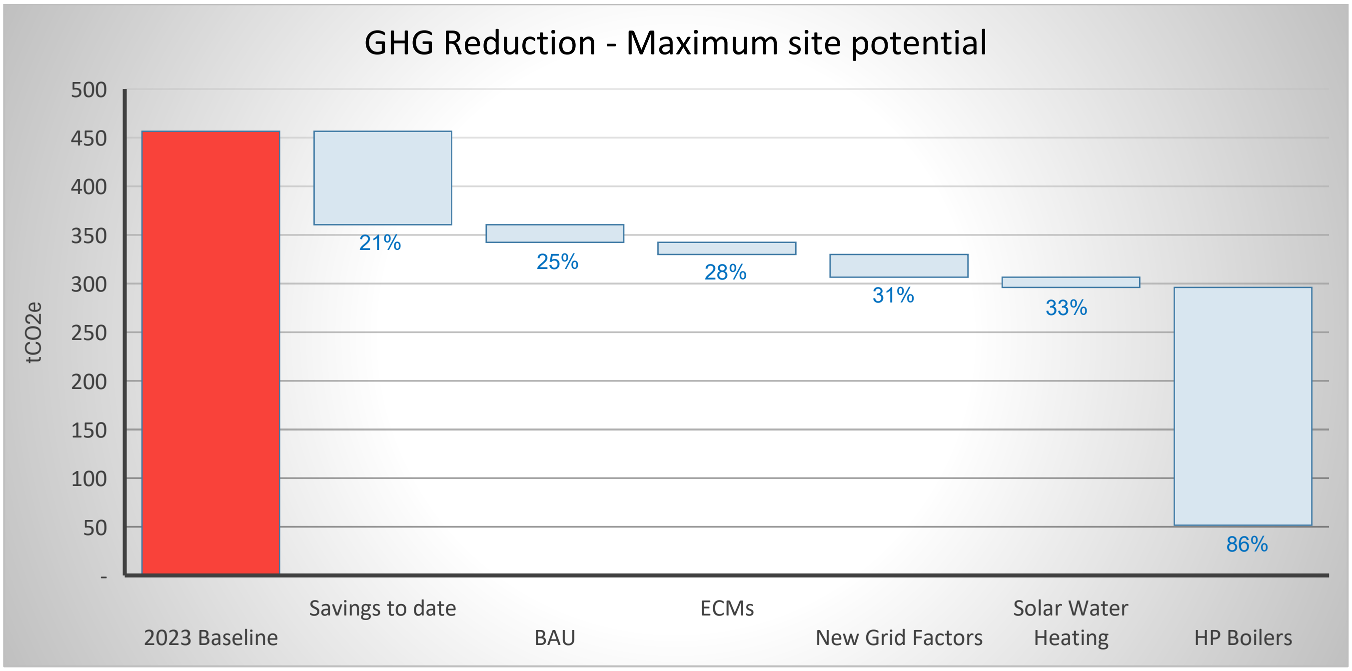

Figure 9-8 GHG Reduction Scenario 5

Figure 9-9 presents the maximum site potential pathway in comparison to the business as usual (BAU) pathway, illustrating the highest level of greenhouse gas (GHG) reduction that can be achieved at the site using all technically feasible decarbonization measures, including on site renewable energy generation.

As with previous pathway figures, the bars show annual capital costs and the dashed lines represent annual GHG emissions (tCO_2e). The BAU pathway is shown in grey, while the maximum site potential pathway is shown in red. The BAU pathway reflects planned asset renewal activities only and results in a moderate decline in emissions over time. These reductions are driven largely by improvements in electricity grid emission factors, with limited on-site fuel switching or electrification.

The maximum site potential pathway, by contrast, incorporates the full suite of available measures, including energy conservation measures, heat pump boilers and installation of rooftop solar water heating panels. This pathway represents the upper bound of achievable GHG reductions under current site conditions and technology constraints. Capital investments are concentrated in the early years to enable comprehensive system upgrades and electrification, followed by smaller investments as remaining measures are completed.

