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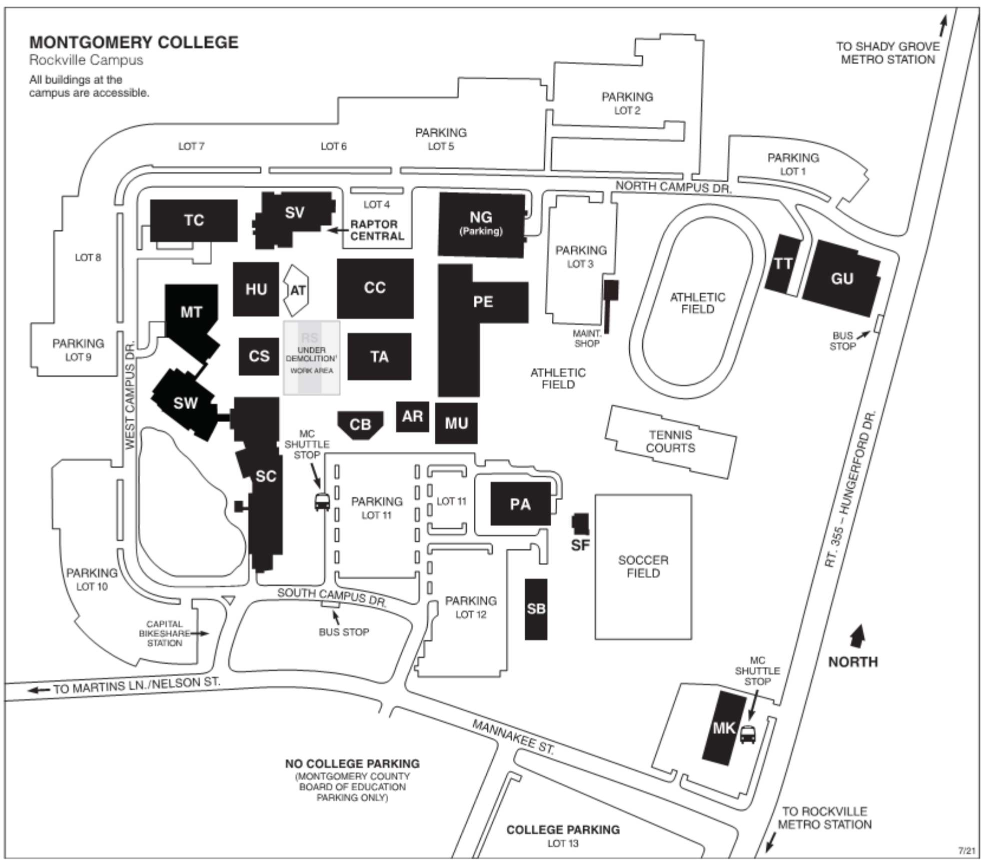
MONTGOMERY COLLEGE



Montgomery College Rockville Campus Utility Master Plan

Final Report

June 2022

BKM No. 19021.02

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FORWARD

This and earlier Utilities Master Plans have been prepared to support their respective Facilities Master Plans and to provide utility details useful to planners, designers, and operations staff. The recommendations in these plans have been based upon knowledge of existing technology and practices. Climate change and resulting impacts are influencing master planning efforts, some of which are being addressed in this current plan.

MONTGOMERY COLLEGE SUSTAINABLITY STATEMENT

In December 2017, Montgomery County Council declared a climate emergency. In response, the Montgomery County Executive published a Climate Action Plan (CAP), June 2021, with the goal of reducing Greenhouse Gas (GHG) by 80% by 2027 and 100% by 2035. The Executive also published Building Energy Performance standards (BEPS), which was introduced to the County Council as Bill 16-21, on May 4, 2021. BEPS requires all buildings, 25,000 Gross Square Foot (GSF) and larger, to benchmark and establish a plan to reduce GHG by the proposed CAP dates.

Future Facilities Master Plans and Utilities Master Plans should address both the CAP and BEPS, specifically in the following area:

- **Buildings:** Increase energy conservation and efficiency, decrease fossil fuel use in buildings, and support carbon neutral building design.
- **Carbon Sequestration:** Retain, increase, and restore terrestrial ecosystems, including forest, meadows, wetlands, green spaces, and urban trees.
- **Climate Adaptation Actions:** Provide suitable infrastructure and tools to reduce the risks and impacts of more extreme climate hazards, i.e., resilience, enhanced storm water management, and green infrastructure.
- **Climate Governance Actions:** Align and orient staffing, technical capacity, process, and decision-making to address climate change.
- **Clean Energy Actions:** Ensure carbon-free electricity, expand renewable electricity generation and use of distributed energy resources.
- **How Can I act on Climate Change:** Public awareness for transportation, home energy, business, consumption, and resilience.
- **Public Engagement, Partnerships, and Education Actions:** Facilitate inclusive, community-driven leadership, build strategic partnerships, empower youth to act at home and in their community, build community trust and partnerships.
- **Transportation Actions:** Transition to 100% zero emissions transportation and expand supporting infrastructure, public transit, reduce use of personal automobiles, and introduce new technologies such as EV charging stations. The placement of EV charging stations in parking lots which are remote from the buildings will become a utility master planning issue. Decisions will need to be made on the location, costs, access and who is responsible for paying for the use of the electricity.

Update History

Original Issue Date: June 24, 2022
BKM No. 19021.02

Updated No.	Date	Revised By	Section Revised	Update Notes

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EXECUTIVE SUMMARY

Burdette, Koehler, Murphy & Associates, Inc. (BKM) was retained by Montgomery College (MC) to provide new Utilities Master Plans (UMP) for the Germantown, Rockville (RV), and Takoma Park/Silver Spring campuses. The following Utilities Master Plan report focuses on the Rockville Campus which is the largest of the three campuses and was originally constructed in 1965. The RV campus is located with Interstate I-270 to the west, I-370 to the north, the city of Rockville to the southeast, and is bounded by Maryland Route 355 (Hungerford Drive) to the east. It is surrounded by residential neighborhoods and Anderson Park. There are three entrances to the campus: one entrance from Hungerford Drive, and two entrances from Mannakee Street in the south.

The RV campus currently consists of 24 buildings (including 1 garage) which are shown on the campus map at the end of the Executive Summary. The campus has seen a series of renovation and new construction projects; most recently, the Science Center West (SW) was renovated in 2015, portions of MT were renovated in 2019, a new Student Services Center (SV) was constructed in 2020, and the original Student Services Building was demolished in 2021.

The goal of this project is to provide a new UMP which builds upon the 2012 Utilities Master Plan. This new UMP considers and evaluates changes to the campus indicated in the Facilities Master Plan 2013 – 2023 (FMP) developed by Cho Benn Holback & Associates. The focus of this UMP is to document existing mechanical, electrical, and plumbing services around the campus followed by an evaluation of requirements of near-term future upgrades to the chilled water, heating water, and power systems, and a review of long-term planned construction projects. The UMP also documents the existing site utilities and their proximity to future building footprints. Existing conditions for the study include the current campus conditions and assumes that all projects currently in construction will be completed by the time this report is finalized.

This UMP for the Rockville Campus has been divided into three timelines to provide appropriate planning and documentation for the existing, near-term (2022-2033), and long-term (2034-2096). The "near-term" phase extends to and includes the next new building project, which is anticipated to be the construction of a new Campus Center building in 2033 as identified in the FMP and the Major Project Completion Dates in Chronological Order (Capital Budget) table provided by Montgomery College on May 20, 2022. For the new Campus Center project, the existing Campus Center (CC) will be demolished allowing the new building to be constructed in the same location. A series of other small projects are anticipated to occur in the near-term phase as well. These include:

- Renovation of the existing HU Central chiller plant, renovation of the HU ice storage, and demolition of the decommissioned HU boiler plant – date TBD
- Replacement of aging underground chilled and heating water distribution systems – date TBD – phased project
- Extension of the heating water and chilled water piping from the Student Services/Technical Center utility vault into the Technical Center – date TBD
- Renovation of the existing (17,696 GSF) Counseling and Advising Building (CB) – date TBD
- Macklin Tower Renovation - 2026

Numerous other projects are indicated in the FMP and the Major Project Completion Dates in Chronological Order (Capital Budget) table that extend beyond the 2033 near-term date. These are considered "long-term" projects and include:

- Renovation of the existing (63,652 GSF) Macklin Tower (MT) – 2057

- Demolition of the existing (9,360 GSF) Interim Technical Training Center (TT) to make room for a new (84,000 GSF) Technical Training Center – 2063
- Demolition of the existing (17,696 GSF) Counseling and Advising Building (CB) to make room for a new (48,000 GSF) Media Arts Building – 2069
- Demolition of the existing (55,908 GSF) Technical Center (TC) to make room for a new (136,000 GSF) Humanities and Social Sciences Building – 2075
- Renovation of the existing (73,912 GSF) Humanities Building - 2084
- Renovation of the existing (28,000 GSF) Robert E. Parilla Performing Arts Center (PA) which will include construction of a (28,325 GSF) addition – 2087
- Renovation of the existing (20,900 GSF) Computer Science Building (CS) – 2090
- Renovation of the existing (84,949 GSF) Physical Education Building (PE) – 2093
- Renovation the existing (42,102 GSF) Mannakee Building (MK) – 2096

An overview of equipment documentation, significant findings, and recommendations will be detailed in individual sections of this report. Summaries of building square footages and utility requirements for buildings existing in 2022 and for the proposed future campus can be found in the respective utility appendices.

Domestic Water, Sanitary Sewer, Stormwater, and Natural Gas

The campus is served by a combined domestic/fire water system supplied by the City of Rockville. A potable water supply enters each building within a water service room or mechanical room where it splits to serve fire protection and domestic water systems. City of Rockville water meters are located at three different water meter vaults around the campus. Additional submeters are recommended for all building domestic water services as well as any cooling tower makeup, makeup water connections to chilled and heating water systems, playing field watering, water used by greenhouses, and pool system makeup connections. These submeters should be monitored and tracked by the campus energy management and control system (EMCS) to reduce utility sewer charges and help Montgomery College staff to identity/troubleshoot system problems.

According to the previous UMP, the city potable water supply is expected to be capable of meeting the existing and future domestic and fire water flow rate requirements, however, it did recommend upgrades to some sections of the water system distribution piping. Since that UMP was released several of those upgrades have taken place as part of new building projects. That UMP touched upon an issue with the pressure boundary on campus as the water supply pressure at the Mannakee Street water vaults is higher than the Hungerford Drive water vault. This results in little to no flow through the Hungerford Drive vault under normal conditions. This has also impacted flow to some buildings, resulting in the need for domestic water booster pumps and fire pumps. It is recommended that periodic system flushing be performed as part of regular maintenance procedures to maintain the domestic/fire water distribution system integrity. Flow tests should be performed to determine if the system provides adequate flow and pressure to serve existing buildings. Moving forward, it is anticipated that Montgomery College will install sprinklers in all new buildings and existing buildings as they are renovated. To accommodate new building domestic water and sprinkler systems, supply pressure issues will have to be evaluated on a project-by-project basis to determine the need for domestic water booster systems and fire pumps. Distribution mains have experienced leaks in the past and so steps to investigate, repair, and replace leaking segments should be considered for all future major construction projects.

Sanitary sewer branch pipes from each building tie into the campus sanitary sewer mains which discharge to the City of Rockville system on the west side of campus. The previous UMP indicated that segments of the campus sanitary sewer system were inadequate to meet future peak flow rates based on calculations. Additionally, the City outfall lines were determined to be inadequate for present and future flows. Recommendations listed in the previous UMP included upsizing campus collector pipes and for Montgomery College to initiate discussions with the City of Rockville so that they can begin to upgrade their system capacity. Some of those on-campus upgrades have occurred, however, the City outfall remains an issue. It is recommended to add City outfall metering to obtain flow data and approach the City if outfall flow issues persist. Additional on-campus upgrades should be evaluated as part of future construction projects. Some segments of the existing sanitary sewer system, specifically below Parking Lot 11, have experienced past pipe breakage issues. These segments should be investigated for potential replacement and upgrade.

The existing storm water system includes outfalls to an existing storm water pond in the southwest corner of the campus, plus additional outfalls to other tributaries. The 2006 UMP modeled the storm water system and determined that the existing storm water collector pipes have adequate capacity for the current campus configuration, but that they should be evaluated with each future project. The storm water pond was determined to be adequately sized for quantity and quality of storm water runoff of current and future loads. As the climate continues to change and local weather become more intense, system resiliency will be a vital consideration for all future projects. Some recent improvements to the stormwater system have included increasing the size and capacity of the pond and construction of new dam outfalls on West Campus Drive. Green roofs and additional bio-retention areas are other improvements that should be considered as part of all significant future projects.

The campus is served by a 6-inch high-pressure natural gas service which provides natural gas to the boiler plants, water heaters, cooking appliances, generators, and laboratories around campus. The gas service to campus is owned by Washington Gas (WGL) except for a small section from HU to CC and CS. The service is a firm (uninterruptable) gas service. The 2012 UMP indicated that the gas service is anticipated to be adequate to accommodate the projects listed in the Facilities Master Plan 2013-2023. Meters are recommended to be installed on all major uses of natural gas including meters on all gas services and sub-meters on all large gas consuming systems within buildings. Natural gas distribution system upgrades should be considered with all future projects as part of the site work involved in those projects. Modifications to the domestic hot water generation and pool heating systems will impact the gas requirements at each building if those modifications are determined to be economically beneficial. PE and the Maintenance Shed should be considered for a conversion from propane to natural gas in the future.

It is recommended that the existing campus metering be expanded to include all major uses of water, sanitary sewer, and natural gas. These meters should be integrated with the EMCS and be implemented in a manner that complies with MC's new Building Energy Performance Standards. This expanded metering will help facilities staff identify and diagnose maintenance issues as they arise on these systems. It will also help MC comply with Montgomery County's new benchmarking law.

The plumbing systems will be further described in a later section of this report along with corresponding site plans which can be found in Appendix 2.

Mechanical Systems

The Rockville campus is served by central and satellite chilled water and heating water plants and their associated distribution piping systems. Most of the buildings on campus are connected to those systems with the exception of a few standalone buildings. The chilled water system includes five chiller plants, of which, there are two central plants located at the HU and SC, and three satellite plants located at CC, PA, and SV. The HU plant is connected to both the East and West Loop distribution systems and serves most of the buildings on campus. Chiller equipment in the HU plant has the capability to provide chilled water to the campus and build ice for demand shaving purposes. The SC plant primarily serves three West Loop buildings (SC, SW, and CS). The satellite chilled water plants provide cooling to their respective buildings during the day and are also connected to the campus distribution loop to provide chilled water during evening hours allowing the HU plant to build ice when campus loads are at their minimums. The PA satellite plant is currently not operational but is anticipated to return to service in the near future.

When analyzing the five plants combined, the chilled water production capacity is slightly less than the total connected load (assuming PA is offline). However, due to a variety of building physical and usage considerations, the campus peak cooling load can be calculated by applying a 75% diversity factor to the connected load. Using this diversity factor, the total cooling capacity of the chilled water plants exceeds the anticipated peak load on the system. On the other hand, the current chilled water system does not have enough spare capacity (firm capacity) to allow for maintenance or equipment replacement during the peak cooling season. For example, if the largest chiller located at the HU plant needs to be taken offline during the peak cooling season, it is likely that the chilled water system will not be able to keep up with the demand for cooling. This is a critical issue as the chilled water equipment including chillers, heat exchangers, and ice storage modules at HU are nearing the end of their service lives and will need to be replaced or to undergo significant maintenance outages in the near future. It is recommended that any repair or replacement work be performed during heating season to ensure no loss of capacity at a time of peak cooling.

There are several system operating deficiencies that are preventing the system from achieving optimal chilled water temperatures and ice utilization. It is recommended that current system deficiencies be addressed by replacing failing chilled and condenser water distribution piping, replacing failing seasonal changeover valves, and by conducting retro-commissioning and rebalancing in each building. In the near future, it is anticipated that the decommissioned HU boiler plant will be demolished which will clear up additional space in the HU mechanical room. The additional mechanical room floor space can be utilized to add another chiller to the HU plant to increase chilled water and ice production capabilities. This will have the benefit of increasing the chilled water firm capacity and will thus create a level of system redundancy allowing for equipment outages to occur during peak cooling days. Moving forward, it is anticipated that all existing buildings connected to the chilled water loops will remain connected. It is also anticipated that all new buildings, except those associated with the Soccer Field Complex Project, will be added to the central chilled water system. To accommodate this expansion, it is recommended that the existing HU chiller plant be upgraded with more ice storage and longer daily ice-build periods. The existing HU cooling towers were replaced in 2020 with higher capacity towers which will accommodate more chilled water and ice production in the future.

In 2033, a planned project will demolish the existing Campus Center and build a new, larger Campus Center Building. This will remove the existing CC satellite chilled water plant, but it is recommended that a new plant be installed as part of that project. In the long-term future it is recommended that the PA chiller plant be expanded to create a South Loop during the 2087 renovation/addition project in that building.

For most of the history of the Rockville campus, heating water had been generated at the HU boiler plant, but that plant was recently decommissioned following the construction of the SV plant. The HU plant is set to be demolished as part of a near-term future project. Heating water is now produced at two plants located at SC and SV. The SV central plant came online in 2019, and it provides heating water to most of the buildings on campus through an East and West Loop distribution system. The SC satellite plant serves SC, SW, and CS. Equipment in the SC plant still has many years of remaining service life, however, there have been reports of boiler firing issues. These issues should be investigated, and boilers may need to be repaired or replaced.

The existing campus total boiler plant capacity is greater than the connected load. Additionally, the campus firm capacity is greater than the existing connected load and the near-term future connected load which indicates that the existing plants are likely adequate to serve the campus through 2033.

Moving forward, it is anticipated that all existing buildings connected to the heating water loops will remain connected. It is also anticipated that all new buildings, except those associated with the Soccer Field Complex, will be added to the central heating water system. Although the campus heating water load will increase over time, upgrades to the system capacity will not be necessary. In the long-term, it is recommended that a boiler plant be added to PA to create a south campus loop during that building's scheduled 2087 renovation and addition project. At any time in the future, the SV plant can be expanded to add two additional boilers and pumps if increased system capacity is required. Additionally, it is recommended that campus domestic hot water and pool heating systems be evaluated for possible removal from the central heating water system if determined to be economically feasible in terms of overall life cycle cost. If these systems are removed, the heating water supply and return temperature setpoints could be lowered during off peak seasons. Reduced heating water return temperatures may result in an increase in overall efficiency due to reduced distribution system losses and more ideal operating conditions for the heating water system central condensing boilers. To accommodate this, local boilers/water heaters will be needed in each building with domestic hot water and pool heating loads.

Much of the existing heating water distribution system is constructed of aging carbon steel pipe that has been found to have issues with leaks. The chilled water distribution system includes both fiber resin pipe (FRP) and carbon steel. The carbon steel chilled water mains also experience issues with leaks. There is an ongoing multiphase project to replace the most problematic segments of these distribution systems. It is recommended that this project continue in an effort to reduce wasted energy, reduce required makeup water, reduce system fowling, and improve overall system resiliency. Aging carbon steel piping be replaced with new pre-insulated piping systems such as Perma-Pipe or equivalent.

It is recommended that the existing campus metering be expanded to include major uses of chilled and heating water. These meters should be integrated with the EMCS. This expanded metering will help facilities staff identify and diagnose maintenance issues as they arise on these systems. It will also help MC comply with Montgomery County's new benchmarking law. Additionally, there is an ongoing project to replace the campus pneumatic control system with direct digital controls (DDC). It is recommended that all new control components be DDC and that the pneumatic phase out project continue. This should be completed in a manner that allows communication between buildings to facilitate demand management and central plant optimization capabilities.