These investments result in substantial and sustained reductions in GHG emissions, visible as a sharp and lasting decline in the red dashed line. Following implementation of the full measure set, emissions reach their lowest achievable level and remain well below the BAU trajectory for the remainder of the study period. Continued grid decarbonization further enhances the emissions performance of the electrified systems.

Overall, the figure demonstrates that the maximum site potential pathway delivers the greatest absolute GHG reduction of all scenarios, approaching near net zero operation. While this pathway requires the highest capital investment, it establishes a benchmark for the site's technical decarbonization limits and provides a reference point against which more cost-constrained or phased pathways can be evaluated.

The Maximum Site Potential scenario demonstrates the upper limit of GHG reductions that can be achieved at the Esquimalt Recreation Centre using currently feasible technologies. By implementing all identified measures—including heat pump boilers and solar water heating—this pathway achieves an estimated 86% reduction in GHG emissions relative to the 2023 baseline, approaching near net-zero operation. While this scenario requires the highest capital investment and is not optimized for cost-effectiveness, it establishes a valuable benchmark for the site's technical decarbonization potential and provides a reference point against which more balanced or phased pathways can be evaluated.

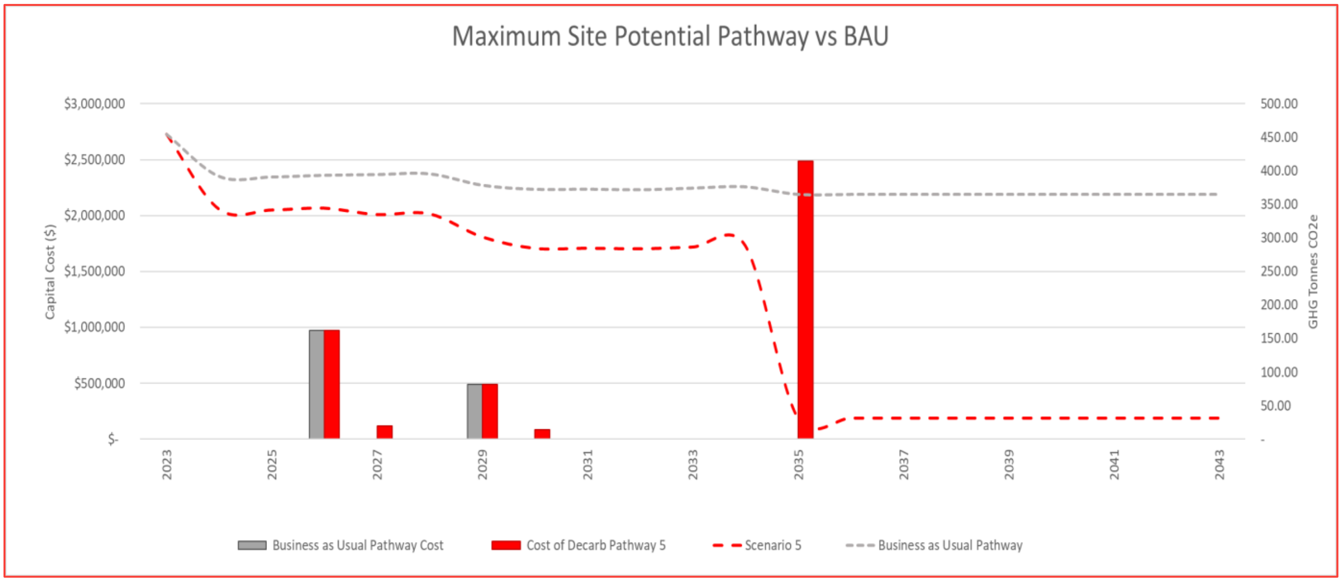

Figure 9-9 GHG Reduction Scenario 5 Pathway vs BAU

9.1.6 SCENARIO 6

The second GHG reduction pathway scenario is

6) Optimized outcome – Balanced approach of aggressive GHG reduction with asset management objectives.

From the utility data, the **2023** GHG emissions were **457** tCO2e. The most current GHG emissions were **360** tCO2e which is a **21%** reduction in emissions since 2023.

Further measures are required to achieve the goal. The following pathway to low GHG emissions includes

- BAU measures
- ECMs listed in Section 7
- GHG reductions from lower grid emissions factors, as projected by ECCC.
- Solar Water Heating System
- Heat Pump Boilers

The combination of measures achieves 84% reduction from the 2023 baseline.

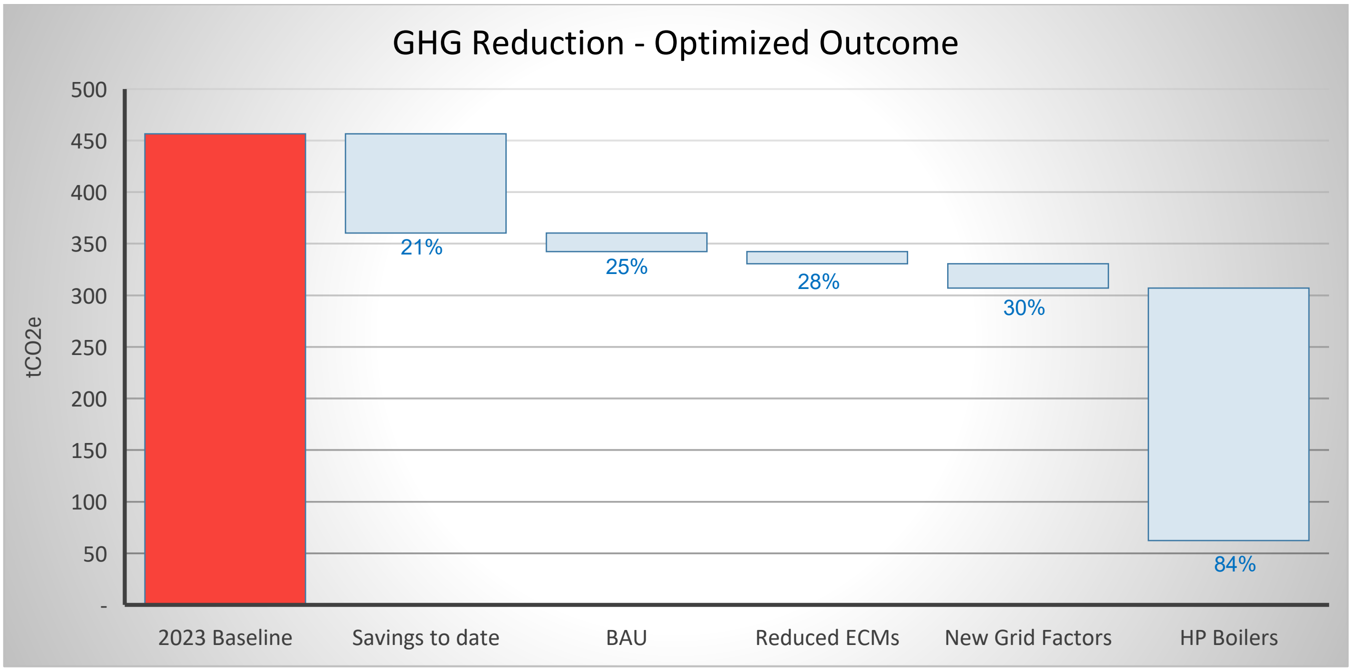

Figure 9-10 GHG Reduction Scenario 6

Figure 9-11 presents the optimized outcome pathway in comparison to the business as usual (BAU) pathway, illustrating a balanced decarbonization approach that prioritizes substantial greenhouse gas (GHG) reductions while maintaining financial and implementation feasibility.

As with the preceding pathway figures, the bars represent annual capital costs, and the dashed lines show annual GHG emissions (tCO_2e). Grey bars and dashed lines correspond to the BAU pathway, while red bars and dashed lines represent the optimized outcome pathway.