Electrical Systems

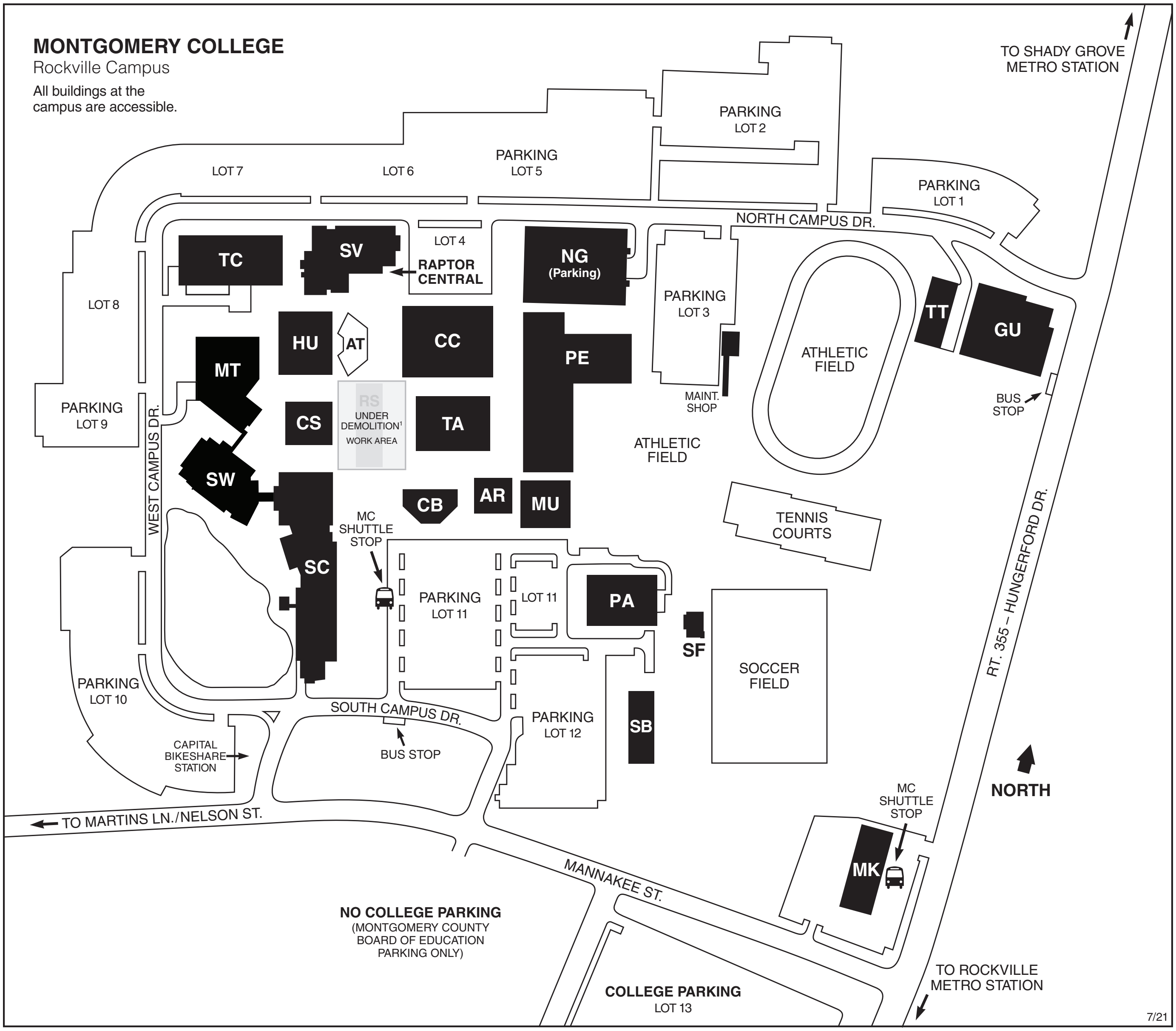
The campus is served by the Potomac Electric Power Company (PEPCO) from a combination of overhead and underground distribution lines owned by the utility. Each building is served through separate feeders and utility meters with the exception of the MU building which is served from the AR building. The PEPCO 13.2kV feeders are routed on poles along the streets of the campus and within an underground duct bank system. Buildings are served by pad-mounted and vault type transformers fed by the 13.2kV underground distribution system. The estimated total campus peak demand load is 6,387 kVA.

Removal of the existing campus buildings and new construction projects shall be coordinated with PEPCO. Projected load estimates for the new buildings shall be provided to PEPCO in order to determine if the existing PEPCO owned electrical distribution infrastructure has sufficient capacity for the new loads. PEPCO will need to design and approve of campus electrical distribution system modifications. The College would then be responsible for reimbursing construction costs to PEPCO.

Please note that PEPCO has not provided detailed information to date regarding the construction of future buildings as it relates to the impact to existing PEPCO primary feeders and associated infrastructure. Load information on campus load growth has been provided to PEPCO and through the efforts of key College personnel, requests for information from PEPCO are ongoing.

The electrical systems will be further described in a later section of this study along with site plans and one-line diagrams located in Appendix 4 of this study.

MONTGOMERY COLLEGE
Rockville Campus



MONTGOMERY COLLEGE

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Legend of Campus Buildings
(as of July 2021)

- **AR** Paul Peck Art Building
- **AT** Amphitheatre
- **CB** Counseling and Advising Building
- **CC** Campus Center
  - *Bookstore*
  - *Cafeteria*
  - *Workforce Development and Continuing Education (WDCE)*
- **CS** Computer Science Building
- **GU** Homer S. Gudelsky Institute for Technical Education
- **HU** Humanities Building
- **MK** Mannakee Building
  - *Center for Training Excellence*
- **MT** Gordon and Marilyn Macklin Tower
  - *Library*
- **MU** Music Building
- **NG** North Garage (parking)
- **PA** Robert E. Parilla Performing Arts Center
- **PE** Physical Education Center
- **SB** South Campus Instruction Building
- **SC** Science Center
- **SF** Soccer Field Concession Building
- **SV** Long Nguyen and Kimmy Duong Student Services Center
  - *Counseling and Advising*
  - *Disability Support Services*
  - *Financial Aid Office*
  - *Public Safety Office*
  - *Raptor Central (Admissions, Enrollment, Visitor Services)*
  - *Records and Registration Office*
  - *Student Life Office*
- **SW** Science Center West
- **TA** Theatre Arts Building
- **TC** Technical Center
- **TT** Interim Technical Training Center

[1] Former Student Services Building (RS) under demolition

DOMESTIC/FIRE WATER SYSTEM

Scope

The 2022 UMP provides an documentation of the existing and future water system capacities based on the Facilities Master Plan 2013 – 2023. The campus receives combined domestic and fire suppression water service from the City of Rockville. Drawing P1.01 in Appendix 2 shows a site plan of the existing domestic/fire water distribution piping while P1.02 and P1.03 show the domestic/fire water site plans in the near-term and long-term future phases respectively.

Existing Conditions

Municipal water is supplied to the campus combined domestic/fire water system via three metered service connections from the City of Rockville. A 12-inch water service enters campus from Hungerford Drive at the southeast corner of the Homer S. Gudelsky Institute (GU) building. An 8-inch water service enters from Mannakee Street at the southwest corner of Parking Lot 12. And lastly, a 12-inch water service enters from Mannakee Street directly south of the pond. Each of these services tie together on campus to form a distribution loop. A separate connection and meter provides a standalone water service to the Mannakee Building (MK).

There are known pressure boundary issues with the domestic/fire water system on campus. For example, the water pressure provided by the Mannakee Street water services are higher than the Hungerford Drive water service. It has been noted that during previous flow tests, some hydrants were not flowing properly. Flow to certain buildings has been determined to be inadequate to serve domestic water and fire suppression system needs, therefore, some projects have included domestic water booster pumps and fire pumps.

Leaks have been identified and repaired in a few segments of the domestic/fire water distribution system. Those repair activities took place along South Campus Drive at the south end of Parking Lot 11 and on the north end of Parking Lot 11. Pipe segments removed were noted as being "corroded". There are additional, unverified, anecdotal accounts of other leaks on campus that should be monitored and considered for repair.

Previous Master Plan

Previous master plans had determined that although the municipal water supplies can provide the required existing and future domestic water volumes, a marginal water pressure (38-46 PSI) is being provided to the campus. This is likely due to limited elevation difference between the Rockville campus and the city storage tanks. Additionally, a significant pressure drop was attributed to a MC owned backflow preventer located at the meter on Hungerford Drive. The system as it was configured at the time of the 2012 UMP was inadequate to provide fire water flow/pressure to all buildings served on campus. Because the system is a combined domestic/fire water system, the 2012 Utilities Master Plan recommended replacing the existing backflow preventer with low pressure drop check valves or to bypass the backflow preventer during fire protection activities. Additionally, it was recommended that the campus domestic water loop be upsized and reconfigured to reduce pressure drop and increase reliability of the system.

Future System Requirements

Buildings will continue to be added and renovated on campus which will in turn increase the demand on the combined domestic/fire water system. Many of the long-term future buildings will be built on the footprint of existing buildings and therefore will require only minimal re-routing of domestic/fire water distribution mains. Projects that may require minor re-routing of existing domestic/fire water pipes include the 2063 construction of the Technical Training Center, the 2084 construction of the Humanities & Social Sciences Building, and the 2087 addition to PA.

Since the last UMP was issued, it was discovered that if the Hungerford Drive backflow preventer was removed, that the water meter would spin backwards indicating pressure boundary issues would force water flow back into the municipal water supply. MC believes, but has not validated that the Hungerford Drive water service can adequately serve the connected buildings when isolated from the Mannakee Street water services. This will need to be validated via water flow tests which should be repeated during each new construction project. Additionally, since the last UMP, segments of the water system distribution piping have been upgraded as part of new building projects. These have included a 12-inch main extension from the Mannakee Street west vault, a segment of 8-inch main was upgraded to 12 inches from the Hungerford Drive vault to just past the North Garage, and a 12-inch main was extended to connect the existing 12-inch main at the northeast corner of TC to form the new north portion of the network.

Most future new construction and major renovation projects will require sprinkler systems. Given the limited system distribution pressure and pressure boundary issues, both fire pumps and domestic water booster pumps will need to be considered for upcoming major construction projects. These requirements should be validated via flow tests conducted as part of each project.

Summary and Recommendations

Multiple segments of the existing campus domestic water distribution system have been replaced with new 12-inch mains since the 2012 Utilities Master Plan. This includes the most critical segments from the Hungerford and East Mannakee meters. The backflow preventer at Hungerford Drive was not replaced or bypassed due to pressure boundary issues. Backflow prevention is a critical component of maintaining a clean supply of domestic water and for protecting the municipal water system. Replacement/removal of the backflow preventor should be undertaken in coordination with local code officials and only if absolutely required to achieve the flow and pressure demands of the fire suppression systems on campus. A more in-depth system analysis is required to determine if replacement of the backflow preventor is required.

It is recommended that periodic system flushing and water flow tests be performed to both maintain the integrity of the system and to determine if adequate flow and pressure is available to serve the domestic and fire suppression needs of the existing buildings on campus. These tests should be performed both with and without isolating the Hungerford Drive water service from the Mannakee Street water services. These tests and flushing procedures should be considered standard maintenance activities with flow test data being entered into Montgomery College's Computerized Maintenance Management System (CMMS).

Steps should be taken to investigate and repair leaks in the domestic/fire system distribution mains. It is recommended that major construction projects on campus should include replacement of segments of the domestic/fire water distribution system adjacent to the building under construction.

All existing backflow prevention devices must be serviced annually in accordance with local plumbing code. It is understood that the Hungerford Drive water vault has water entrainment issues. All vaults with water entrainment issues should be retrofitted with sump pumps to remove water and facilitate maintenance of the backflow preventor.

In the future, domestic/fire water distribution mains are anticipated to need to be rerouted around or through the Technical Training Center, Humanities & Social Sciences Building, and the Parilla Performing Arts Center (PA) addition.

It is unlikely that the City of Rockville delivery pressure will increase, so all remaining on-campus domestic water main upgrades mentioned in the 2012 UMP should be incorporated. A domestic water booster pump and fire pump should be investigated as part of the design process for all future renovations and new construction projects.

Submeters are recommended to be added to the main domestic water services to each building, playing field watering sources (yard hydrants), greenhouse water services, and all makeup water connections to cooling towers, chilled water systems, heating water systems, and pools. Connecting these meters and submeters to the campus EMCS will provide valuable information to facilities and engineering staff to troubleshoot issues which could reduce domestic water and sewer usage costs. Additionally, this will be useful energy benchmarking information that can be used for compliance with Montgomery County's new Building Energy Performance Standards.

SANITARY SEWER SYSTEM

Scope

The 2022 UMP provides documentation of the existing and future sanitary sewer system at the Rockville campus based on the Facilities Master Plan 2013 – 2023. Montgomery College owns and maintains its campus sanitary collection system which discharges to the City of Rockville's sewer system. Drawing P1.11 in Appendix 2 shows a site plan of the existing sanitary system piping while P1.12 and P1.13 show the sanitary system site plans in the near-term and long-term future phases respectively.

Existing Conditions

Sanitary sewer lines convey flows from the campus to the City of Rockville's sewer system. An 8-inch line collects sanitary flows from GU and TT and runs north-south to Mannakee Street where it connects into the City of Rockville collector system. It is assumed that this line also collects sanitary from MK. That line ultimately comes back on campus at Parking Lot 10 so that all flow enters the same City outfall on the west side of campus. Sanitary from the rest of the campus flows into 8-inch collector mains. Routed below Parking Lot 11 are 8-inch sanitary sewer lines serving PA and SB. Breaks in those mains have been reported in the past.

Previous Master Plan

The 2006 UMP indicated that several sections of the on-campus sanitary sewer system were inadequate to meet future flows and that the City outfall was inadequate to meet present and future flows based on calculations performed as part of a previous UMP. Upgrades to existing trunk lines between manholes 2 and 25 were recommended be upgraded to 12-inch mains, and it was proposed that the 8-inch sanitary line under Parking Lot 11 be replaced with a 12-inch line to serve future expansion on the south side of campus. Additionally, it was recommended that the city be notified of the surcharging issues so that they can make downstream modifications. Since the 2006 UMP, sanitary sewer infrastructure improvements were made as part of the SC/SE/SW projects. Additional upgrades were made as part of the new SV construction project.

Future System Requirements

There are several projects included in the FMP over the next few years, but it will not be until the 2033 Campus Center project that the load on the sanitary system will be significantly impacted. Starting in 2033, there are a series of new construction projects that will increase the load on the sanitary system. In support of these projects, the MC and Rockville sanitary sewer systems will need to be upgraded and expanded. Many of the long-term future buildings will be built on the footprint of existing buildings and therefore will require only minimal re-routing of sanitary lines. Projects that may require minor re-routing of existing sanitary lines include the 2063 construction of the Technical Training Center and the 2087 addition to PA.

Summary and Recommendations

Based on calculations performed as part of the 2006 UMP, the load on the existing campus sanitary sewer system is anticipated to be beyond the capacity of the existing campus and city sanitary mains. On-campus sanitary sewer line sizes will need to be increased to accommodate current and future loads. However, increasing the on-campus sanitary line sizes will provide limited benefit if the City of Rockville's system cannot accommodate the added load. It is recommended metering be installed in the City outfall to collect flow rate data that can be used to coordinate with the City of Rockville. This process should take place soon so as to begin the planning process prior to the 2033 Campus Center project. Additionally, as part of future projects that disturb site conditions, sanitary sewer mains should be evaluated for replacement and upgrades. Pipe segments that have a history of leaks, such as those below Parking Lot 11, should be investigated for potential replacement. The location of the existing sanitary sewer mains may need to be relocated for future projects including the Technical Training Center new construction and the Parilla Performing Arts Center (PA) addition.

STORM DRAINAGE SYSTEM

Scope

The 2022 UMP provides documentation of the existing and future storm water system at the Rockville campus based on the Facilities Master Plan 2013 – 2023. Drawing P1.21 in Appendix 2 shows a site plan of the existing storm water system piping while P1.22 and P1.23 show the storm water system site plans in the near-term and long-term future phases respectively.

Existing Conditions

The campus sits on an 85-acre site that is approximately 50% impervious. The rest of the campus contains grass or wooded landscapes. Stormwater on campus is either collected at storm drains or runs off to various tributaries on campus. Storm drains are piped to the on-campus tributaries or to the pond located in the southwest corner of the campus. The pond's size and capacity were expanded as part of the SC construction project. That project also included construction of a new dam outfall on West Campus Drive. Additionally, most buildings have either bio-retention areas or green roofs for stormwater management.

Recently there have been a few intense rain events that have caused surcharging of existing/partially blocked stormwater drainage pipes. This has resulted in flooding of CA, CC, the new SV, and the HU mechanical room.

Previous Master Plan

The previous UMP indicated that in addition to the campus drainage, some off-site areas near Mannakee Street drain to the pond as well. The total area served by the pond was estimated to be approximately 128 acres. Despite this added off-site area served by the campus bio-retention pond, the previous UMP had indicated that the pond is adequate in terms of water quality and volume. Upgrades to the pond were not recommended as the campus impervious areas were not expected to increase and future landscaping areas were anticipated to reduce runoff. It was previously indicated that any future construction project that does not tie-into the pond system will require stormwater local treatment measures. Stormwater modeling completed for the 2006 UMP indicated that some segments of the system could experience supercharging, but also indicated that there is no immediate need to upgrade the system.

Future System Requirements

While the facilities on campus will continue to expand over the coming decades, most of the construction will take place on currently impervious surfaces. New buildings are planned to be built on the locations of existing buildings while on-campus parking will increase via replacing parking lots with parking garages. Therefore, it is anticipated that the campus impervious area will remain the same or even decrease in the future. However, climate change is a consideration that has the potential to greatly impact the stormwater drainage system on campus.

Many of the long-term future buildings will be built on the footprint of existing buildings and therefore will require only minimal re-routing of storm water lines. Projects that may require minor re-routing of existing storm water lines include the 2063 construction of the Technical Training Center and the 2087 addition to PA.

Summary and Recommendations

The existing campus stormwater management incorporates on-campus tributaries and a stormwater management pond. It is anticipated that the pond is adequately sized to handle the current and projected future stormwater load in terms of quantity and quality, based on analysis conducted as part of the previous UMP. Although the previous UMP indicated that the stormwater system is adequate to serve the campus stormwater runoff, climate change continues to impact local weather and, therefore, system sizing and capacity should be evaluated with each new construction project. If climate change continues in this fashion, stormwater drainage system resiliency will be vital to protecting to the campus buildings, infrastructure, and people. Future projects should consider green roofs and additional bio-retention areas to increase campus stormwater drainage system capacity and resiliency. Storm water drainage pipe infrastructure should be evaluated with each new construction project to ensure the sizing remains adequate for changing campus layout and local weather patterns. Existing storm water drainage pipes may need to be re-routed over the long-term as new building and addition projects take place. Re-routing of stormwater drainage pipes should consider any new bio-retention areas added as part of future projects.

NATURAL GAS SYSTEM (NG)

Scope

The 2022 UMP provides documentation of the existing and future natural gas system at the Rockville campus based on the Facilities Master Plan 2013 – 2023. Drawing P1.31 in Appendix 2 shows a site plan of the existing natural gas distribution piping while P1.32 and P1.33 show the natural gas site plans in the near-term and long-term future phases respectively.

Existing Conditions

Natural gas is provided to the campus by WGL with a 6-inch high-pressure main running along Mannakee Street. A 6-inch branch line is tapped off the utility main and enters the campus to the east of Parking Lot 10. The 6-inch high-pressure line splits west and east on South Campus Drive. The 6-inch line on West Campus Drive heads north to the north side of MT where it then runs east between MT and the ice modules. This line extends to the west side of SV between SV and TC. In HU, the natural gas system had previously served boilers and a Telogen chiller, but both systems are now decommissioned. The line running east on South Campus Drive turns north parallel with the east side of SC to feed the boiler plant and labs in SC. It also runs east to feed AR/MU and runs east through the athletic fields toward GU. The natural gas piping from AR/MU to GU is cross linked polypropylene. There is a meter at AR/MU for the branch pipe that feeds kilns and another meter at GU that serves the Technical Trades Labs. The natural gas system including the distribution piping and meters are owned by WGL. MC owns a small section of the natural gas distribution system on campus. This MC owned line leaves the west side of HU and runs south and then back east where it connects to CS and CC. The existing gas service to campus is a firm (uninterruptable) gas service which serves boiler plants, water heaters, cooking appliances, generators, and laboratories around campus. Most of the piping on campus is buried HDPE with only one segment of carbon steel ping between AR and MU remaining.

Previous Master Plan

The 2012 UMP indicated that the existing high pressure 6-inch gas service would be adequate for the projects planned in the Facilities Master Plan 2013 – 2023. Additionally, that report indicated that the existing campus house line system can generally remain in place.

Future System Requirements

Based on the 2012 UMP, it is anticipated that the current high pressure 6-inch gas service will be adequate to serve the projects indicated in the current FMP. The HU central boiler plant was decommissioned in 2020 when the SV plant came online which shifted that load to other plants. Many of the long-term future buildings will be built on the footprint of existing buildings and therefore will require only minimal re-routing of natural gas lines. Based on the 2013 – 2023 Facilities Master Plan building footprints, the only long-term project that appears as if it may require minor re-routing of existing natural gas lines would be the 2063 construction of the Technical Training Center. Building renovations and new construction should consider including gas system infrastructure improvements as part of the site work. A south campus heating water distribution loop may be considered as part of the 2087 PA renovation/addition project. If the South Loop is pursued, modifications to the natural gas distribution system on campus may be required. To accommodate this, boilers will be added to PA which will require a new natural gas service to that building. Refer to the Heating Water section for more information.

Propane is currently used in PE and the Maintenance shed for space and water heating. A conversion to natural gas should be considered in the future.

Summary and Recommendations

Although, the existing natural gas service is anticipated to be adequate for all projects included in the current FMP, it is recommended that each project be coordinated with WGL during the design phase. As mentioned in the Heating Water Section of this report, it is recommended that a boiler plant be added to the Parilla Performing Arts Center (PA) during the 2087 addition project. At that time, gas service will need to be extended to that building.

Since much of the on-campus natural gas distribution system is owned by WGL, it is recommended that as system modifications are made to accommodate future projects, WGL be contacted to replace the remaining carbon steel gas line.

A future life cycle analysis should be performed to determine if local generation of hot water for domestic hot water use is more economical than generating domestic hot water via a heat exchanger and connection to the central heating water system. This analysis may impact the natural gas requirements for each building with domestic hot water and pool heating needs. Refer to the Heating Water section of this report for more information. Additionally, PE and the Maintenance Shed should be considered for a conversion from propane to natural gas.

Based on the proposed layout of future buildings, the 2" branch line serving GU will need to be re-routed to accommodate the 2075 Technical Training Center new construction project. Natural gas meters are recommended on all building gas services as well as sub-meters on all major gas consuming systems within buildings. Connecting these meters and submeters to the campus EMCS will provide valuable information to facilities and engineering staff to troubleshoot issues which could reduce domestic water and sewer usage costs. Additionally, this will be useful energy benchmarking information that can be used for compliance with Montgomery County's new Building Energy Performance Standards.

MECHANICAL SYSTEMS – CHILLED WATER

Scope

The 2022 UMP provides documentation, analysis, and recommendations of the existing and future chilled water systems at the Rockville campus based on the Facilities Master Plan 2013 – 2023. This study documents the existing equipment and capacities of the installed mechanical equipment in the central plants as well as the demand load for cooling of each building. The study also provides recommendations to improve performance of the existing systems and distribution piping along with modifications that are required as buildings are constructed or renovated. Drawing M1.01 in Appendix 3 shows a site plan of the existing chilled water system while M1.02 and M1.03 show the near-term and long-term chilled water site plans respectively. Campus chilled water schematics are provided on drawings M1.11 through M1.13 to show the general configuration of the heating water system. Equipment plans are also included in Appendix 3 to show the general equipment layout within each chiller plant.

Existing Conditions

Chilled water is produced at two central plants located in the Humanities Building (HU) and Science Center (SC), and three satellite plants located at Campus Center (CC), Parilla Performing Arts Center (PA), and Student Services Center (SV). The existing central plant in HU is at the center of the two chilled water distribution loops. The East Loop originating with 12-inch mains serves CC, TA, PE, CB, AR, MU, PA, SB, and GU. The West Loop originating with 10-inch mains serves MT, CS, SC, and SW. The Humanities Building plant also directly serves the HU and TC buildings. The Mannakee Building (MK) is a standalone building served by direct expansion equipment and does not currently tie into the chilled water distribution system.

The existing central plant in HU is the largest and oldest plant on campus. That plant includes one 450-ton Frick screw-compressor ammonia (R-717) chiller, one 390-ton Frick screw-compressor ammonia (R-717) chiller, one decommissioned 150-ton Tecogen engine-driven natural gas chiller (HFC-134a refrigerant), two 600-ton BAC cooling towers, four 1,095 ton-hour BAC ice storage modules, and two glycol-to-chilled water plate-and-frame heat exchangers. The cooling towers were installed in 2020 whereas the chillers and ice modules were installed between 1992-1997. Although well maintained, given their age and run hours, the chillers and ice modules are nearing the end of their service lives and are expected to require more frequent repairs or overall replacement in the near future. For example, during a recent plant inspection, it was noted that the insulated cover on the Chiller No. 3 evaporator was missing which results in heat gain, thus reducing chiller efficiency and causing condensation issues. Additionally, the plant includes air-capture horizontal chilled water expansion tanks which are not believed to be currently capable of maintaining system pressure.

Ice modules are used to supplement the chiller capacity during periods of peak cooling loads. This system provides two main benefits which include reduced chiller equipment sizes and shifted electricity usage to off-peak periods. The plant uses a 70/30 water/propylene glycol solution to build ice during off-peak periods. Based on the 2007 Central Plant As-Built Documentation, the two existing Frick chillers have capacities of 240 tons and 210 tons in "ice-making" mode, respectively. The resulting total cooling capacity that the HU plant can be provide to the chilled water loop while simultaneously operating chillers in "normal cooling" mode and melting ice over an 8-hour period is 1,390 tons. If either of the active HU chillers is taken out of service for an extended period of time, the overall cooling capacity of the chiller plant will drop significantly due to the reduced chiller capacity as well as a reduction in nighttime ice production. The worst-case scenario is a prolonged outage to the 450-ton chiller. This would result in a total cooling capacity for the HU plant to decrease from 1,390 tons to approximately 640 tons. Refer to Drawing M2.01 for a schematic of the existing campus chilled water system.

Two 600-ton BAC single-cell cooling towers located on grade adjacent to HU replaced the original cooling towers in 2020. The new BAC towers were selected to have greater heat rejection capacity as compared to the original towers to allow for expanded chiller plant capacity in the near future. The towers are connected to a single condenser water header that is connected to all three chillers. At peak, the towers can provide 1,200 tons of total heat rejection. There is no additional space to add a third tower.

Glycol pumps circulate water through the chiller evaporators, ice modules, and plate and frame heat exchangers. Heat exchanger #1 was installed in 1992 and appears to be in fair condition. Heat exchanger #2 was installed in the 2000's and appears to be in good condition. Although VFDs are present, the glycol pumps operate at constant speed. The primary chilled water pumps circulate water through the plate and frame heat exchangers and campus distribution loops. The primary chilled water pumps include variable frequency drives (VFDs) to provide variable flow in response to demand based on differential pressure signals from the distribution loops. The primary pumps appear to be original to the building and are therefore, they are beyond their typical service lives. Secondary pumps located in each building distribute chilled water from the campus loop to air handling equipment for space conditioning purposes.

The existing condenser water and glycol piping is FRP. Piping connecting the ice modules to the chiller plant has been reported to be in good condition and of adequate size to support the addition of two ice modules. During the cooling tower replacement project in 2020, a pressure test revealed a minor leak in the existing condenser water piping, however, the leak was not determined to be significant and was not repaired at that time.

A SC chiller plant supplies chilled water to the CS, SC, SW, and the West Loop. The chiller plant is located in a first-floor mechanical room and includes three 305-ton McQuay magnetic bearing chillers. The chillers are sequenced in lead/lag/lag configuration. In this configuration, the total plant operating capacity is 915 tons. There is a three-cell cooling tower located on the roof of SC that rejects heats from the chillers. A valve vault located between MT and CS on the West Loop includes manual valves to provide a separation between buildings served by the SC chiller plant during peak cooling loads. The SC chillers were installed in 2011 and are in good condition. SC utilizes chilled water pumps with VFDs to vary flow in response to demand. These pumps were installed in 2011 and appear to be in good condition. The plant was originally sized to serve SC, SE, SW, and to provide some cooling to the West Loop. However, the cooling load in SC may have increased as there have been reports that the building which was originally designed to operate just one air handling unit at a time, now needs both air handling units to satisfy the cooling load. This has impacted the cooling loads on the West Loop and should be monitored to ensure no cooling shortages are experienced.

Satellite chillers are located at CC, PA, and SV are intended to operate to provide cooling to their respective buildings during the day and provide cooling to the loop at night during ice build mode. Campus Center has a 240-ton Carrier water-cooled chiller with a corresponding 300-ton BAC cooling tower located on the roof. The chiller at PA is a 110-ton air cooled Carrier chiller located on the north side of the building. That chiller is currently out of service but is anticipated to be repaired and operational in 2023. The PA chiller is used for building loads at night or during the winter if there are events in the building's auditorium. The satellite chillers in CC and PA were installed in the 2000s and appear to be in good condition.

The SV plant ties into the distribution loops via the HU mechanical room. The SV plant which came online in 2019, includes two 250-ton Carrier water-cooled screw R-134A VFD chillers and a two-cell BAC cooling tower. This plant ties into the chilled water distribution system via a connection to HU. A set of 12-inch Perma-Pipe chilled water supply and return mains installed as part of the SV project leave the HU building to the east, pass through the SV basement plant, and exit to the east where they connect to the existing FRP distribution loop near the CC building. The SV chilled water plant is tied into the distribution loop in a side-arm fashion and operates to supplement the HU chiller plant capacity as needed. A set of direct buried, 6-inch chilled water mains leave the SV plant and head west where they terminate in a pipe vault at the east entrance to TC. In the future, these pipes will be extended from the vault to serve the Technical Training Center, but in the meantime, TC will continue to be served by the HU plant. SV utilizes chilled water pumps with VFDs to vary flow in response to demand.

The chilled water distribution system appears to have been designed for a temperature difference of 16°F Delta-T which results in 1.5 gpm/ton. However, based on discussions with facilities staff, it is known that the temperature difference varies throughout the day depending on the campus cooling load, rate of ice melt, and operation of boilers. Based on elevated chilled water return temperatures, it is thought that changeover valves in buildings with 2-pipe heating and cooling systems are experiencing significant change over valve leakage resulting in heating water that enters the chilled water loop. The buildings affected by this issue include CC, HU, TC, AR, MU, CB, and MT. This is not a problem for buildings with 4-pipe heating and cooling systems and so, a few of the buildings are being renovated to convert 2-pipe systems to 4-pipe systems.

Operation of the campus chilled water system changes throughout the day. At night, the central HU plant chillers operate in ice-making mode for approximately 9.5 hours while the other central and satellite chillers operate to cool the campus buildings. During the day the HU plant switches to operate the chillers and ice storage system heat exchangers in series to cool returning chilled water. The initial design was for the chilled water system to operate with 40°F chilled water supply to and 56°F chilled water return from campus buildings. However, the system typically operates with only a 6-8°F temperature difference between supply and return. This results in quicker ice melt than originally designed as the primary chilled water flow rate remains constant. Refer to Table 3-7 for a summary of existing chilled water plant equipment.

A recent project installed chilled water BTU meters on campus. This will be beneficial in support of energy benchmarking efforts and maintenance activities moving forward. However, due to reduced campus occupancy as a result of the COVID-19 pandemic, for this study, chilled water connected loads for the campus buildings were estimated using a cooling load factor and building gross square footage numbers. The cooling load factor for each building is a value based upon industry standards and existing buildings of similar function. There are currently 16 buildings connected to the campus chilled water distribution system with an estimated total connected load of 3,085 tons (the connected loads of each building are summarized in Table 3-1). Based on building usage schedules, building orientation, thermal massing, and several other factors, it is unlikely all campus buildings will be operated simultaneously at full cooling. Therefore, system diversity can be applied to the connected load to determine an overall system peak cooling load. Utilizing 75% diversity, the campus peak cooling load was calculated to be 2,315 tons. Total system cooling capacity across all central and satellite chiller plants is 3,045 tons (including existing ice melt over an 8-hour period with the PA chiller offline). The campus currently has limited redundancy given that the HU chillers serve the dual purposes of providing chilled water during the day and ice making at night. For example, if the 450-ton Frick chiller is taken out of service for any reason, the plant capacity is reduced to a firm plant capacity of 2,295 tons, which is 20 tons less than the anticipated peak load indicated above.

The 75% diversity factor can be applied to each individual plants as well. The resultant peak cooling demand on the HU central plant is 1,110 tons. A comparison of the central plant peak load (1,110 tons) to available capacity (1,390 tons) indicates the HU plant is sufficient to support the existing cooling load and can support additional buildings connected to the distribution loops. Appling the 75% diversity factor to the buildings connected to the SC plant results in a peak cooling demand of 660 tons. Similar to HU, a comparison of the central plant peak load (660 tons) to available capacity (915 tons) indicates the SC plant is sufficient support the existing cooling load of the buildings and can support additional buildings. Diversity is not applied to the satellite plants located at CC, PA, and SV as these plants act as standalone plants during peak cooling periods. The load in SV is 400 tons (not including the 75% diversity factor) while the SV plant will provide 500 tons of cooling leaving approximately 100 tons of spare capacity available for distribution to other buildings.

A separate standalone plant is located at Macklin Tower (MT). This plant consists of a 20-ton, air-cooled chiller that operates to serve three TV studio computer room air conditioning units in the winter when the central chilled water system shuts down. This chiller does not provide chilled water to the campus loop and therefore is not included in any of the central plant calculations.

The existing East Loop chilled water piping consists of a combination of direct buried carbon steel Perma-Pipe and fiber resin mains with PVC branch lines. Some joints and fittings have begun to fail with a majority of the issues occurring in two areas; 1) between TA and the playing fields and 2) between CC and TA. Failing pipe segments results in increased need for makeup water, wasted energy, and pipe corrosion causing fowling in system components. Piping from HU to SV is new and considered to be in good condition. As part of the SV construction project, new distribution mains were installed between SV and a 4-pipe vault outside of CC. Mains between HU, MT, and CS have been recently replaced with new direct bury carbon steel Perma-Pipe. The remainder of the West Loop chilled water piping is insulated carbon steel piping contained within a trench. Piping from the valve vault to CS, SW, and SC is new and considered to be in good condition. A multi-phase project currently in design will work to replace the failing distribution mains as follows. Refer to Drawing M1.01 for an existing condition site plan of the chilled water system.

- Phase 1 – Mains between HU, MT, and CS – Construction Complete 2022
- Phase 2 – Mains between TA, PE, AR/MU, and to the athletic fields – In Design
- Phase 3 – Mains between CC and TA – Future Project

The campus Energy Management and Control System utilizes a mix of direct digital controls (DDC) and pneumatic controls. Central pneumatic air compressors are located in the basement of MT with distributed pneumatic air lines located in trenches. This pneumatic air system operates dampers and valves in some of the older buildings on campus. Some airlines have corroded which has required the original carbon steel distribution tubing to be replaced by copper with satellite air compressors being strategically located on the network to provide redundancy. Pneumatic air devices are currently being phased out and are being replaced with DDC. Automatic system control valves are located in the SE mechanical room.

Previous Master Plan

The 2012 UMP discussed that adding a chiller plant to SC would be sufficient to serve the buildings connected to the West Loop. At that time, the combined connected load for SC, SW, CS, MT, and Science East (now part of SC) was 1,157 tons which would result in an anticipated peak load of approximately 870 tons when using a 75% diversity factor. The chillers installed in SC operate in lead-lag-lag configuration with a maximum operational output of 915 tons in that configuration. The connected load for SC, SW, CS, and MT is now estimated to be 1,210 tons with a peak cooling load of 910 tons. This indicates that the SC chiller plant should be sufficient to serve the entire West Loop, however, the actual load on the loop may be higher than expected based on anecdotal information regarding the operation of the SC air handling units as previously mentioned.

The Facilities Master Plan 2013 – 2023 recommended that a new central chiller plant be provided during the construction of the new Student Services Center. In 2019, the 500-ton SV chiller plant came online. Additionally, the FMP recommended that a satellite chiller plant be included in the Library Learning Commons (LRC) when constructed. This would serve to add capacity to the loop and allow the Mannakee Building along any new projects on the south side of campus to be added to the chilled water system. It is now known that the Library Learning Commons is no longer being planned and therefore, another location should be identified for a south campus satellite chiller plant. A potential candidate location would be the Perilla Performing Arts Center when the renovation and addition project takes place in 2087.

The 2012 Utilities Master Plan indicated that the West Loop had reached the end of its useful life. Since the 2012 UMP, a section of the West Loop between the valve vault and SC was replaced as part of the 2013 Science Center East project. Additionally, chilled and heating water mains were installed between SV and HU as part of the SV construction project in 2019. The remaining original West Loop was replaced as part of the multi-phase distribution loop upgrade project in 2022.

Future System Requirements

Two chilled water projects are currently being planned for the near-term future. The HU central plant upgrades project will demolish the decommissioned Tecogen natural gas engine driven chiller, add ice storage capacity, and add a new chiller to the HU plant. Although this project is listed in the Major Project Completion Dates spreadsheet provided by Montgomery College, it is no longer planned for 2022, as the priority has shifted to continuation of the underground distribution system replacement project. This project recently completed construction of phase 1 and phase 2 is currently in design. The HU plant upgrade is anticipated to occur in 2023. As part of that project, it is recommended that one new ice module be added along with a rotary screw chiller capable of providing at least 260 tons of cooling and 135 tons of ice build capacity. Assuming that this project is completed, and that the PA chiller is brought back online, the total campus chilled water capacity will increase to 3,550 tons. At that time, the firm capacity will be 2,820 tons which is greater than the anticipated peak load of 2,315 tons.

In 2033, CC will be demolished, and a new Campus Center will be built in the same location. This will result in a net increase of 175 tons of connected cooling load on the campus system. It is recommended that a chiller plant be provided as part of that project so the new Campus Center will continue to have a satellite plant similar to the existing configuration. Following the completion of this project, the campus chilled water connected load is anticipated to be 3,260 tons with a peak cooling load of 2,445 tons after applying the 75% diversity factor. Assuming the new Campus Center chiller plant will be sized for the load in the building plus 10%, a 460-ton chiller plant will need to be provided. This will bring the total campus cooling capacity to 3,770 tons with a firm capacity of 3,040 tons. There are no other projects currently planned for the near-term future (prior to 2033) that will have a significant impact on the campus cooling load.

Beyond 2033, the campus is anticipated to expand to the south as indicated in the Facilities Master Plan 2013 – 2023. Load on the campus chilled water system will continue to increase between 2033 and 2096 as buildings are added, renovated, and expanded. Assuming that MK will eventually be added to the South Loop and that all other projects progress as indicated in the Major Project Completion Dates in Chronological Order (Capital Budget) table provided by Montgomery College on March 11, 2020, the campus connected load will increase to 4,050 tons while the anticipated peak load will increase to 3,040 tons by 2096 (refer to tables 2-1 through 2-3 for a more detailed breakdown). Assuming the 110-ton chiller at PA will be replaced with a 550-ton chiller, the campus total cooling capacity will increase to 4,210 tons with a firm capacity of 3,480 tons.