Under the BAU pathway, capital investments are limited to scheduled asset renewals, resulting in a modest and gradual reduction in emissions over time. Most of the emissions decline in this case is attributable to projected reductions in electricity grid emission factors, rather than targeted on-site decarbonization measures.

The optimized outcome pathway, by contrast, selectively incorporates high-impact and cost effective measures from across the available options, including energy conservation measures and selected elements of Bundles 1 and 2. This pathway intentionally excludes the highest-cost measures with lower marginal GHG benefits, focusing instead on interventions that offer a strong balance between emissions reduction, capital cost, and alignment with asset lifecycle planning.

Capital investments under this pathway are concentrated in key implementation years, producing clear step changes in GHG emissions, while avoiding the very high upfront costs associated with the maximum site potential scenario. Following implementation, emissions remain significantly lower than the BAU trajectory, with continued improvement driven by grid decarbonization.

Overall, the figure demonstrates that the optimized outcome pathway achieves deep and sustained GHG reductions, approaching near net zero performance, while remaining more practical and financially achievable than the maximum site potential pathway. This scenario represents a realistic and balanced decarbonization strategy, providing a strong foundation for long term emissions reduction while respecting capital constraints, operational considerations, and asset management objectives.

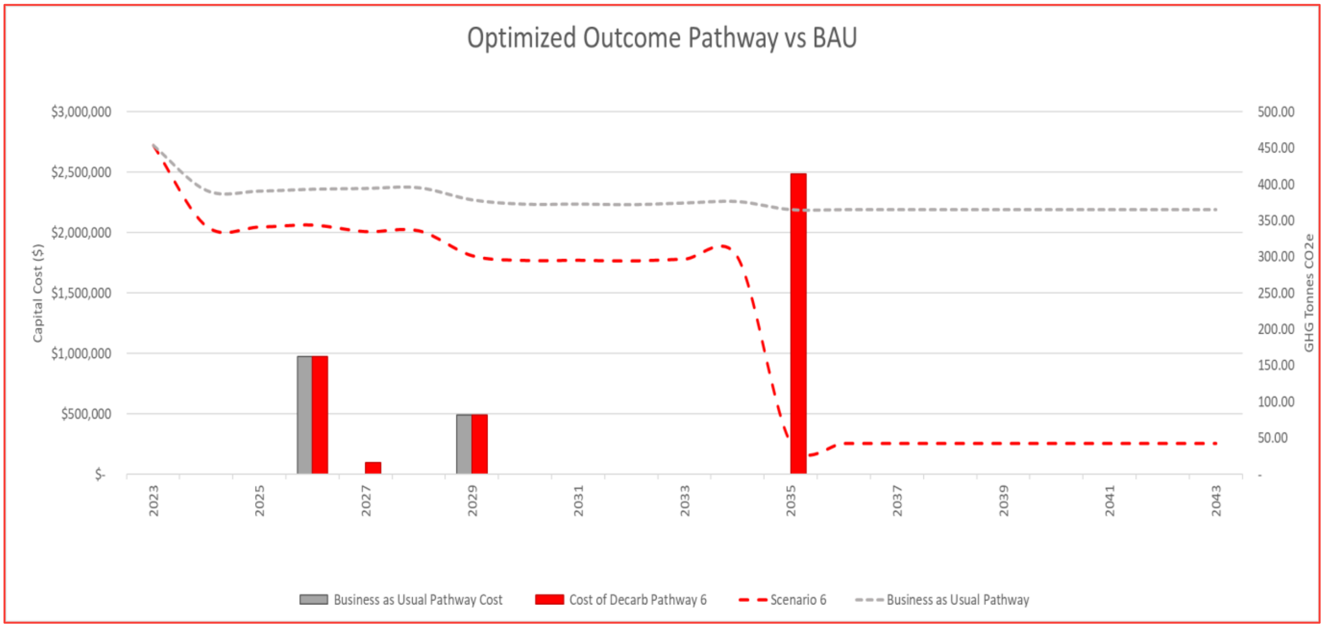

Figure 9-11 GHG Reduction Scenario 6 Pathway vs BAU

9.2 LIFE CYCLE COST ANALYSIS (LCCA)

An Incremental Life Cycle Cost Analysis (ILCC) was conducted to evaluate the financial performance of the proposed decarbonization pathways relative to the Business-as-Usual (BAU) approach. ILCC is used as the primary financial metric because it captures the total cost impact of design and retrofit decisions over the study period, rather than focusing solely on upfront capital costs or simple payback.

This approach is particularly well-suited to long-term decarbonization planning, where higher initial investments may result in lower operating costs, avoided future replacements, and improved cost-effectiveness when assessed over the full life cycle.

LCCA Methodology and Assumptions

The ILCC analysis incorporates the following key elements:

- First (capital) costs associated with each pathway;
- A 20-year study period, with construction assumed to begin in 2026;
- Utility costs, including electricity and natural gas, with appropriate escalation rates;
- System service life estimates and associated replacement or residual values within the study period; and
- Standard inflation and discount rates to reflect the time value of money.

Residual values are accounted for such that equipment with service lives longer or shorter than the study period is assigned a linearly depreciated residual value at the end of the analysis period. All results are presented in 2025 dollars, escalated using the rates summarized in the table below.

Table 9-1 LCC Assumptions

Rate Name	Value (%)
Energy Inflation (ENER)	2.00%
Long Term Construction Costs (Capital Costs) Escalation (LTCC)	2.00%
Operations and Maintenance Escalation (O&M)	2.00%
Discount Rate (DISC)	2.00%

An incremental LCC approach is applied rather than a comparative LCC. This means that absolute life-cycle costs are not calculated; instead, the analysis focuses on the difference in life-cycle cost between each pathway and the BAU baseline. This approach provides results that are equally valid for decision-making while avoiding unnecessary complexity.

LCCA Results and Interpretation

The summary results of the LCCA are presented in the table below.

Table 9-2 LCCA Results

Pathway	Absolute Capital Cost ($M)	Study Life Cycle Cost NPV ($M)	LCC per Tonne Reduced ($/Tonne)
Business as Usual Pathway (5 Years)	$1.33	$1.11	$14,505
Short-term Deep Retrofit	$2.53	$1.20	$353
Business as Usual Pathway (10 Years)	$1.33	$2.40	$29,998
Mid-Term Retrofit	$2.63	$2.19	$(732)
Business as Usual Pathway (20 Years)	$1.33	$4.93	$55,316
Long-term retrofit (20 years)	$3.36	$3.87	$(2,584)
Maximum Site Potential	$3.43	$4.06	$(2,060)
Optimum Outcome	$3.34	$5.86	$2,254

Several key insights emerge from these results:

- BAU becomes progressively less cost-effective over time. The BAU pathways show rapidly worsening cost effectiveness as the analysis horizon extends: approximately $14,505/tCO$_2$e (5-year BAU), $29,998/tCO$_2$e (10-year BAU), and $55,316/tCO$_2$e (20-year BAU). This indicates that relying on BAU alone produces comparatively small emissions reductions while accumulating substantial life-cycle costs per tonne reduced.
- Several decarbonization pathways produce net life-cycle savings relative to BAU. Table 9-2 reports negative life-cycle cost per tonne (and negative NPVs where applicable), indicating net savings compared to BAU over the study period. In particular, the Medium-Term Retrofit shows ($732)/tCO$_2$e, the Long-Term Retrofit shows ($2,584)/tCO$_2$e, and the Maximum Site Potential shows ($2,060)/tCO$_2$e. These results suggest that, over 20 years, operating cost savings and avoided future costs can outweigh the incremental capital investment for these pathways.
- Fast action can be cost-effective, but it requires front-loaded capital. The Short-Term Deep Retrofit achieves a strong cost effectiveness of $353/tCO$_2$e, but with a higher near-term capital requirement ($2.53M) relative to BAU ($1.33M). This pathway can be attractive where near-term targets are binding, but it must be evaluated against capital availability and delivery capacity.
- "Maximum reductions" does not automatically mean "best economics," and vice-versa. The Maximum Site Potential pathway achieves near-net-zero-level reductions and shows net savings per tonne ($2,060)/tCO$_2$e, but it also has one of the highest capital costs ($3.43M). This pathway is best interpreted as a technical upper bound and a benchmarking case, not necessarily the preferred implementation plan.
- Optimized Outcome has a positive cost effectiveness of $2,254/tCO$_2$e and the highest NPV of listed scenarios ($5.86M), meaning it is not the lowest-cost-per-tonne case in the table. However, its capital cost ($3.34M) is comparable to other deep pathways, suggesting it may represent a different balance of investment timing, residual value treatment, or measure mix rather than purely "lowest $/tonne.
- The strongest economic performers in Table 9-2 are the pathways with net savings per tonne.
  Based strictly on the tabulated metric LCC per tonne reduced, the Long-Term Retrofit shows the most favorable value among the listed scenarios (($2,584)/tCO$_2$e), followed by Maximum Site Potential (($2,060)/tCO$_2$e) and Medium-Term Retrofit (($732)/tCO$_2$e).