Most of the chilled water mains are located in areas that will not be impacted by long-term future building projects. Only the chilled water branch line serving GU will have to be looked at for possible rerouting during the 2063 Technical Training Center project.

Summary and Recommendations

Currently, 16 buildings on campus are cooled by the chilled water system. The existing system makes use of five central and satellite chiller plants piped together as part of two distribution loops. These are supplemented by four ice storage modules that work in series with the Humanities Building chillers during peak cooling load periods. The ice modules benefit Montgomery college by reducing the size of the central plant equipment needed to handle the peak cooling load and by shifting electricity usage from the day to overnight when demand rates are reduced. The ice modules also help to increase the equipment utilization over the course of its service life. The combination of these chiller plants and ice storage modules provide adequate cooling capacity for the existing campus, however, spare capacity is limited meaning that equipment outages will need to be carefully managed until plant upgrades occur.

Other than the cooling towers which were replaced in 2020, much of the existing equipment in the HU central plant is at or beyond the typical expected service life and needs to be replaced or repaired. Based on age, the chilled water pumps and ice modules should be replaced as soon as possible. Montgomery College's intent for the chillers is to replace individual parts as opposed to replacing the equipment in its entirety. Given their age, it is recommended that service be performed to identify any component parts that may be failing or could fail soon so that prolonged chiller outages can be planned. A simple first recommended repair activity is to replace the Chiller No. 3 insulated evaporator cover to reduce unwanted heat transfer. The heat exchangers likely have remaining service life, but should disassembled, cleaned, and plates replaced as needed. Additionally, the existing air-capture horizontal chilled water expansion tanks are no longer properly functioning and should be replaced with new bladder style expansion tanks to better manage system pressures. Given that the anticipated peak campus load (2,315 tons) is greater than the firm capacity (2,295 tons), component replacement/maintenance will have to occur in a phased manner or during the heating season. Any chilled water component should be replaced with a component of equal (if not greater) capacity in terms of total cooling, flow rate, pump head, ice production, and/or ice storage capacity to ensure no loss in overall system operating capacity. The existing ice storage yard has open space available to install two new ice modules. It is recommended that when the existing ice modules are replaced, at least one new ice module be added. This would increase the ice storage capacity from 4,380 ton-hours to 5,475 ton-hours. At that time, a corresponding increase in ice building capabilities will be required. To accommodate this, a new chiller is recommended to be installed as described in the following paragraph.

As mentioned above, chilled water system redundancy is limited as the current firm capacity is less than the anticipated peak load on the system. An upcoming project is planned to demolish the decommissioned HU boiler plant which will open additional space within the HU mechanical room for a possible chiller plant expansion. It is recommended that the existing decommissioned Tecogen chiller be demolished during that time to open additional floor space. Following demolition, it is recommended that a new ammonia rotary screw chiller capable of 260 tons of cooling and 135 tons of ice build be added to the HU plant. In doing so, the HU plant total chilled water capacity would increase to 1,100 tons. It is anticipated that this would increase the ice build capacity from 450 tons to 585 tons which would equate to 5,555 ton-hours of ice built over the course of an 9.5-hour ice making period. If these recommendations are implemented, the campus firm chilled water capacity would increase to approximately 2,820 tons which is greater than the anticipated campus peak load of 2,315 tons. This will provide the system with some redundancy should any one component fail during the near-term period (2023-2033). This discussion assumes that the PA chiller is brought back online in 2023 as well.

In addition to increasing the system capacity, several steps should be taken to improve the operation of the chilled water system. For example, it is recommended that Montgomery College proceed with the chilled water distribution piping replacement project that is currently in design. The system installed as part of that project will include direct buried pre-insulated piping within existing trenches or adjacent to the existing trenches to match existing pipe routing. It is recommended that all future piping projects make use of a pre-insulated piping systems (Perma-Pipe or equivalent). This will help to reduce system leakage and improve system efficiency due to improved insulation. Additionally, the buried condenser water piping between the HU plant and the new cooling towers/ice modules that had previously been shown to have a minor leak should be evaluated and considered for replacement depending on the current condition and severity of the leak. It is recommended that the College also pressure test to verify the integrity of segments of the distribution mains not included in the current multi-phase replacement project. It is recommended that seasonal changeover valves be replaced for buildings with 2-pipe HVAC systems. Replacement valves should be bubble tight type valves to eliminate system carryover. Each building currently connected to the chilled water system should be retro-commissioned and rebalanced to ensure the systems are operating correctly. This includes SC where the cooling load has recently increased and thus reduced the spare capacity of that chiller plant. By implementing these recommendations, the system will operate more efficiently, require less makeup water, and experience less fowling. Monitoring of makeup water systems will help to validate if corrective actions are resolving the issues with leaky distribution mains. Additionally, reduced system leaks, improved insulation, and reduced system cross contamination will help the system better maintain the designed 16°F Delta-T between the chilled water supply and return. This will result in more consistent and efficient system operation and better ice utilization throughout the day. Along with these changes, it is recommended that BTU meters be installed in all future buildings to monitor chilled water production and usage on a building-by-building basis. The BTU meters should be connected to the campus EMCS to make data readily accessible to facilities and engineering staff. This information will be critical for energy benchmarking and in troubleshooting buildings and systems not achieving optimal operational performance.

The next campus cooling load increase will occur in 2033 when a new Campus Center building is planned to replace the existing CC building. This will result in an increased peak cooling load on the chilled water system. The existing CC building has a satellite chiller plant whose main functions are to cool CC and to provide cooling to the loop at night when the HU plant is in ice-making mode. When the new Campus Center is constructed, it is recommended that a satellite water cooled chiller plant be included so that the HU chillers can continue to build ice at night. The chiller plant should be sized for 110% of the building load or 460 tons. With the addition of this chiller plant, the campus cooling capacity would rise to 3,770 tons. Overall system redundancy would improve as the with a firm capacity would increase to 3,040 tons which would be greater than the anticipated peak campus load (2,445 tons).

In 2063 a new Technical Training Center will replace TT. During that project it is recommended that the Technical Training Center be added to the East Loop via a connection to the GU branch. This will provide energy efficiency and maintenance benefits through simplifying the cooling system for that building. The GU building is currently served by 6-inch chilled water pipes with adequate spare capacity to accommodate the added flow required to serve the Technical Training Center. After construction is completed for the new Technical Training Center the campus peak load will remain less than the system firm capacity assuming that all previous recommendations have been implemented. This project will be followed by demolition of CB and construction of a new Media Arts building on the same site in 2069. Projections for the campus loads at that point still have the anticipated peak load less than the system firm capacity. In 2075, it is planned that TC will be demolished and a new Humanities & Social Sciences building will be built on the same site. It is not until 2087 that the anticipated campus peak load is expected to catch the system firm capacity. At that time, if there are no other upgrades, the campus peak load is expected to match the system firm capacity of 3,040 tons. However, chiller plant upgrades are recommended as part of the 2087 PA renovation and addition project. Given that the South Garage new construction project is no longer being considered, the PA project may be the best opportunity to develop a South Loop to serve the buildings on the south side of campus including MK, if determined to be economically feasible. If a 490-ton chiller plant is added to PA at that time, it would be capable of serving the South Loop (MK, PA, and SB). At that point, the campus peak load would be 3,040 tons and the system would have a firm capacity of 3,420 tons. It is anticipated that a portion of the PA plant would need to be air-cooled so that it could operate in winter to serve any auditorium spaces within the building. Given that MK currently includes electric direct expansion cooling, if plans proceed to integrate MK into the South Loop, load will be removed from the electric power distribution system. This will need to be considered in the long-term planning of the power distribution system.

It is recommended that the current project to replace the existing pneumatic control system with new DDC components continue until the pneumatic system is completely replaced. This switch to a DDC energy management and control system should be done in a way that allows communication between buildings which will facilitate demand management and system plant optimization. This applies to all systems connected to the EMCS, not just the chilled water system.

MECHANICAL SYSTEMS – HEATING WATER

Scope

The 2022 UMP provides documentation, analysis, and recommendations of the existing and future heating water systems at the Rockville campus based on the Facilities Master Plan 2013 – 2023. This study documents the existing equipment and capacities of the installed mechanical equipment in the central plants as well as the demand load for heating of each building. The study also provides recommendations to improve performance of the existing systems and distribution piping along with modifications that are required as buildings are constructed or renovated. Drawing M1.11 in Appendix 3 shows a site plan of the existing heating water system while M1.12 and M1.13 show the near-term and long-term heating water site plans respectively. Campus heating water schematics are provided on drawings M2.11 through M2.13 to show the general configuration of the heating water system. Equipment plans are also included in Appendix 3 to show the general equipment layout within each boiler plant.

Existing Conditions

The heating water system on campus consists of two boiler plants: one central plant and one satellite plant. The plants provide heating water to an East and a West distribution loops which serve 16 buildings in total. Around campus, heating water is used for space heating, domestic water production, and pool heating. The latter two uses require heat exchangers to separate the central heating water loop from the end use. Control of these systems is achieved through a mix of pneumatic and direct digital controls.

Construction of the new Student Services Center (SV) was completed in 2020 and included a central heating water plant which came online in 2019. Following construction of the SV plant, the Humanities Building (HU) heating water plant was decommissioned. The HU plant is set to be demolished as part of a near-term future project.

The boiler plant located in the basement of SV is now the central heating water plant serving most of the buildings on campus. The SV plant serves both the East and West Loops along with the Technical Center (TC) which is connected via direct buried pipes from the HU mechanical room. As part of the SV construction project, 6-inch chilled and heating water pipes were extended from SV to a vault located between SV and TC, but final connections to TC were not made at that time. A satellite plant located in a mechanical penthouse on the roof of SC serves three West Loop buildings (SC, SW, and CS). The East Loop serves CC, SV, TA, PE, CB, AR, MU, PA, SB, and GU via 12-inch mains. The West Loop passes through the Humanities Building and serves MT, CS, SC, SW, HU via 12-inch mains. MK is a standalone building with electric heat and does not tie into the heating water distribution system. The distribution system is setup in a primary-secondary configuration. Primary pumps provide a variable volume of water to the distribution loops, while secondary pumps provide a variable flow of water through each building. Heating water distribution uses a 30°F temperature difference between supply and return. Refer to Drawing M2.11 for a schematic of the existing heating water system.

The heating water distribution system is constructed of direct buried, carbon steel Perma-Pipe or trenched piping where located below sidewalks. Sections of the heating water distribution mains are beyond their service lives and should be replaced. The system has experienced issues with leaks due to aging carbon steel pipes which results in a significant need for makeup water, wasted energy, and pipe corrosion causing fowling in system components. Piping from HU to SV is new and considered to be in good condition. As part of the SV construction project, new distribution mains were installed between SV and a 4-pipe vault outside of CC. Mains between HU, MT, and CS have been recently replaced with new direct bury carbon steel Perma-Pipe. There is an active multi-phase project to replace the remaining problematic segments of the heating water distribution system. The scope of that project is as follows:

- Phase 1 – Mains between HU, MT, and CS – Construction Completed in 2022
- Phase 2 – Mains between TA, PE, AR/MU, and to the athletic fields – In Design
- Phase 3 – Mains between CC and TA – Future Project

The SV boiler plant includes five condensing boilers (rated at 5,640 MBH each, 28,200 MBH total) with available space and infrastructure present to add two additional similarly sized boilers. Also located in the mechanical room are heating water expansion tanks and chemical shot feeders. The SV plant equipment is assumed to be in good condition as it was installed in 2019.

The existing SC boiler plant consists of four condensing boilers (rated at 2,610 MBH each, 10,440 MBH total), two primary variable volume heating water distribution pumps, and an expansion tank. There have been some reported boiler firing issues with the boilers installed at SC. This should be investigated to determine if repair or replacement of the boilers is required. A valve vault located between MT and CS on the West Loop includes manual valves to provide a separation between buildings served by the SC boiler plant during peak-heating loads. Automatic system control valves are located in the SE mechanical room. Refer to Drawing M1.11 for an existing conditions site plan of the heating water system.

All currently operational boiler plants utilize natural gas provided via a firm (uninterruptable) service. Fuel oil is no longer utilized on campus and all fuel tanks have been removed.

MC Facilities staff previously tracked the load on the HU boilers at the time of the peak demand when those boilers served as the central heating water plant for the campus. At that time, it was determined the load was satisfied utilizing one 400 BHP boiler and partial loading of one 100 BHP boiler. This equates to a plant peak demand load of approximately 450 BHP or 15,100 MBH. At that time, the anticipated load on campus was 18,726 MBH indicating that the campus has a diversity factor of approximately 80% which can be used when looking at future loads.

In calculating the heating water demand for each building, a heating load factor was used. This factor is a heat load per square foot value based upon industry standards and existing buildings of similar function. With 16 buildings currently connected to the campus heating water system, the total connected load is estimated to be 31,230 MBH across both distribution loops. Considering building usage schedules, building orientations on the campus, thermal massing, and other factors, it is unlikely that all buildings will be in full heating mode at the same time. Therefore, the previously measured 80% diversity factor can be applied to the overall campus peak heating load which results in an anticipated campus load of 24,990 MBH. The current capacity of all campus boiler plants is 38,640 MBH. A firm capacity can be calculated assuming the largest heat generating component is out of service. The largest boiler would be one of the boilers located in SV (5,640 MBH each). If one of those boilers is taken out of service for any reason, the resulting campus firm capacity would be 33,000 MBH which is more than the anticipated peak load and total connected load on the system. This does not account for a possible expansion of the SV plant which has the space and infrastructure available to add two addition 5,640 MBH boilers. Refer to Table 3-4 for more information regarding the existing campus connected loads and capacities. Tables 3-5 and 3-6 show the near-term and long-term connected loads/capacities respectively. Chart 3-2 shows the campus heating load vs heating capacity over time.

Previous Master Plan

The Facilities Master Plan 2013 – 2023 indicated that there would be a few renovation projects occurring in the near-term future, but no new building construction projects until the existing Campus Center is demolished and replaced with a new Campus Center in 2033. Based on these planned projects, it is anticipated that the campus heating load will remain consistent until the Campus Center projects begin. Additional buildings and renovation projects were indicated to occur between 2033 and 2096.

The 2012 Utilities Master Plan indicated that the existing central plant located in HU was beyond its expected service life. Although the report did not indicate that the plant was short on capacity, it did show that the plant output was less than the connected load of each of the buildings. It was also noted that the boiler plant had experienced a decrease in efficiency over time which likely results in a loss of available capacity. The 2012 UMP recommended that the HU plant equipment be replaced, that a new satellite plant be included in the SV project, and that a new satellite plant be added during a future construction project on the south side of campus. Since the 2012 UMP was finalized, two additional boilers have been added to the SC satellite plant which was then connected to the West Loop and five boilers were installed as part of the SV project.

The 2012 Facilities Master recommended that a new satellite boiler plant be provided during the construction of the Library Learning Commons (LRC). This would serve to add capacity to the loop and create a South Loop allowing buildings such as MK to be added to the heating water distribution system. It is now known that the Library Learning Commons is no longer being planned and therefore, another location should be identified for a south campus satellite boiler plant. A potential candidate location would be the Perilla Performing Arts Center (PA) when the renovation and addition project takes place in 2087. Alternatively, capacity of the existing SV plant could simply be expanded by adding boilers and pumps in the space previously allocated for future equipment.

The existing campus heating water distribution piping was indicated to be Schedule 40 welded steel pipe with fiberglass insulation and aluminum jacketing located in a pre-cast concrete utility trench. Campus distribution piping was noticed to be in poor condition and recommended to be replaced. Branch lines serving the CB and the CS have now been replaced. West Loop mains between HU, MT, and CS have been replaced with new direct buried Perma-Pipe. Additionally, new branch lines have been extended between SC and SW, and SC and the West Loop Valve Vault. As part of the SV construction project, a set of direct buried 6-inch heating water pipes were extended from SV to a valve vault outside TC. Final connection to TC was not made during that project and will be considered as part of a future project. Also as part of the SV project, a set of 12-inch Perma-Pipe heating water mains were installed between HU and SV. Those pipes enter the SV basement plant and exit to the east where they connect to the existing East Loop near CC.

Future System Requirements

Two heating water projects are currently being planned for the near-term future. The HU central plant upgrades project will demolish the decommissioned boilers. Although this project is listed in the Major Project Completion Dates spreadsheet provided by Montgomery College, it is no longer planned to take place in 2022. Instead, the priority is to continue with the phased underground distribution system upgrade project. This project recently completed construction of phase 1 and phase 2 is currently in design.

As soon as the SV plant was brought online, the HU plant was decommissioned. Despite the decommissioning of the HU central plant, the overall existing campus heating capacity is anticipated to be adequate to serve the campus for the near-term future. There are no planned campus load changes until the Campus Center project which is scheduled to be completed in 2033. Following the Campus Center project, the connected heating water load is anticipated to increase to 32,830 MBH with a peak load of 26,260 MBH after applying an 80% diversity factor. The total capacity of the campus heating water system will remain 38,640 MBH with a firm capacity of 33,000 MBH. Therefore, it is expected that the heating water system will be adequate over the near-term with built-in redundancy allowing the largest boiler to be removed from service and the system still satisfy the peak heating load.

Beyond 2033, the campus is anticipated to expand to the south as indicated in the Facilities Master Plan 2013 – 2023. This presents an opportunity to create a South Loop which could tie in existing and future buildings on that side of campus. Assuming future buildings (Technical Training Center, Media Arts, and Humanities & Social Sciences Building) and renovated existing buildings (PA and MK) will tie into the campus heating water system, the load on the campus heating water system will continue to increase between 2033 and 2096 from 32,830 MBH to 40,890 MBH. Peak load will increase from 26,260 MBH to 32,710 MBH during that time as well. It is anticipated that the total capacity of the boiler plants will be greater than the connected load through 2096 based on the FMP planned projects. Adding a south campus satellite plant sized to accommodate the South Loop (4,700 MBH) during the 2087 renovation of PA would increase the total plant capacity from 38,640 MBH to approximately 43,340 MBH. Additionally, the campus firm capacity would increase from 33,000 MBH to approximately 37,700 MBH during that time.

Most of the heating water mains are located in areas that will not be impacted by long-term future building projects. Only the heating water branch lines serving GU will have to be evaluated for possible rerouting during the 2063 Technical Training Center project.

Summary and Recommendations

A new central boiler plant located in SV was constructed in 2019 which allowed the HU plant to be decommissioned. The result of that project replaced aging and inefficient heating water equipment with new, more energy efficient equipment. The HU boilers can now be demolished at any time to make room for additional chiller plant equipment. It is recommended that during the demolition of the HU boiler plant the heating water expansion tanks be removed from MT. Those expansion tanks will not be needed as the SV plant has its own expansion tanks.

Based on the Facilities Master Plan 2013 – 2023 proposed projects, the SV plant combined with the SC plant will be capable of serving the entire campus's heating water needs and will have adequate firm capacity to facilitate maintenance activities both in the near-term and long-term. It is recommended that BTU meters be installed in all future buildings to monitor heating water production and usage on a building-by-building basis. The BTU meters should be connected to the campus EMCS to make data readily accessible to facilities and engineering staff. This information will be useful for energy benchmarking and troubleshooting buildings and systems not achieving optimal operational performance. Additionally, all heating water system controls are recommended to be converted from pneumatic to direct digital controls in accordance with MC's new Building Energy Performance Standards. This will allow for better integration of all building controls, facilitate demand management strategies, and improve central plant optimization capabilities.

The SC boilers were installed in 2011 and 2013 while the SV boilers were installed in 2019. Therefore, the existing heating water equipment has many years of remaining service life. The SC plant boilers have experienced firing issues in the past and should be investigated for repair or replacement. Additionally, since the two plants were constructed several years apart, future boiler replacement activities can take place in one plant at a time while the other plant has many years of remaining service life.