The Life Cycle Cost Analysis demonstrates that the choice of decarbonization pathway has a material impact on both long-term financial performance and emissions outcomes for the Esquimalt Recreation Centre. While Business-as-Usual (BAU) pathways minimize near-term capital expenditures, they consistently perform poorly when evaluated on a life-cycle basis, particularly over longer planning horizons. As the analysis horizon extends from 5 to 20 years, the BAU cost per tonne of GHG reduced increases substantially, indicating diminishing value and increasing exposure to long-term energy price and carbon risk.

In contrast, multiple decarbonization pathways evaluated in this study achieve significantly lower life-cycle costs per tonne of emissions reduced, with several pathways demonstrating net life-cycle savings relative to BAU over the 20-year study period. These results reflect the combined effects of avoided natural gas consumption, reduced exposure to fuel price escalation, and alignment of capital investments with asset replacement cycles. Importantly, the analysis shows that higher upfront capital investment does not necessarily translate to higher long-term cost, and in several cases delivers superior economic performance when assessed over the full life cycle.

The LCCA further highlights that timing and depth of intervention matter. Accelerated pathways, such as the Short-Term Deep Retrofit, deliver rapid emissions reductions at relatively low cost per tonne but require significant near-term capital commitment. Longer-term pathways distribute investment over time and, when paired with grid decarbonization and strategic electrification, can achieve deeper emissions reductions with favorable life-cycle economics. The Maximum Site Potential scenario establishes a technical upper bound for emissions reduction, while demonstrating that near-net-zero operation is achievable, albeit with higher capital intensity.

Overall, the analysis confirms that early and strategic investment in decarbonization measures is financially preferable to deferring action. From a long-term asset management and climate-risk perspective, pathways that integrate energy conservation, electrification, and planned asset renewal provide the most resilient and cost-effective outcomes. The LCCA results support the conclusion that decarbonization should be viewed not as an added cost, but as a long-term financial optimization strategy that reduces operating costs, mitigates future risk, and aligns the facility with the Township's climate objectives.

9.3 TIMELINE

Based on the building condition assessment and discussions with staff, the following timeline is expected for business-as-usual measures.

Table 9-3 Timeline for Measures

MEASURE	YEAR OF IMPLEMENTATION
Replace Dectron Unit	2026
Replace AHU-4 & AHU-5	2029 (2027 short term)

The following timeline for measures is proposed for GHG reduction measures.

Table 9-4 Time for GHG Reduction Measures

MEASURE	YEAR OF IMPLEMENTATION
ECMs	2027
Heat Pump Boilers	2030 (2035 Max and Opt)

10 REJECTED MEASURES

10.1 SCHEDULING AHU-2

10.1.1 OPPORTUNITY

The air handling unit AHU-2 runs continuously. It was proposed to schedule the unit off at night. Scheduling of the unit was rejected as there might be issues with humidity.

11 RECOMMENDATION

11.1 SUMMARY OF SAVINGS

The energy conservation measures are sorted into the groups below. Due to the interactive effects between the measures, the total savings may not be the absolute total of all the measures combined. Some measures reduce the building loads which in turn reduces energy consumed by equipment or systems. Once the ECMs are decided or the pathway determined, then reviewing the savings for interactive effects is recommended.

MEASURE		POTENTIAL SAVINGS			COST/PAYBACK	
#	ENERGY CONSERVATION MEASURE	Energy (ekWh[1]/Yr)	Utility Cost ($/Yr)	Emissions Reduction (tCO_2e/Yr)	Opinion Of Cost	Simple Payback (years)
BAU						
6.1	Replace Dectron Unit	58,000	$3,800	1	$900,000	NA
6.2	Replace AHU-4 and AHU-5	15,000	-$2,500	17	$428,600	NA
	Totals (Rounded)	**73,000**	**$1,300**	**18**	**$1,328,600**	**NA**
Energy Conservation Measures						
7.1	Pool Cover - small pool/hot tub	1,200	$100	0	$5,600	56
7.2	Jubilee hall occupancy sensor/door interlock	13,500	$800	0	$5,100	6
7.3	BAS Recommissioning	90,000	$4,300	9	$22,000	5
7.4	VSD for Pool Pumps	200,000	$13,500	3	$67,500	5
7.5	Daylight sensors for atrium	5,200	$350	0	$5,600	16
	ECM Totals (Rounded)	**377,700**	**$20,000**	**30**	**$1,428,800**	**71**
GHG Reduction Measures						
8.1A	Heat pump boilers	950,000	$15,500	240	$1,900,000	123
8.1B	Heat pump boiler	500,000	$7,800	125	$1,200,000	154
8.2	Solar Water Heating	56,000	$1,650	10	$73,600	45

11.2 NEXT STEPS

This report presents measures that can reduce energy use at your building. To realize the benefits outlined in this report, the measures identified must be implemented. Our description of each measure includes our recommendation on how to proceed.

We recommend the following next steps:

1. **Review the proposed measures** listed in section 6;
2. **Decide which measures to implement** and your implementation timeline;
3. **Select your incentive program enrolment strategy**. The preferred incentive program for this property will depend on the measures you choose to implement, and the timeline for implementation.
4. **Decide how implementation will be managed** (and engage support, if desired);

5 **Implement operational measures** that are quick or low-cost. Plan to verify that measures are completed and that the expected benefit is achieved;

6 **Implement retrofit measures, or add them to your capital plan** if they cannot be completed in the current capital year. Develop a formal scope of work and request quotes for more detailed or costly measures. You may need to prepare engineering designs and/or specifications, develop bid documents for competitive quotes, manage construction review and/or contract administration, commission systems, verify installation as intended, train operators on system changes, and measure performance improvement;

7 **Train operators** on system changes and update building documentation; and

8 **Measure performance improvement** and verify measures are completed as planned.

WSP can provide the expertise and services that will lead to successful completion of any or all of these operational and retrofit measures. We trust this report meets your needs and would be pleased to discuss our findings further with you at your convenience. We would also very much like to help you implement these measures and look forward to taking these next steps with you.

APPENDIX

A

MASTER LIST OF FINDINGS

APPENDIX A

APPENDIX

B METHODOLOGY

APPENDIX B

METHODOLOGY

Work completed for this assessment included:

1 Preliminary System Review: We performed this review prior to visiting the site using existing mechanical, electrical, and structural drawings and report. We review past equipment maintenance, repair, and replacement details;

2 Facility Walkthrough: Our team was on site to assess the current condition of equipment and associated components;

3 Fossil-fuelled asset : We developmented an asset inventory profile including model and serial numbers, age, installation date, capacities, dimensions, photographs, etc;

4 Identification : We Identified key issues relevant to project scope related to the state of current fossil-fuelled assets;

5 Analysis: We performed various calculations to estimate both the potential of electrification and implementation costs associated with potential fuel switching measures; and