Although of adequate size, some of the existing distribution piping was previously reported to be in poor condition. It is recommended that the current multi-phase replacement project continue through completion. This will improve energy efficiency, reduce water consumption, reduce system fowling, and improve overall system resiliency. It is recommended that all future piping projects make use of a pre-insulated piping systems (Perma-Pipe or equivalent). This will help to reduce system leakage and improve system efficiency through the added insulation. It is recommended that the College consider pressure testing to verify the integrity of segments of the distribution mains not included in the current multi-phase replacement project. The existing heating water pipes serving GU will have to be evaluated for possible rerouting during the 2063 Technical Training Center project. When that project occurs, it is recommended that the Technical Training Center be added to the East Loop via a connection to the GU branch. This will provide energy efficiency and maintenance benefits through simplifying the heating system for that building. The GU building is currently served by 6-inch heating water pipes with adequate spare capacity to accommodate the added flow required to serve the Technical Training Center.

A South distribution loop should be considered as long-term construction projects are anticipated on that side of the campus. It is recommended that a boiler plant be constructed during the 2087 addition to the PA to create a South Loop serving the PA, SB, MK, and future projects if determined to be economically feasible. It is recommended that the South Loop tie into the East Loop with a valve vault for loop isolation purposes. Given that MK currently includes electric heating, if plans proceed for the South Loop and MK is integrated, load will be removed from the electric power distribution system and added to the natural gas distribution system. This will need to be considered in the long-term planning of the power distribution and natural gas distribution systems. Alternatively, room is available in the SV plant to add additional boilers to achieve the same increase in plant capacity. For energy efficiency purposes, it is recommended that all future boiler plant projects include condensing boilers.

As previously mentioned, the boilers used at the SV central plant and SC satellite plant are condensing boilers. Condensing boilers achieve better efficiencies when the return water temperature is kept low. Therefore, an increased overall system efficiency could be achieved if applications that require higher heating water temperatures are removed from the central system. It is recommended that the campus domestic water and pool heating systems be analyzed and possibly be removed from the central heating water system which could reduce the heating water return temperature during off peak seasons. To accommodate this, small, dedicated boilers/water heaters will be required at each building with domestic hot water and pool heating loads.

ELECTRICAL SYSTEMS – POWER

Scope

The 2022 UMP provides documentation, analysis, and recommendations of the existing and future electrical power systems that serve the Rockville campus based on the Facilities Master Plan 2013 – 2023. This master plan documents the existing utility and campus owned electrical service entrance equipment, associated demand loads, and capacities. Estimated demand loads for future buildings and building modifications are also included. The master plan provides basic recommendations for distribution system modifications required to meet the future estimated demand loads. Drawing E1.01 in Appendix 4 shows a site plan of the existing campus power distribution system. Drawing E1.02 and E1.03 in Appendix 4 shows a site plan of the proposed near-term and long-term campus power distribution system. Additionally, campus electrical power distribution single-line diagrams are provided in Appendix 4 to show the general configuration of the electrical system.

Existing Conditions

All existing buildings at the Rockville campus receive electrical power from the local utility company, the Potomac Electric Power Company (PEPCO). PEPCO provides secondary service to individual facilities within the Rockville campus. Each of these facilities has a separate PEPCO transformer, PEPCO meter, electrical service, and associated service entrance disconnect. PEPCO owns and maintains the medium voltage (13.2kV) overhead feeders and exterior vault, pad mounted, and pole type transformers that supply power to the individual service locations. Table 4-1 in Appendix 4 lists the individual service locations. The Music Building (MU) receives power from the adjacent Art Building (AR) and therefore is not equipped with an individual PEPCO meter.

The electrical peak demand load for each of the existing service locations is shown in Table 4-1 in Appendix 4. The peak demand loads are calculated using PEPCO historical monthly kW peak demand load information from the last several years. The PEPCO monthly values are converted from kW to kVA by assuming a .9 power factor and by multiplying by 1.25 in accordance with NEC article 220.87.

The estimated total campus peak demand load is 6,387 kVA and is calculated by summing all of the individual service locations. It is important to note that the estimated total campus peak demand load will be less that the actual total campus peak demand load due to the fact that not all individual peak demand loads at each individual service occur at exactly the same time.

The service entrance equipment serving the various buildings is manufactured primarily by Eaton, with several other service entrances utilizing equipment by Federal Pacific, General Electric, Siemens, and Square D. The condition of the service entrance equipment ranged from fair to good condition. The equipment appears to be maintained, however, much of the equipment appeared to be nearing the end of its expected life cycle and should be replaced within the near future.

Future System Requirements

PEPCO will remain the owner and operator of the 13.2kV voltage electrical distribution system, so any desired modifications to this system will need to be coordinated with PEPCO. Removal of the existing campus buildings and proposed new construction projects shall be coordinated with PEPCO. The existing 13.2kV PEPCO electrical distribution system shall be extended to all new buildings throughout the campus.

The near-term and long-term future campus projects include several demolition and new construction projects throughout the campus. These projects and the anticipated year of completion are listed in Table 4-2.

Projected load estimates for the new buildings shall be provided to PEPCO in order to determine if the existing PEPCO owned electrical distribution infrastructure has sufficient capacity for the new loads. PEPCO will need to design and approve of campus electrical distribution system modifications. The College would then be responsible for reimbursing construction costs to PEPCO. A PEPCO service application will need to be submitted to begin this process.

The responsibility for installing the electrical infrastructure from the pole to the switch boxes, transformer pad/vault, and to the building is the responsibility of the College and its contractors. PEPCO is responsible for installing cabling from the pole, switches, transformers, and cabling into the building's service entrance. The college designs the systems based on PEPCO standards and PEPCO approves the final design. The College is responsible for the cost of the infrastructure and the cost of what PEPCO provides.

All future building designs shall include College owned electrical sub-meters with quantity and location to comply with IgCC and IECC requirements to meter specific load categories such as lighting, HVAC, etc. All metering shall also be in compliance with applicable College Building Energy Performance Standards.

Please note that PEPCO has not provided detailed information to date regarding the construction of future buildings as it relates to the impact to existing PEPCO primary feeders and associated infrastructure. Load information on campus load growth has been provided to PEPCO and through the efforts of key College personnel, requests for information from PEPCO are ongoing.

Designers for all future buildings at Montgomery College Rockville Campus should be aware that Schneider Electric has approached the College and had preliminary discussions regarding a Power Purchase Agreement (PPA) preliminary concept. The viability of this concept is yet to be investigated in detail by Schneider Electric. The concept discussed with the College is based on Schneider Electric purchasing and maintaining all of the PEPCO owned primary distribution and pad mounted transformers currently supporting the Rockville Campus, then selling power back to the College for a term of 20 years. Discussions have also included installation of on-site cogeneration, building combined heat and power (BCHP), and photovoltaic (PV) systems. The discussions were broad in nature, but are still being considered by the College.

Montgomery County requires that all projects that receive county funding be provided with PV at a rate of 1kW/1,000SF renovated or newly constructed for projects larger than 10,000SF. Identification of possible locations for future PV is included in this report. See Table 4-3 and Site Plan E1.04. Proposed PV locations are displayed for rooftop, parking lot, and ground mounted PV systems. Locations have been determined by evaluating the available physical space within the Campus to accommodate the panel arrays. PV systems would need to be sub-metered and monitored by the College EMS. Montgomery College will need to evaluate these potential locations for additional criteria such as feasibility, cost, and environmental impact.

Summary and Recommendations

The existing 13.2kV electrical distribution system owned by PEPCO will need to be extended to the new buildings. The existing electrical service infrastructure in several of the existing to remain buildings is at the end of its service life and should be replaced in-kind to avoid future equipment failure. Coordination of all electrical distribution system upgrades shall be coordinated with PEPCO.

It is recommended that the buildings with multiple service entrances (AR and MU) are reconfigured to be provided with a single service entrance. This will eliminate confusion while attempting to disconnect power to portions of the building during maintenance or emergency situations.

Efforts to pursue PEPCO (in association with key College personnel) for definitive information related to the impact of new building load growth must be continued.

Efforts to maintain an understanding of the Schneider Electric PPA concept and its status should be continued.

bkm

Appendix 1
General Information

TABLE 1-1 - Building Abbreviations List

Official Abbreviation	Building Name	Building Number	Gross Square Feet (GSF)**	Net Assignable Square Feet (NASF)**	Comments
Rockville Campus					
AR	Paul Peck Art Building	201	25,594	15,809	
AT	Ampitheatre	-	-	-	
CB	Counseling and Advising Building	205	17,696	9,890	*Expected Renovation TBD, 2069 Expected Closure*
CC	Campus Center	202	74,302	50,735	*2033 Expected Closure and New Building Opening*
CH	Child Care Center	203	2,498	2,350	
CN	Canoe Trailer Shed	216	420	377	
CS	Computer Science Building	204	20,862	14,581	*2090 Expected Renovation*
GU	Homer S. Gudelsky Institute for Technical Education	207	64,000	41,635	
HU	Humanities Building	208	73,912	48,822	*TBD Expected Central Plant Renovation, 2084 Expected Renovation*
MK	Mannakee Building	211	42,102	33,880	*2096 Expected Renovation*
MS	Maintenance Shop	210	4,720	4,220	
MT	Gordon and Marilyn Macklin Tower	206	117,282	80,064	*2026 and 2057 Expected Renovations*
MU	Music Building	212	21,050	10,526	
NG	North Garage	214	308,400	2,508	
PA	Robert E. Parilla Performing Arts Center	213	28,000	16,493	*2087 Expected Renovation and Addition*
PE	Physical Education Center	215	84,949	62,444	*2093 Expected Renovation*
SB	South Campus Instruction Building	220	29,900	18,059	
SC	Science Center***	217	204,277	118,019	
SF	Soccer Field Concession Building	228	2,675	0	
SV	Long Nguyen and Kimmy Duong Student Services Center	224	127,960	70,960	
SW	Science Center West	219	70,508	42,153	
TA	Theatre Arts Building	223	35,032	21,150	
TC	Technical Center	222	55,908	39,012	*2075 Expected Closure*
TT	Interim Technical Training Center	209	9,360	7,871	*2063 Expected Closure*
TBD*	Technical Training Center	-	84,000	50,400	*2063 Expected Opening*
TBD*	Media Arts	-	48,000	28,800	*2069 Expected Opening*
TBD*	Humanities & Social Sciences Building	-	136,000	81,600	*2075 Expected Opening*

*Building proposed per Facilities Master Plan 2013 - 2023
**From MC Resource Conservation Plan FY 2023 and from the Facilities Master Plan 2013 - 2023
***Includes Science Center East

TABLE 1-2 – List of Abbreviations

BTU	BRITISH THERMAL UNIT
BTUH	BRITISH THERMAL UNITS PER HOUR
CW	CHILLED WATER
G	NATURAL GAS
GSF	GROSS SQUARE FEET
GPM	GALLONS PER MINUTE
FMP	FACILITIES MASTER PLAN
HP	HORSEPOWER
HR	HOUR
HW	HEATING WATER
KVA	KILOVOLT-AMPERES
KW	KILOWATTS
S	SANITARY SEWER
SF	SQUARE FOOT
UMP	UTILITY MASTER PLAN
W	DOMESTIC WATER

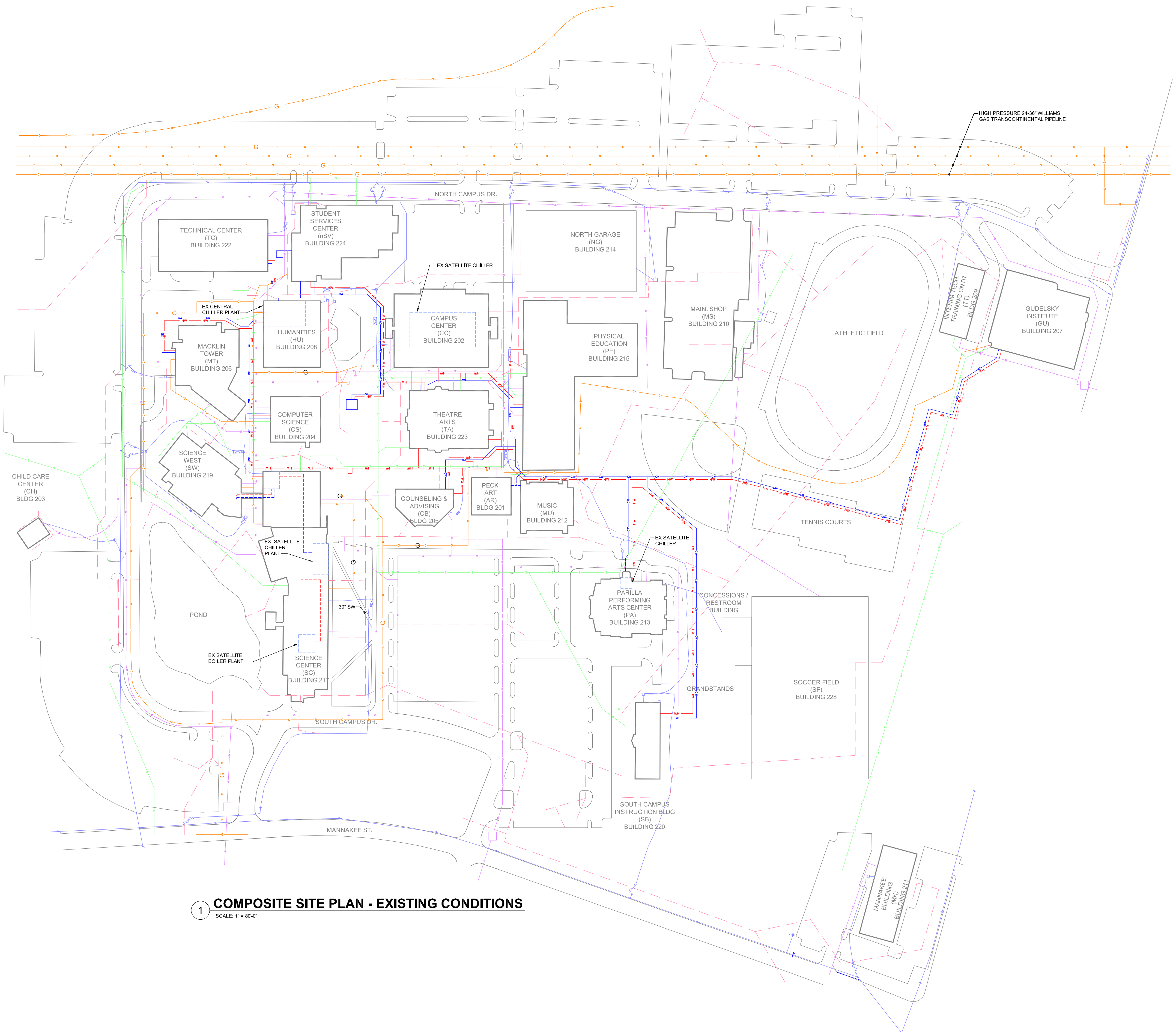
Montgomery College - Rockville Campus
Utility Master Plan Study
BKM Project Number: 19021.02

June 2022

TABLE 1-3- Campus Long-Term Facilities Masterplan Timeline

Completion Date by Term	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061
Building	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall	Winter Spring Summer Fall
Paul Peck Art Building (AR - 201)																																								
Institute For Technical Education (GU - 207)																																								
Music Building (MU - 212)																																								
Science Center (SC - 217)																																								
Science Center West (SW - 219)																																								
Student Services Center (SV - 224)																																								
Theatre Arts Building (TA - 223)																																								
South Campus Instruction Building (SB - 220)																																								
Campus Center (CC - 202)																																								
Gordon And Marilyn Macklin Tower (MT - 206)																																								
Counseling And Advising Building (CB - 205)																																					PROJECTED DEMOLITION 2069			
Technical Center (TC - 222)																																					PROJECTED DEMOLITION 2075			
Humanities Building (HU - 208)																																					PROJECTED RENOVATION 2084			
Performing Arts Ceneter (PA - 213)																																					PROJECTED RENOVATION 2087			
Computer Science (CS - 204)																																					PROJECTED RENOVATION 2090			
Physical Education Building (PE - 215)																																					PROJECTED RENOVATION 2093			
Intermin Technical Training Ceneter (TT - 209)																																					PROJECTED DEMOLITION 2063			
Mannakee Building (MK - 211)																																					PROJECTED RENOVATION 2096			
New Campus Center (TBD*)																																								
Technical Training Center (TBD*)																																					PROJECTED COMPLETION 2063			
Media Arts (TBD*)																																					PROJECTED COMPLETION 2069			
Humanities & Social Sciences (TBD*)																																					PROJECTED COMPLETION 2075			

KEY	
	Existing Building
	Renovated Building
	Stand-Alone Building
	Future Building



1 **COMPOSITE SITE PLAN - EXISTING CONDITIONS**

SCALE: 1" = 80'-0"

LEGEND:

- CHILLED WATER
- HEATING WATER
- DOMESTIC COLD WATER
- SANITARY
- STORM WATER
- NATURAL GAS
- CONDENSER WATER SUPPLY/RETURN
- GLYCOL WATER SUPPLY/RETURN
- ELECTRIC

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 40' 80' 120' 160' 240'

SCALE: 1" = 80'-0"

N

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Mechanical / Electrical Engineers
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P: 410.323.0600 | www.bkma.com

PROJECT NAME:

Montgomery College

MONTGOMERY COLLEGE
Central Administration
Office of Facilities
9221 Corporate Boulevard
Rockville, MD 20850
Telephone: 240-567-7363

ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

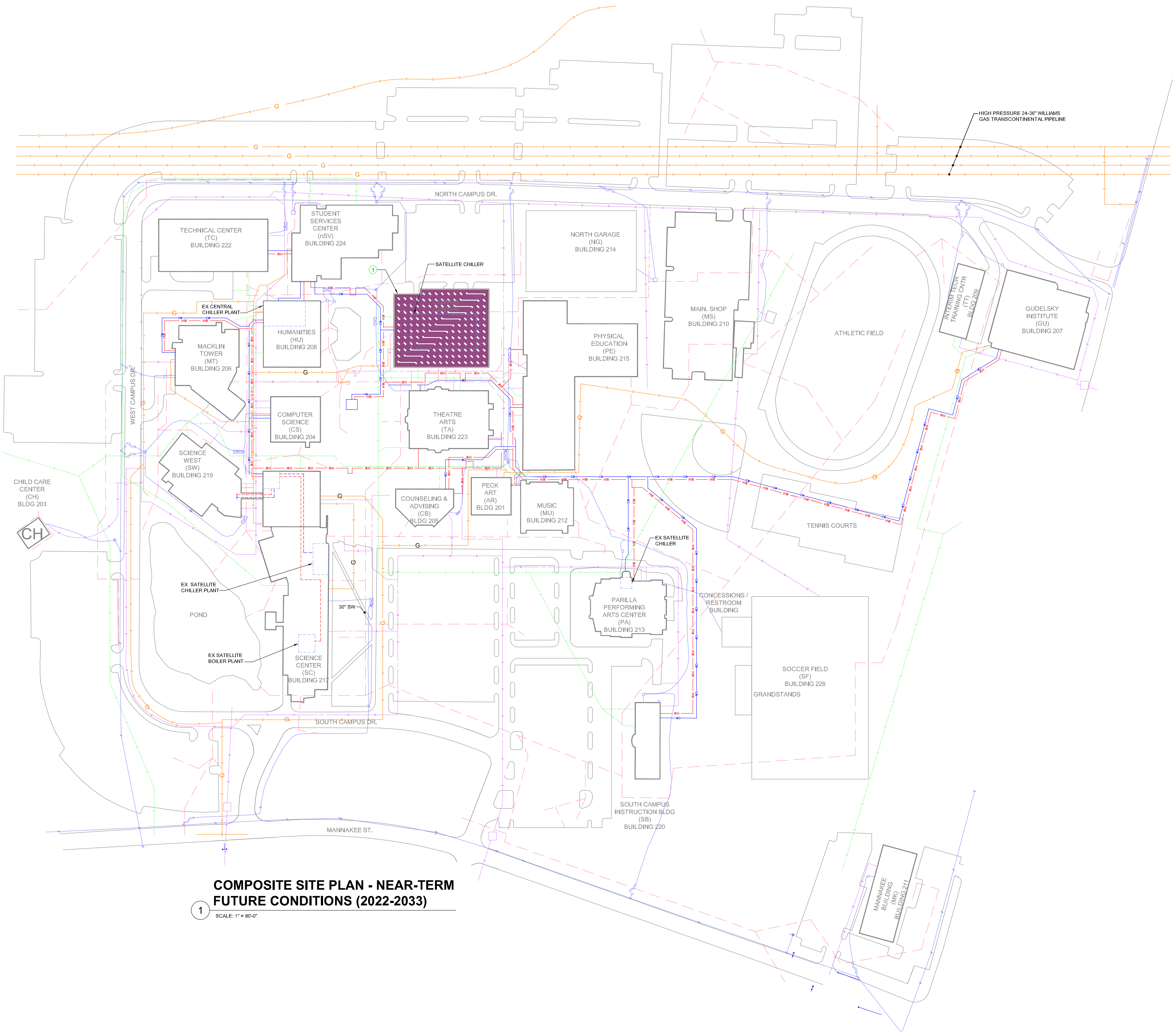
SHEET TITLE:
COMPOSITE SITE PLAN EXISTING CONDITIONS