6 Reporting: We summarized our findings and the recommended next steps in this report.

APPENDIX

C MEASUREMENT AND VERIFICATION OPTIONS

APPENDIX C

MEASUREMENT AND VERIFICATION OPTIONS

For each measure presented in this report, we recommend a measurement and verification approach based on the International Performance Measurement and Verification Protocol (IPMVP): Concepts and Options for Determining Energy and Water Savings. The Protocol defines techniques for reviewing and confirming savings in various situations. The following is an excerpt from the Protocol which outlines the four primary M&V options available:

OPTION A. PARTIALLY MEASURED RETROFIT ISOLATION: Savings are determined by partial field measurement of the energy use of the system(s) to which an ECM was applied; separate from the energy use of the rest of the facility. Measurements may be either short-term or continuous. Partial measurement means that some but not all parameter(s) may be stipulated, if the total impact of possible stipulation error(s) is not significant to the resultant savings. Careful review of ECM design and installation will ensure that stipulated values fairly represent the probable actual value. Stipulations should be shown in the M&V Plan along with analysis of the significance of the error they may introduce.

OPTION B. RETROFIT ISOLATION: Savings are determined by field measurement of the energy use of the systems to which the ECM was applied; separate from the energy use of the rest of the facility. Short-term or continuous measurements are taken throughout the post-retrofit period.

OPTION C. WHOLE FACILITY: Savings are determined by measuring energy use at the whole facility level. Short-term or continuous measurements are taken throughout the post-retrofit period.

OPTION D. CALIBRATED SIMULATION: Savings are determined through simulation of the energy use of components or the whole facility. Simulation routines must be demonstrated to adequately model actual energy performance measured in the facility. This option usually requires considerable skill in calibrated simulation.

APPENDIX

D LIMITATIONS

APPENDIX

APPENDIX D

LIMITATIONS

WSP Canada Inc. is the “Consultant” referenced throughout this document.

— The scope of our work and related responsibilities related to our work are defined in our project authorization (“Conditions of Assignment”).

— Any user accepts that decisions made, or actions taken based upon interpretation of our work are the responsibility of only the parties directly involved in the decisions or actions.

— No party other than the Client shall rely on the Consultant’s work without the express written consent of the Consultant, and then only to the extent of the specific terms in that consent. Any use which a third party makes of this work, or any reliance on or decisions made based on it, are the responsibility of such third parties. Any third party user of this report specifically denies any right to any claims, whether in contract, tort and/or any other cause of action in law, against the Consultant (including Sub-Consultants, their officers, agents and employees).The work reflects the Consultant’s best judgement in light of the information reviewed by them at the time of preparation. It is not a certification of compliance with past or present regulations. Unless otherwise agreed in writing by the Consultant, it shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. No portion of this report may be used as a separate entity; it is written to be read in its entirety.

— Only the specific information identified has been reviewed. No physical or destructive testing and no design calculations have been performed unless specifically recorded. Conditions existing but not recorded were not apparent given the level of study undertaken. Only conditions actually seen during examination of representative samples can be said to have been appraised and comments on the balance of the conditions are assumptions based upon extrapolation. Therefore, this work does not eliminate uncertainty regarding the potential for existing or future costs, hazards or losses in connection with a property. We can perform further investigation on items of concern if so required.

— The Consultant is not responsible for, or obligated to identify, mistakes or insufficiencies in the information obtained from the various sources, or to verify the accuracy of the information.

— No statements by the Consultant are given as or shall be interpreted as opinions for legal, environmental or health findings. The Consultant is not investigating or providing advice about pollutants, contaminants or hazardous materials.

— The Client and other users of this report expressly deny any right to any claim against the Consultant, including claims arising from personal injury related to pollutants, contaminants or hazardous materials, including but not limited to asbestos, mould, mildew or other fungus.

— Budget figures are our opinion of a probable current dollar value of the work and are provided for approximate budget purposes only. Accurate figures can only be obtained by establishing a scope of work and receiving quotes from suitable contractors.

— Time frames given for undertaking work represent our opinion of when to budget for the work. Failure of the item, or the optimum repair/replacement process, may vary from our estimate.