DRAWING NO:
C1.01

BKM# 19021.02

ARL: G:\19021.02\Drawings\Acad\M\C1.01 - Site Plan - Composite Site Plan - Existing Conditions

Plotted By: Bill Jamieson | 6/24/2022 2:34 PM



COMPOSITE SITE PLAN - NEAR-TERM FUTURE CONDITIONS (2022-2033)

1 SCALE: 1" = 80'-0"

LEGEND:

- CHILLED WATER
- HEATING WATER
- DOMESTIC COLD WATER
- SANITARY
- STORM WATER
- NATURAL GAS
- CONDENSER WATER SUPPLY/RETURN
- GLYCOL WATER SUPPLY/RETURN
- ELECTRIC

DRAWING NOTES:

1. NEW CAMPUS CENTER CONSTRUCTED IN 2033.

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 40' 80' 120' 160' 240'

SCALE: 1" = 80'-0"

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
COMPOSITE SITE PLAN NEAR-TERM FUTURE CONDITIONS (2022-2033)

DRAWING NO:
C1.02

BKM# 19021.02

LEGEND:

- CHILLED WATER — CW —
- HEATING WATER — HW —
- DOMESTIC COLD WATER — W —
- SANITARY — S —
- STORM WATER
- NATURAL GAS — G —
- CONDENSER WATER SUPPLY/RETURN
- GLYCOL WATER SUPPLY/RETURN
- ELECTRIC

COMPOSITE SITE PLAN - LONG-TERM FUTURE CONDITIONS (2034-BEYOND)

1

SCALE: 1" = 80'-0"

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 40' 80' 120' 160' 240'

SCALE: 1" = 80'-0"

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
COMPOSITE SITE PLAN LONG TERM FUTURE CONDITIONS (2034-BEYOND)

DRAWING NO:
C1.03

BKM# 19021.02

bkm

Appendix 2
Plumbing Systems

Burdette, Koehler, Murphy and Associates, Inc.
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1 **SITE PLAN - WATER SYSTEM - EXISTING CONDITIONS**

SCALE: 1" = 100'-0"

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

N

ARL: G:\19021.02\Drawings\Acad\P\P101 - Site Plan - Domestic Cold Water - Existing Conditions

Plotted By: Bill Jamieson | 6/17/2022 11:49 AM

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
**SITE PLAN
WATER SYSTEM
EXISTING CONDITIONS**

DRAWING NO:
P1.01

BKM# 19021.02

1 **SITE PLAN - WATER SYSTEM - NEAR-TERM FUTURE (2022-2033)**

SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NEW CAMPUS CENTER CONSTRUCTED IN 2033.

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

N

Plotted By: Bill Jamieson | 6/17/2022 11:45 AM

ARL: G:\19021.02\Drawings\Acad\P\P102 - Site Plan - Domestic Cold Water - NT Conditions

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
WATER SYSTEM
NEAR-TERM FUTURE (2022-2033)

DRAWING NO:
P1.02

BKM# 19021.02

1 SITE PLAN - WATER SYSTEM - LONG-TERM FUTURE (2034 - BEYOND)

SCALE: 1" = 100'-0"

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 50' 100' 150' 200' 300'

SCALE: 1" = 100'

N

ARL: G:\19021.02\Drawings\Acad\P\P103 - Site Plan - Domestic Cold Water - LT Conditions

Plotted By: Bill Jamieson | 6/17/2022 12:25 PM

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
WATER SYSTEM
LONG-TERM FUTURE
(2034-BEYOND)

DRAWING NO:

P1.03

BKM# 19021.02

1 SITE PLAN - SANITARY SYSTEM - EXISTING CONDITIONS

SCALE: 1" = 100'-0"

ARL: G:\19021.02\Drawings\Acad\P\P111 - Site Plan - Sanitary - Existing Conditions

Plotted By: Bill Jamieson | 6/17/2022 12:26 PM

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

N

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ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

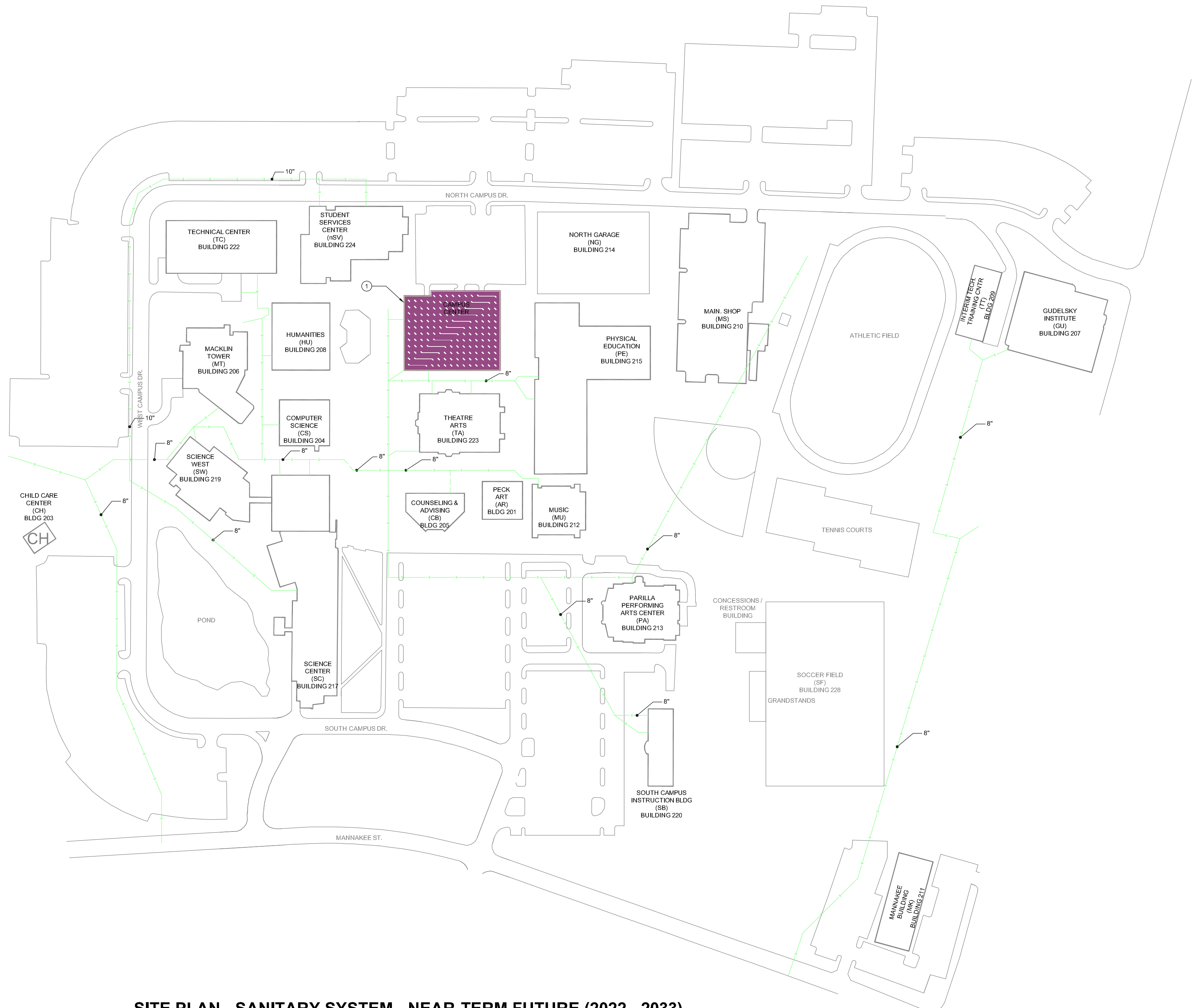
DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
SANITARY SYSTEM
EXISTING CONDITIONS

DRAWING NO:

P1.11

BKM# 19021.02



1 SITE PLAN - SANITARY SYSTEM - NEAR-TERM FUTURE (2022 - 2033)

SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NEW CAMPUS CENTER CONSTRUCTED IN 2033.

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 50' 100' 150' 200' 300'

SCALE: 1" = 100'

N

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PROJECT NAME:

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
SANITARY SYSTEM
NEAR-TERM FUTURE
(2022-2033)

DRAWING NO:

P1.12

BKM# 19021.02

Plotted By: Bill Jamieson | 6/17/2022 12:27 PM

ARL: G:\19021.02\Drawings\Acad\P\P112 - Site Plan - Sanitary - NT Conditions

1 SITE PLAN - SANITARY SYSTEM - LONG-TERM FUTURE (2034 - BEYOND)

SCALE: 1" = 100'-0"

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

N

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
SANITARY SYSTEM
LONG-TERM FUTURE
(2034-BEYOND)

DRAWING NO:
P1.13

BKM# 19021.02

1 **SITE PLAN - STORM SYSTEM - EXISTING CONDITIONS**

SCALE: 1" = 100'-0"

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
STORM SYSTEM
EXISTING CONDITIONS

DRAWING NO:

P1.21

BKM# 19021.02

ARL: G:\19021.02\Drawings\Acad\P\P121 - Site Plan - Storm Water - Existing Conditions

Plotted By: Bill Jamieson | 6/16/2022 8:00 AM

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

SITE PLAN - STORM SYSTEM - NEAR-TERM FUTURE (2022 - 2033)

1

SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NEW CAMPUS CENTER CONSTRUCTED IN 2033.

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 50' 100' 150' 200' 300'

SCALE: 1" = 100'

N

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
STORM SYSTEM
NEAR-TERM FUTURE
(2022-2033)

DRAWING NO:

P1.22

BKM# 19021.02

1 SITE PLAN - STORM SYSTEM - LONG-TERM FUTURE (2034 - BEYOND)

SCALE: 1" = 100'-0"

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
STORM SYSTEM
LONG-TERM FUTURE
(2034-BEYOND)

DRAWING NO:
P1.23

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

SCALE: 1" = 100'

BKM# 19021.02

Plotted By: Bill Jamieson | 6/16/2022 8:00 AM

ARL: G:\19021.02\Drawings\Acad\P\P123 - Site Plan - Storm Water - LT Conditions

1 SITE PLAN - NATURAL GAS - EXISTING CONDITIONS

SCALE: 1" = 100'-0"

DRAWING NOTES:

1. HIGH PRESSURE 24-36" TRANSCONTINENTAL GAS PIPELINE.
2. GAS METER.

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

SCALE: 1" = 100'

bkm
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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
NATURAL GAS
EXISTING CONDITIONS

DRAWING NO:
P1.31

BKM# 19021.02

1 SITE PLAN - NATURAL GAS - NEAR-TERM FUTURE (2022 - 2033)

SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NEW CAMPUS CENTER CONSTRUCTED IN 2033.
2. HIGH PRESSURE 24-36" WILLIAMS GAS TRANSCONTINENTAL GAS PIPELINE.

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

bkm
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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
NATURAL GAS
NEAR-TERM FUTURE
(2022-2033)

DRAWING NO:
P1.32

BKM# 19021.02

SITE PLAN - NATURAL GAS - LONG-TERM FUTURE (2034 - BEYOND)

1 SCALE: 1" = 100'-0"

DRAWING NOTES:

1. HIGH PRESSURE 24-36" WILLIAMS GAS TRANSCONTINENTAL GAS PIPELINE.

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'
SCALE: 1" = 100'

N

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Mechanical / Electrical Engineers
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PROJECT NAME:
Montgomery College

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Central Administration
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Rockville, MD 20850
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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
NATURAL GAS
LONG-TERM FUTURE
(2034-BEYOND)

DRAWING NO:
P1.33

BKM# 19021.02

bkm

Appendix 3
Mechanical Systems

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TABLE 3-1 - Cooling Loads - Existing Buildings

Year Built	Bldg Abbrev	Bldg Abbrev	Building Name	Bldg Area (GSF)	Cooling Estimated Load (Tons)	Cooling Load Factor (GSF/Ton)	Chiller Plant Capacity (Tons)	Notes
Humanities (HU) Central Plant Connected Loads								
1966	HU	208	Humanities Building	73,912	175	422	1,390	4
1966	PE	215	Physical Education	84,949	208	408	--	
1966	TC	222	Technical Center	55,908	149	375	--	
1966	TA	223	Theatre Arts	35,032	117	299	--	
1969	CB	205	Counseling & Advising	17,696	58	305	--	
1971	AR	201	Paul Peck Art Building	25,594	79	324	--	
1971	MT	206	Gordon & Marilyn Macklin Tower	117,282	332	354	--	
1971	MU	212	Music Building	21,050	82	257	--	
1992	GU	207	Gudelsky Institute for Technical Education	64,000	187	342	--	
1996	SB	220	South Campus Instruction Building	29,900	92	325	--	
			Total Connected Load/Capacity	525,323	1,479	--	1,390	
			Plant Capacity Surplus/(Shortage)	--	--	--	-89	
Student Services Center (SV) Satellite Plant Connected Loads								
2020	SV	224	Student Services Center	127,960	396	323	500	3
			Total Connected Load/Capacity	127,960	396	--	500	
			Plant Capacity Surplus/(Shortage)	--	--	--	104	
Science Center (SC) Satellite Plant Connected Loads								
1966	CS	204	Computer Science	20,862	64	326	--	
1971	SW	219	Science West	41,988	122	344	--	
2011	SC	217	Science Center	201,493	692	291	915	2
			Total Connected Load/Capacity	264,343	878	--	915	
			Plant Capacity Surplus/(Shortage)	--	--	--	37	
Campus Center (CC) Satellite Plant								
1966	CC	202	Campus Center	74,302	240	310	240	1
			Total Connected Load/Capacity	74,302	240	--	240	
			Plant Capacity Surplus/(Shortage)	--	--	--	0	
Parilla Performing Arts (PA) Satellite Plant								
1984	PA	213	Parilla Performing Arts Center	28,000	93	301	0	
			Total Connected Load/Capacity	28,000	93	--	0	
			Plant Capacity Surplus/(Shortage)	--	--	--	-93	
			Total Campus Connected Load/Capacity	**1,019,928**	**3,085**	**--**	**3,045**	
			Total Campus Capacity Surplus/(Shortage)	**--**	**--**	**--**	**-40**	
			Total Campus Peak Load (75%)	**--**	**2,315**	**--**	**--**	

Notes:
1. Building has its own chiller and does not require chilled water from the distribution loop/central plants.
2. Load includes Science East.
3. Building replaced the original Student Services Building in 2019.
4. Plant capacity includes chiller capacity (990 tons) plus ice melt capacity over an 8-hour period (550 tons). Techogen chiller considered to be decommissioned.
5. PA has its own chiller, but the chiller is not operational. Chiller is anticipated to be repaired and operational in 2023.

TABLE 3-2 - Cooling Loads - Near-Term Future Buildings (2022-2033)

Year Built	Year Renovated	Bldg Abbrev	Bldg Number	Building Name	Bldg Area (GSF)	Cooling Estimated Load (Tons)	Cooling Load Factor (GSF/Ton)	Chiller Plant Capacity (Tons)	Notes
Humanities (HU) Central Plant Connected Loads									
1966	2023	HU	208	Humanities Building	73,912	175	422	**1,784**	5
1966		PE	215	Physical Education	84,949	208	408	--	
1966		TC	222	Technical Center	55,908	149	375	--	
1966		TA	223	Theatre Arts	35,032	117	299	--	
1969		CB	205	Counseling & Advising	17,696	58	305	--	
1971		AR	201	Paul Peck Art Building	25,594	79	324	--	
1971	2023	MT	206	Gordon & Marilyn Macklin Tower	117,282	332	354	--	
1971		MU	212	Music Building	21,050	82	257	--	
1992		GU	207	Gudelsky Institute for Technical Education	64,000	187	342	--	
1996		SB	220	South Campus Instruction Building	29,900	92	325	--	
				Total Connected Load/Capacity	525,323	1,479	--	1,784	
				Plant Capacity Surplus/(Shortage)	--	--	--	306	
Student Services Center (SV) Satellite Plant Connected Loads									
2020		SV	224	Student Services Center	127,960	396	323	500	1
				Total Connected Load/Capacity	127,960	396	--	500	
				Plant Capacity Surplus/(Shortage)	--	--	--	104	
Science Center (SC) Satellite Plant Connected Loads									
1966		CS	204	Computer Science	20,862	64	326	--	
1971		SW	219	Science West	41,988	122	344	--	
2011		SC	217	Science Center	201,493	692	291	915	2
				Total Connected Load/Capacity	264,343	878	--	915	
				Plant Capacity Surplus/(Shortage)	--	--	--	37	
Campus Center (CC) Satellite Plant									
~~1966~~		**~~CC~~**	**~~202~~**	**~~Campus Center~~**	**--**	**--**	**--**	**--**	**3**
2033		**CC**	**--**	**Campus Center**	**128,000**	**415**	**308**	**460**	**1, 4**
				Total Connected Load/Capacity	128,000	415	--	460	
				Plant Capacity Surplus/(Shortage)	--	--	--	45	
Parilla Performing Arts (PA) Satellite Plant									
1984		PA	213	Parilla Performing Arts Center	28,000	93	301	110	6
				Total Connected Load/Capacity	28,000	93	--	110	
				Plant Capacity Surplus/(Shortage)	--	--	--	17	
				Total Campus Connected Load/Capacity	**1,073,626**	**3,260**	**--**	**3,770**	
				Total Campus Capacity Surplus/(Shortage)	**--**	**--**	**--**	**510**	
				Total Campus Peak Load (75%)	**--**	**2,445**	**--**	**--**	

Notes:
1. Building has its own chiller and does not require chilled water from the distribution loop/central plants.
2. Load includes Science East.
3. Building demolished in 2033.
4. Building to replace the existing Campus Center in 2033. Chiller plant is assumed to be sized to match building load +10%.
5. Plant capacity includes chiller capacity (1100 tons) plus increased ice melt capacity over an 8-hour period (820 tons) installed in 2023.
6. PA chiller plant anticipated to be repaired and back online by 2023.

TABLE 3-3 - Cooling Loads - Long-Term Future Buildings (2034-Beyond)

Year Built	Year Renovated	Bldg Abbrev	Bldg Number	Building Name	Bldg Area (GSF)	Cooling Estimated Load (Tons)	Cooling Load Factor (GSF/Ton)	Chiller Plant Capacity (Tons)	Notes
Humanities (HU) Central Plant Connected Loads									
1966	**2084**	HU	208	Humanities Building	73,912	175	422	1,784	9
1966	2093	PE	215	Physical Education	84,949	208	408	--	
~~**1966**~~		~~**TC**~~	~~**222**~~	~~**Technical Center**~~	--	--	--	--	**6**
1966		TA	223	Theatre Arts	35,032	117	299	--	
~~**1969**~~		~~**CB**~~	~~**205**~~	~~**Counseling & Advising**~~	**--**	**--**	**--**	**--**	**5**
1971		AR	201	Paul Peck Art Building	25,594	79	324	--	
1971	**2057**	MT	206	Gordon & Marilyn Macklin Tower	117,282	332	354	--	
1971		MU	212	Music Building	21,050	82	257	--	
1992		GU	207	Gudelsky Institute for Technical Education	64,000	187	342	--	
2063		**TBD**	**--**	**Technical Training Center**	**84,000**	**240**	**350**	**--**	**4**
2069		**TBD**	**--**	**Media Arts**	**48,000**	**160**	**300**	**--**	**4**
2075		**TBD**	**--**	**Humanities & Social Sciences**	**136,000**	**340**	**400**	**--**	**4**
				Total Connected Load/Capacity	689,819	1,920	--	1,784	
				Plant Capacity Surplus/(Shortage)	--	--	--	-135	
Student Cervices Center (SV) Satellite Plant Connected Loads									
2020		SV	224	Student Services Center	127,960	396	323	500	1
				Total Connected Load/Capacity	127,960	396	--	500	
				Plant Capacity Surplus/(Shortage)	--	--	--	104	
Science Center (SC) Satellite Plant Connected Loads									
1966	**2090**	CS	204	Computer Science	20,862	64	326	--	
1971		SW	219	Science West	41,988	122	344	--	
2011		SC	217	Science Center	201,493	692	291	915	2
				Total Connected Load/Capacity	264,343	878	--	915	
				Plant Capacity Surplus/(Shortage)	--	--	--	37	
Campus Center (CC) Satellite Plant									
~~1966~~		~~CC~~	~~202~~	~~Campus Center~~	--	--	--	--	3
2033		**CC**	**--**	**Campus Center**	**128,000**	**415**	**308**	**460**	**1, 4**
				Total Connected Load/Capacity	128,000	415	--	460	
				Plant Capacity Surplus/(Shortage)	--	--	--	45	
Parilla Performing Arts (PA) Satellite Plant									
1984	**2087**	**PA**	**213**	**Parilla Performing Arts Center**	**56,325**	**188**	**300**	**490**	**1, 7**
1996		SB	220	South Campus Instruction Building	29,900	92	325	--	**8**
1985	**2096**	**MK**	**211**	**Mannakee Building**	**42,102**	**165**	**255**	**--**	**8**
				Total Connected Load/Capacity	128,327	445	--	490	
				Plant Capacity Surplus/(Shortage)	--	--	--	45	
				Total Campus Connected Load/Capacity	**1,338,449**	**4,055**	**--**	**4,150**	
				Total Campus Capacity Surplus/(Shortage)	**--**	**--**	**--**	**95**	
				Total Campus Peak Load (75%)	**--**	**3,040**	**--**	**--**	

Notes:
1. Building has its own chiller and does not require chilled water from the distribution loop/central plants.
2. Load includes Science East.
3. Building demolished in 2033.
4. New building. Cooling load estimated.
5. Building demolished in 2069.
6. Building demolished in 2075.
7. Building to undergo a renovation and addition in 2087. It is recommended that the chiller plant capacity be increased to create a south campus loop.
8. Building recommended to be added to the south campus loop in 2087.
9. Plant capacity includes chiller capacity (990 tons) plus ice melt capacity over an 8-hour period (550 tons).

TABLE 3-4 - Heating Loads - Existing Buildings

Year Built	Bldg Abbrev	Bldg Number	Building Name	Bldg Area (GSF)	Heating Estimated Load (MBH)	Heating Load Factor (BTUH/GSF)	Boiler Plant Capacity (MBH)	Notes
Student Services Center (SV) Central Plant Connected Loads								
1966	CC	202	Campus Center	74,302	2,240	30	--	
1966	HU	208	Humanities Building	73,912	1,697	23	--	5
1966	PE	215	Physical Education	84,949	2,819	33	--	
~~1966~~	~~SV~~	~~221~~	~~Student Services Building~~	--	--	--	--	3
2020	SV	--	Student Services Center	127,960	4,259	33	28,200	4
1966	TC	222	Technical Center	55,908	1,550	28	--	
1966	TA	223	Theatre Arts	35,032	1,092	31	--	
1969	CB	205	Counseling & Advising	17,696	624	35	--	
1971	AR	201	Paul Peck Art Building	25,594	773	30	--	
1971	MT	206	Gordon & Marilyn Macklin Tower	117,282	3,249	28	--	
1971	MU	212	Music Building	21,050	799	38	--	
1984	PA	213	Parilla Performing Arts Center	28,000	874	31	--	
1992	GU	207	Gudelsky Institute for Technical Education	64,000	2,112	33	--	
1996	SB	220	South Campus Instruction Building	29,900	897	30	--	
			Total Connected Load/Capacity	755,585	22,984	--	28,200	
			Plant Capacity Surplus/(Shortage)	--	--	--	5,216	
Science Center (SC) Satellite Plant Connected Loads								
1966	CS	204	Computer Science	20,862	595	29	--	
1971	SW	219	Science West	41,988	1,246	30	--	1
2011	SC	217	Science Center	201,493	6,406	32	10,440	2
			Total Connected Load/Capacity	264,343	8,247	--	10,440	
			Plant Capacity Surplus/(Shortage)	--	--	--	2,193	
			Total Campus Connected Load/Capacity	**1,019,928**	**31,232**	**--**	**38,640**	
			Total Campus Capacity Surplus/(Shortage)	**--**	**--**	**--**	**7,408**	
			Total Campus Peak Load (80%)	**--**	**24,985**	**--**	**--**	

Notes:
1. Building renovated in 2014.
2. Load includes Science East.
3. Building demolished in 2020.
4. Building has four boilers currently installed (2,610 MBH each) with space and infrastructure available for two more boilers which are not accounted for in this calculation.
5. Plant has a capacity of 23,936 MBH, but was decommissioned in 2020.

TABLE 3-5 - Heating Loads - Near-Term Future Buildings (2022-2033)

Year Built	Year Renovated	Bldg Abbrev	Bldg Number	Building Name	Bldg Area (GSF)	Heating Estimated Load (MBH)	Heating Load Factor (BTUH/GSF)	Boiler Plant Capacity (MBH)	Notes
Student Services Center (SV) Central Plant Connected Loads									
~~1966~~		**~~CC~~**	**~~202~~**	**~~Campus Center~~**	**--**	**--**	**--**	**--**	**4**
2033		**CC**	**--**	**Campus Center**	**128,000**	**3,840**	**30**	**--**	**5**
1966	2022	HU	208	Humanities Building	73,912	1,697	23	--	1
1966		PE	215	Physical Education	84,949	2,819	33	--	
~~1966~~		~~SV~~	~~221~~	~~Student Services Building~~	--	--	--	--	3
2020		SV	--	Student Services Center	127,960	4,259	33	28,200	6
1966		TC	222	Technical Center	55,908	1,550	28	--	
1966		TA	223	Theatre Arts	35,032	1,092	31	--	
1969		CB	205	Counseling & Advising	17,696	624	35	--	
1971		AR	201	Paul Peck Art Building	25,594	773	30	--	
1971	2023	MT	206	Gordon & Marilyn Macklin Tower	117,282	3,249	28	--	
1971		MU	212	Music Building	21,050	799	38	--	
1984		PA	213	Parilla Performing Arts Center	28,000	874	31	--	
1992		GU	207	Gudelsky Institute for Technical Education	64,000	2,112	33	--	
1996		SB	220	South Campus Instruction Building	29,900	897	30	--	
				Total Connected Load/Capacity	809,283	24,584	--	28,200	
				Plant Capacity Surplus/(Shortage)	--	--	--	3,616	
Science Center (SC) Satellite Plant Connected Loads									
1966		CS	204	Computer Science	20,862	595	29	--	
1971		SW	219	Science West	41,988	1,246	30	--	
2011		SC	217	Science Center	201,493	6,406	32	10,440	2
				Total Connected Load/Capacity	264,343	8,247	--	10,440	
				Plant Capacity Surplus/(Shortage)	--	--	--	2,193	
				Total Campus Connected Load/Capacity	**1,073,626**	**32,832**	**--**	**38,640**	
				Total Campus Capacity Surplus/(Shortage)	**--**	**--**	**--**	**5,808**	
				Total Campus Peak Load (80%)	**--**	**26,265**	**--**	**--**	

Notes:
1. Boiler plant decommissioned starting in 2020.
2. Load includes Science East.
3. Building demolished in 2020.
4. Building demolished in 2033.
5. Building to replace the existing Campus Center in 2033.
6. Building has four boilers currently installed (2,610 MBH each) with space and infrastructure available for two more boilers which are not accounted for in this calculation.

TABLE 3-6 - Heating Loads - Long-Term Future Buildings (2034-Beyond)

Year Built	Year Renovated	Bldg Abbrev	Bldg Number	Building Name	Bldg Area (GSF)	Heating Estimated Load (MBH)	Heating Load Factor (BTUH/GSF)	Boiler Plant Capacity (MBH)	Notes
Student Services Center (SV) Central Plant Connected Loads									
~~1966~~		**~~CC~~**	**~~202~~**	**~~Campus Center~~**	**--**	**--**	**--**	**--**	**4**
2033		**CC**	--	**Campus Center**	**128,000**	**3,840**	**30**	**--**	**5**
1966	**2084**	HU	208	Humanities Building	73,912	1,697	23	--	1
1966		PE	215	Physical Education	84,949	2,819	33	--	
~~1966~~		~~SV~~	~~221~~	~~Student Services Building~~	--	--	--	--	3
2019		SV	--	Student Services Center	127,960	4,259	33	28,200	11
~~1966~~		**~~TC~~**	**~~222~~**	**~~Technical Center~~**	**--**	**--**	**--**	**--**	**8**
1966		TA	223	Theatre Arts	35,032	1,092	31	--	
~~1969~~		**~~CB~~**	**~~205~~**	**~~Counseling & Advising~~**	**--**	**--**	**--**	**--**	**7**
1971		AR	201	Paul Peck Art Building	25,594	773	30	--	
1971	**2057**	MT	206	Gordon & Marilyn Macklin Tower	117,282	3,249	28	--	
1971		MU	212	Music Building	21,050	799	38	--	
1992		GU	207	Gudelsky Institute for Technical Education	64,000	2,112	33	--	
2063		**TBD**	--	**Technical Training Center**	**84,000**	**2,520**	**30**	**--**	**6**
2069		**TBD**	--	**Media Arts**	**48,000**	**1,440**	**30**	**--**	**6**
2075		**TBD**	**--**	**Humanities & Social Sciences**	**136,000**	**3,400**	**25**	**--**	**6**
				Total Connected Load/Capacity	945,779	28,000	--	28,200	
				Plant Capacity Surplus/(Shortage)	--	--	--	200	
Science Center (SC) Satellite Plant Connected Loads									
1966	**2090**	CS	204	Computer Science	20,862	595	29	--	
1971		SW	219	Science West	41,988	1,246	30	--	
2011		SC	217	Science Center	201,493	6,406	32	10,440	2
				Total Connected Load/Capacity	264,343	8,247	--	10,440	
				Plant Capacity Surplus/(Shortage)	--	--	--	2,193	
Parillia Performing Arts (PA) Satellite Plant Connected Loads									
1984	**2087**	PA	213	Parilla Performing Arts Center	**56,325**	**1,805**	**32**	**4,700**	**9**
1996		SB	220	South Campus Instruction Building	29,900	897	30	--	**10**
1985	**2096**	**MK**	**211**	**Mannakee Building**	**42,102**	**1,937**	**46**	**--**	**10**
				Total Connected Load/Capacity	128,327	4,639	--	4,700	
				Plant Capacity Surplus/(Shortage)	--	--	--	61	
				Total Campus Connected Load/Capacity	**1,338,449**	**40,886**	**--**	**43,340**	
				Total Campus Capacity Surplus/(Shortage)	**--**	**--**	**--**	**2,454**	
				Total Campus Peak Load (80%)	**--**	**32,709**	**--**	**--**	

Notes:
1. Boiler plant decommissioned starting in 2020.
2. Load includes Science East.
3. Building demolished in 2020.
4. Building demolished in 2033.
5. Building to replace the existing Campus Center in 2033.
6. New building. Heating load estimated.
7. Building demolished in 2069.
8. Building demolished in 2075.
9. Building to undergo a renovation and addition in 2087. It is recommended that the boiler plant be added and capacity sized to to create a south campus loop.
10. Building recommended to be added to the south campus loop in 2087.
11. Building has four boilers currently installed (2,610 MBH each) with space and infrastructure available for two more boilers which are not accounted for in this calculation.

TABLE 3-7 - Cooling Plants - Existing Equipment

Tag	Unit	Manufacturer	Year Installed	Entering Water Temp (°F)	Leaving Water Temp (°F)	Pump Motor (HP)	Flow Rate (GPM)	Pressure (FT HD)	Cooling Tower Capacity (Tons)	Normal Chiller Capacity (Tons)	Ice Making Chiller Capacity (Tons)	Ice Storage Latent Capacity (Tons-Hrs)	Heat Exchanger Capacity (Tons)
Humanities (HU) Central Plant:													
CT-1	Cooling Tower, VFD	BAC	2020	95	85	--	1800	--	600	--	--	--	--
CT-2	Cooling Tower, VFD	BAC	2020	95	85	--	1800	--	600	--	--	--	--
P-6A	Condenser Water Pump	Bell & Gossett	1992?	--	--	40	1140	1140	--	--	--	--	--
P-6B	Condenser Water Pump	Bell & Gossett	1992?	--	--	40	1140	1140	--	--	--	--	--
CH-1	Gas Engine Rotary Chiller	Tecogen	1992	50/26	39/20	--	336	--	--	(Note 1)	--	--	--
CH-2	Ammonia, Rotary Screw Chiller (210 ice-build / 390 chilled water)	IRS/Frick	1994	50/26	39/20	--	875	--	--	390	210	--	--
CH-3	Ammonia, Rotary Screw Chiller (240 ice-build / 450 chilled water)	IRS/Frick	1997	50/26	39/20	--	875	--	--	450	240	--	--
P-5B	Primary Chilled Water Pump	Bell & Gossett	1992?	--	--	40	875	115	--	--	--	--	--
P-5C	Primary Chilled Water Pump, VFD	Bell & Gossett	1992?	--	--	100	2400	115	--	--	--	--	--
P-4A	Secondary Chilled Water Pump, VFD	Bell & Gossett	1992?	--	--	40	1800	65	--	--	--	--	--
P-4B	Secondary Chilled Water Pump, VFD	Bell & Gossett	1992?	--	--	40	1800	65	--	--	--	--	--
Ice Mod #1	Ice Storage Module	BAC	1993	22	31	--	438	--	--	--	--	1,095	--
Ice Mod #2	Ice Storage Module	BAC	1993	22	31	--	438	--	--	--	--	1,095	--
Ice Mod #3	Ice Storage Module	BAC	1995	22	31	--	438	--	--	--	--	1,095	--
Ice Mod #4	Ice Storage Module	BAC	1995	22	31	--	438	--	--	--	--	1,095	--
HX-1	Glycol-Chilled Water Plate & Frame Heat Exchanger	Tranter	1992	--	--	--	--	--	--	--	--	--	960
HX-2	Glycol-Chilled Water Plate & Frame Heat Exchanger	Tranter	2000's	--	--	--	--	--	--	--	--	--	960
Total HU Central Plant Equipment Capacity:									**1,200**	**840**	**450**	**4,380**	**1,920**
Student Services Center (SV) Satellite Plant:													
CT-1	Cooling Tower, VFD	BAC	2019	100	85	--	1740	--	870	--	--	--	--
P-1	Condenser Water Pump, VFD	Bell & Gossett	2019	--	--	25	825	85	--	--	--	--	--
P-2	Condenser Water Pump, VFD	Bell & Gossett	2019	--	--	25	825	85	--	--	--	--	--
WCC-1	Centrifugal Chiller	Carrier	2019	50	39	--	550	20	--	250	--	--	--
WCC-2	Centrifugal Chiller	Carrier	2019	50	39	--	550	20	--	250	--	--	--
P-3	Primary Chilled Water Pump, VFD	Bell & Gossett	2019	--	--	15	550	55	--	--	--	--	--
P-4	Primary Chilled Water Pump, VFD	Bell & Gossett	2019	--	--	15	550	55	--	--	--	--	--
Total SV Satellite Plant Equipment Capacity:									**870**	**500**	**0**	**0**	**0**

TABLE 3-7 - Cooling Plants - Existing Equipment

Tag	Unit	Manufacturer	Year Installed	Entering Water Temp (°F)	Leaving Water Temp (°F)	Pump Motor (HP)	Flow Rate (GPM)	Pressure (FT HD)	Cooling Tower Capacity (Tons)	Normal Chiller Capacity (Tons)	Ice Making Chiller Capacity (Tons)	Ice Storage Latent Capacity (Tons-Hrs)	Heat Exchanger Capacity (Tons)
Science Center (SC) Satellite Plant:													
CT-1	Cooling Tower, VFD	BAC	2011	100	85	--	580	--	290	--	--	--	--
CT-2	Cooling Tower, VFD	BAC	2011	100	85	--	580	--	290	--	--	--	--
CT-3	Cooling Tower, VFD	BAC	2011	100	85	--	580	--	290	--	--	--	--
P-3A	Condenser Water Pump, VFD	Bell & Gossett	2011	--	--	40	1735	60	--	--	--	--	--
P-3B	Condenser Water Pump, VFD	Bell & Gossett	2011	--	--	40	1735	60	--	--	--	--	--
CH-1	Electric Mag Lev Chiller, VFD	McQuay	2011	60	42	--	410	15	--	305	--	--	--
CH-2	Electric Mag Lev Chiller, VFD	McQuay	2011	60	42	--	410	15	--	305	--	--	--
CH-3	Electric Mag Lev Chiller, VFD	McQuay	2011	60	42	--	410	15	--	305	--	--	--
P-1A	Primary Chilled Water Pump, VFD	Bell & Gossett	2011	--	--	20	745	50	--	--	--	--	--
P-1B	Primary Chilled Water Pump, VFD	Bell & Gossett	2011	--	--	20	745	50	--	--	--	--	--
								Total SC Satellite Plant Equipment Capacity:	**870**	**915**	**0**	**0**	**0**
Campus Center (CC) Satellite Plant:													
CT-1	Cooling Tower, VFD	BAC	2005	95	85	--	720	--	240	--	--	--	--
P-4	Condenser Water Pump	Bell & Gossett	2005?	--	--	15	720	65	--	--	--	--	--
CH-1	Chiller	Carrier	2005	42	58	--	360	22	--	240	--	--	--
P-3	Primary Chilled Water Pump	Bell & Gossett	2005?	--	--	20	360	100	--	--	--	--	--
								Total CC Satellite Plant Equipment Capacity:	**0**	**240**	**0**	**0**	**0**
Parilla Performing Arts (PA) Satellite Chiller:													
CH-1	Reciprocating Chiller	Carrier	2009	55	41	--	252	9	--	110	--	--	--
CWP-1	Chilled Water Pump	Bell & Gossett	2009	--	--	3	170	35	--	--	--	--	--
CWP-2	Chilled Water Pump	Bell & Gossett	2009	--	--	5	170	65	--	--	--	--	--
CWP-3	Chilled Water Pump	Bell & Gossett	2009	--	--	5	170	65	--	--	--	--	--
								Total PA Satellite Plant Equipment Capacity:	**0**	**110**	**0**	**0**	**0**

Total HU Central Plant Cooling Capacity:	**1,390**	**(Note 2)**
Total SC Satellite Plant Cooling Capacity:	**500**	
Total SV Satellite Plant Cooling Capacity:	**915**	
Total CC Satellite Chiller Cooling Capacity:	**240**	
Total PA Satellite Chiller Cooling Capacity:	**0**	**(Note 3)**
Total Campus Chilled Water System Capacity:	**3,045**	

General Notes:
A. Capacity values equal nominal equipment capacity. Redundancy and equipment derating is not factored in.

Specific Notes:
1. The Tecogen chiller (CH-1) has a capacity of 150-tons (cooling) and 80-tons (ice making), but has not been run in for several years and is considered to be decommissioned.
2. Includes 550 tons provided by ice melt system.
3. Chiller provides 110 tons of cooling, but is not currently operational. Expected to be operational in 2023.

TABLE 3-8 - Heating Plants - Existing Equipment

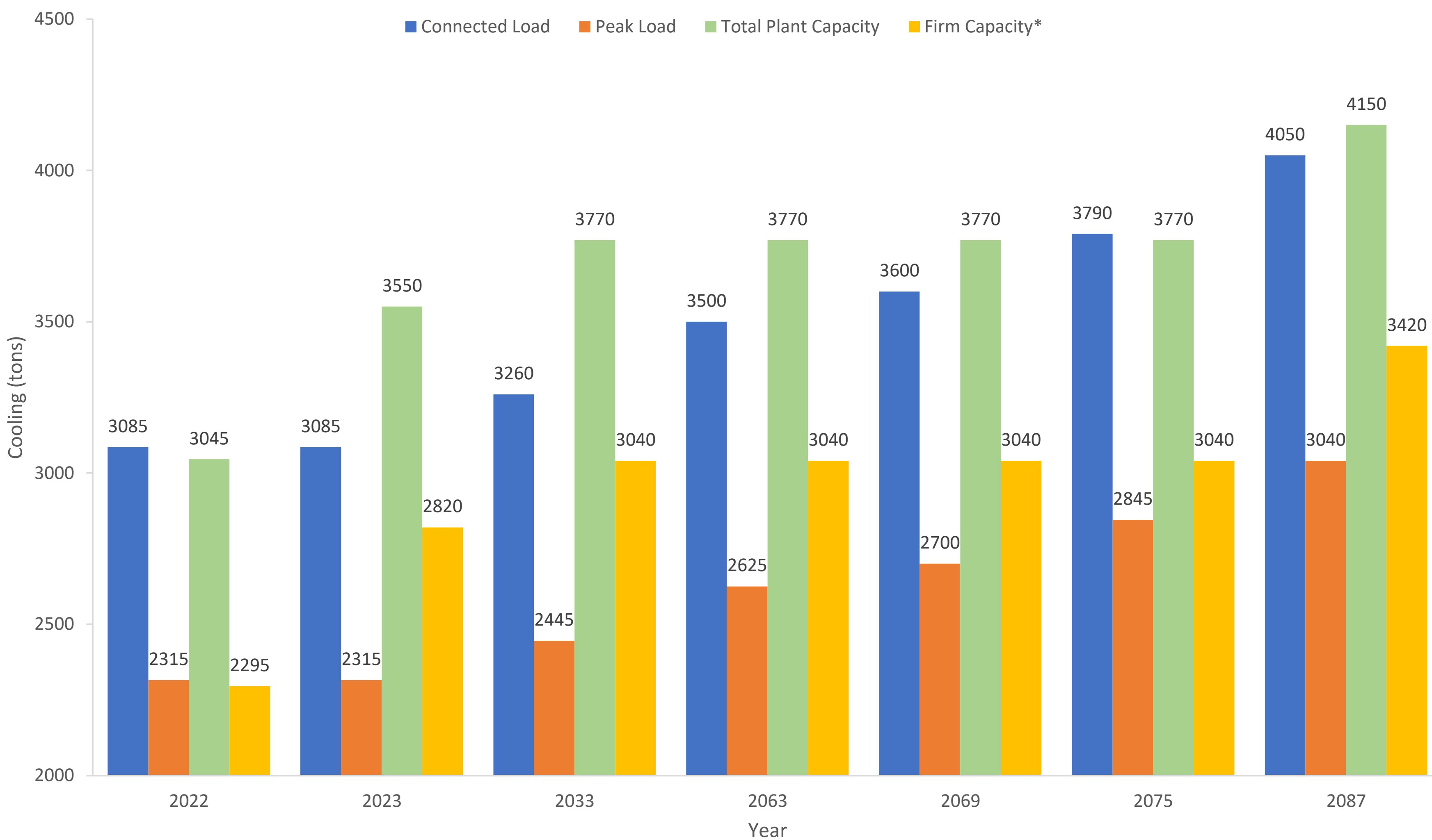
Tag	Unit	Manufacturer	Year Installed	Entering Water Temp (°F)	Leaving Water Temp (°F)	Pump Motor (HP)	Flow (GPM)	Pressure (FT HD)	Boiler Capacity (MBH Output)
Humanities (HU) Central Plant:									
Boiler # 1	Firetube, NG/No. 2 Oil (100 BHP)	Cleaver-Brooks	1987	170	200	--	225	--	3,348
Boiler # 2	Firetube, NG/No. 2 Oil (100 BHP)	Cleaver-Brooks	1987	170	200	--	225	--	3,348
Boiler # 3	Firetube, NG/No. 2 Oil (100 BHP)	Cleaver-Brooks	1987	170	200	--	225	--	3,348
Boiler # 4	Firetube, NG/No. 2 Oil (400 BHP)	Cleaver-Brooks	1994	170	200	--	895	--	13,392
Chiller # 1	Gas Engine Rotary Chiller, NG	Tecogen	1992	170	200	--	0	--	0
P-1A	Primary Heating Water Pump, VFD	Bell & Gossett	1987?	--	--	30	1385	65	--
P-1B	Primary Heating Water Pump, VFD	Bell & Gossett	1987?	--	--	30	1385	65	--
								Total HU Central Plant Equipment Capacity:	23,436
Student Services Center (SV) Satellite Plant:									
B-1	Fulton Condensing, NG Boiler	Fulton	2019	160	180	--	560	--	5,640
B-2	Fulton Condensing, NG Boiler	Fulton	2019	160	180	--	560	--	5,640
B-3	Fulton Condensing, NG Boiler	Fulton	2019	160	180	--	560	--	5,640
B-4	Fulton Condensing, NG Boiler	Fulton	2019	160	180	--	560	--	5,640
B-5	Fulton Condensing, NG Boiler	Fulton	2019	160	180	--	560	--	5,640
B-6	NG Boiler (future)	--	--	--	--	--	--	--	--
B-7	NG Boiler (future)	--	--	--	--	--	--	--	--
P-9	Primary Heating Water Pump, VFD	Bell & Gossett	2019	--	--	40	725	130	--
P-10	Primary Heating Water Pump, VFD	Bell & Gossett	2019	--	--	40	725	130	--
P-11	Primary Heating Water Pump, VFD	Bell & Gossett	2019	--	--	40	725	130	--
P-12	Primary Heating Water Pump (future)	--	--	--	--	--	--	--	--
P-13	Primary Heating Water Pump (future)	--	--	--	--	--	--	--	--
								Total SV Satellite Plant Equipment Capacity:	28,200
Science Center (SC) Satellite Plant:									
Boiler # 1	Aerco Condensing, NG Boiler	Aerco	2011	160	180	--	260	--	2,610
Boiler # 2	Aerco Condensing, NG Boiler	Aerco	2011	160	180	--	260	--	2,610
Boiler # 3	Aerco Condensing, NG Boiler	Aerco	2013	160	180	--	260	--	2,610
Boiler # 4	Aerco Condensing, NG Boiler	Aerco	2013	160	180	--	260	--	2,610
P-4A	Primary Heating Water Pump, VFD	Bell & Gossett	2011	--	--	15	525	65	--
P-4B	Primary Heating Water Pump, VFD	Bell & Gossett	2011	--	--	15	525	65	--
								Total SC Satellite Plant Equipment Capacity:	10,440

Total HU Bldg Boiler Capacity:	**0**	**(Note 1)**
Total SV Bldg Boiler Capacity:	**28,200**	**(Note 2)**
Total SC Bldg Boiler Capacity:	**10,440**	
Total Campus Heating System Boiler Capacity:	**38,640**	
Total Campus Heating System Boiler Capacity (minus HU):	**38,640**	

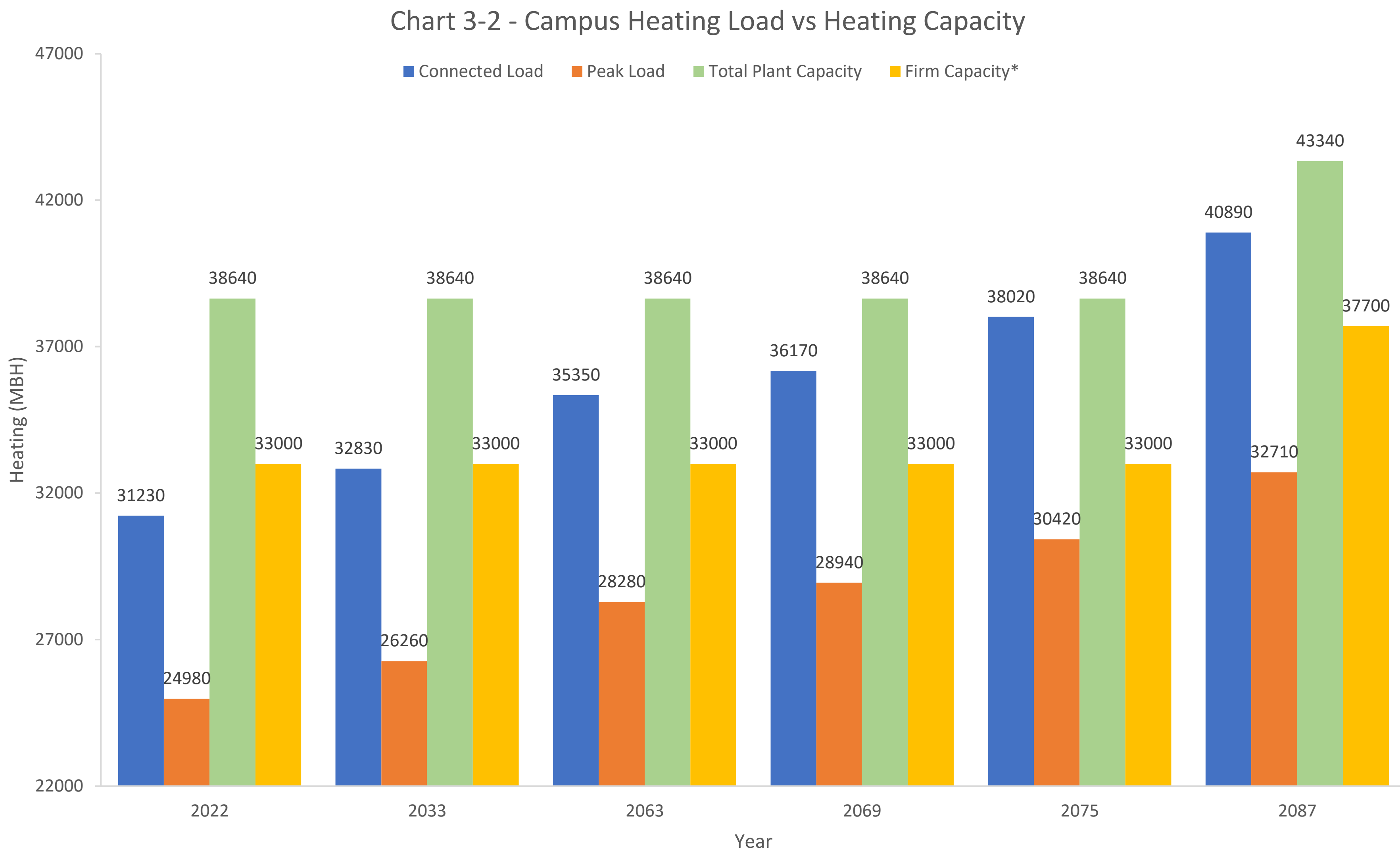
General Notes:
A. Boiler capacity equals the total connected rated equipment capacity. Redundancy and equipment derating is not factored in.

Specific Notes:
1. HU plant is considered decommissioned and will be demolished in the near future. This includes the Techogen chiller.
2. The SV plant includes the space and infrastructure required to install 2 future boilers and 2 future heating water pumps. Projected equipment capacities of those 2 additional boilers are not included in this table.

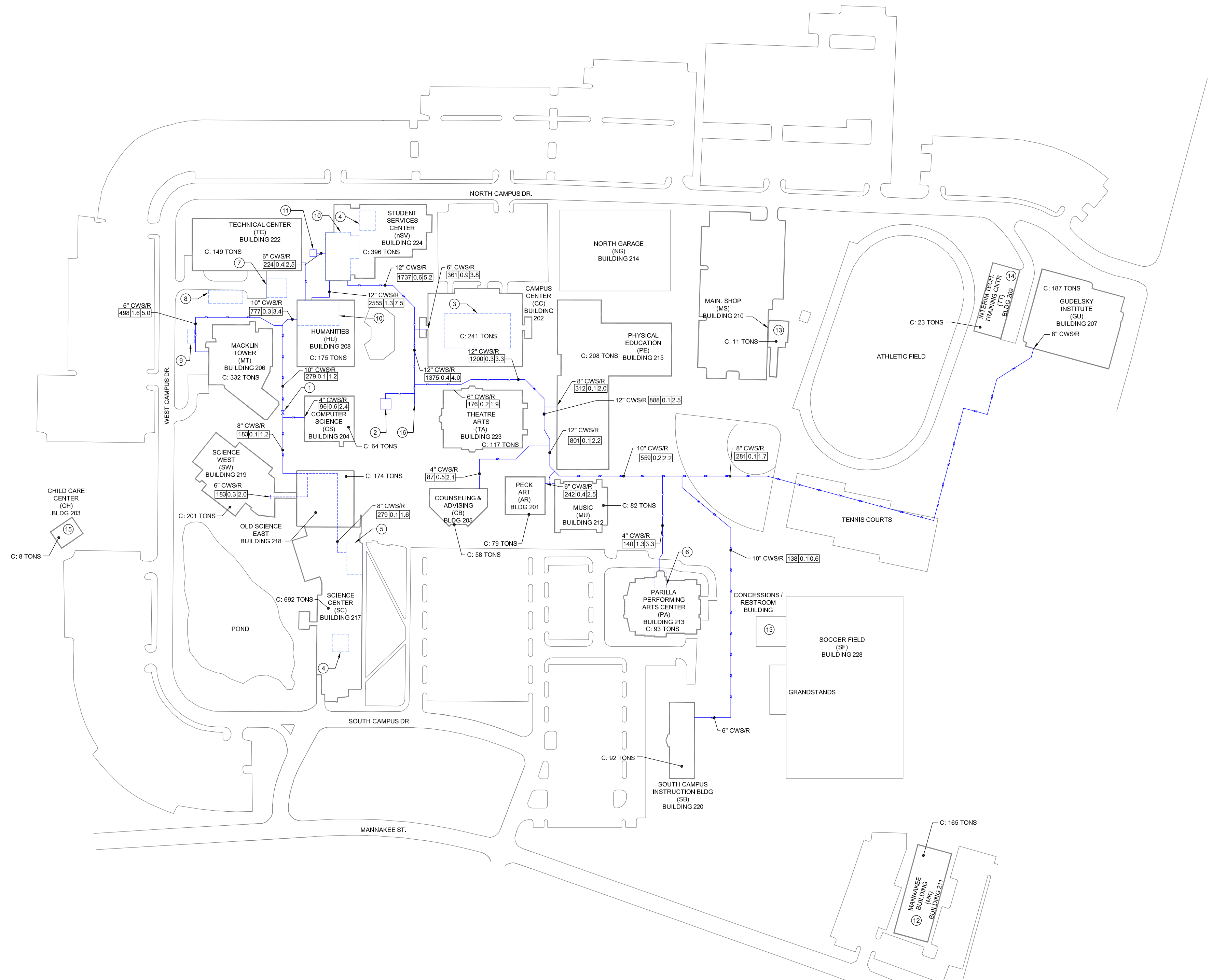
Chart 3-1 - Campus Cooling Load vs Cooling Capacity



2020 - Existing condition following SV construction and demolition of the old Student Services Building with PA chiller offline
2022 - Demolition of HU boiler plant, installation of new HU chiller, one new HU ice module, increased ice-making duration, and PA chiller brought back online
2033 - Demolition of CC and completion of the new Campus Center with chiller plant
2063 - Completion of the new Technical Training Center
2069 - Demolition of CB and completion of the new Media Arts Building
2075 - Demolition of TC and completion of the new Humanities and Social Sciences Building
2087 - Completion of the addition to PA including new chiller plant and construction of the South Loop with connection to MK and SB
*Firm capacity assumes the loss of the 450-ton Frick chiller (CH-1) at HU which results in the subsequent loss of 240 tons of cooling via ice melt



2022 - Existing condition with HU plant decommissioned
2033 - Demolition of CC, and completion of the new Campus Center
2063 - Completion of the new Technical Training Center
2069 - Demolition of CB and completion of the new Media Arts Building
2075 - Demolition of TC and completion of the new Humanities and Social Sciences Building
2087 - Completion of the addition to PA including new boiler plant and construction of the South Loop with connection to MK and SB
*Firm capacity assumes the loss of any boiler at SV.
Note - The SV plant includes space and infrastructure for the installation of 2 future boilers. Those boilers are not included in this chart.



① SITE PLAN - CHILLED WATER - EXISTING CONDITIONS

SCALE: 1" = 100'-0"

GENERAL NOTES:

1. THESE DRAWINGS ARE DIAGRAMMATIC FOR PLANNING PURPOSES ONLY, FOR EXACT LOCATION AND SIZE OF UTILITY INFRASTRUCTURE, REFER TO SUB-SURFACE ENGINEERING STUDIES AND UTILITY LOCATING SERVICES.
2. REFER TO TABLES 2-1 THROUGH 2-3 FOR CHILLED WATER LOAD SUMMARIES AND TABLE 2-7 FOR COOLING EQUIPMENT SUMMARY.

DRAWING NOTES:

(1) NORMALLY CLOSED SHUT-OFF VALVES WITHIN PIPING VAULT. PIPING SCHEDULED TO BE REPLACED SUMMER 2021.
(2) VALVE VAULT WITH 6" CHILLED WATER MAINS CAPPED FOR FUTURE CONNECTION.
(3) SATELLITE CHILLER PLANT LOCATED IN PENTHOUSE. COOLING TOWER MOUNTED ON ROOF.
(4) COOLING TOWER MOUNTED ON ROOF.
(5) SATELLITE CHILLER PLANT LOCATED IN 1ST FLOOR MECHANICAL ROOM.
(6) SATELLITE CHILLER PLANT LOCATED IN 1ST FLOOR MECHANICAL ROOM WITH AIR COOLED CHILLER LOCATED ON GRADE.
(7) GRADE MOUNTED COOLING TOWERS, NEW SPRING 2020, SERVING HUMANITIES BUILDING WATER COOLED CHILLERS.
(8) FOUR GRADE MOUNTED ICE MODULES.
(9) GRADE MOUNTED SUPPLEMENTAL CHILLER SERVING MACKLIN TOWER MCTV SUITE.
(10) SATELLITE CHILLER PLANT LOCATED IN BASEMENT MECHANICAL ROOM.
(11) PIPING VAULT FOR FUTURE CONNECTION TO TC.
(12) BUILDING SERVED BY TO PACKAGED DX ROOF TOP UNITS.
(13) BUILDING SERVED BY DX SPLIT SYSTEMS.
(14) BUILDING SERVED BY HEAT PUMPS.
(15) BUILDING SERVED BY A PACKAGED DX ROOFTOP UNIT.
(16) CAPPED CHILLED WATER MAINS.

LEGEND:

FLOW RATE	WATER PRESSURE	VELOCITY
GPM	FT HD/100 LF	FPS

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 50' 100' 150' 200' 300'

SCALE: 1" = 100'

N

ARL: G:\19021.02\Drawings\Acad\M\M1.01 - Site Plan - Chilled Water - Existing Conditions

Plotted By: Bill Jamieson | 6/16/2022 7:36 AM

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

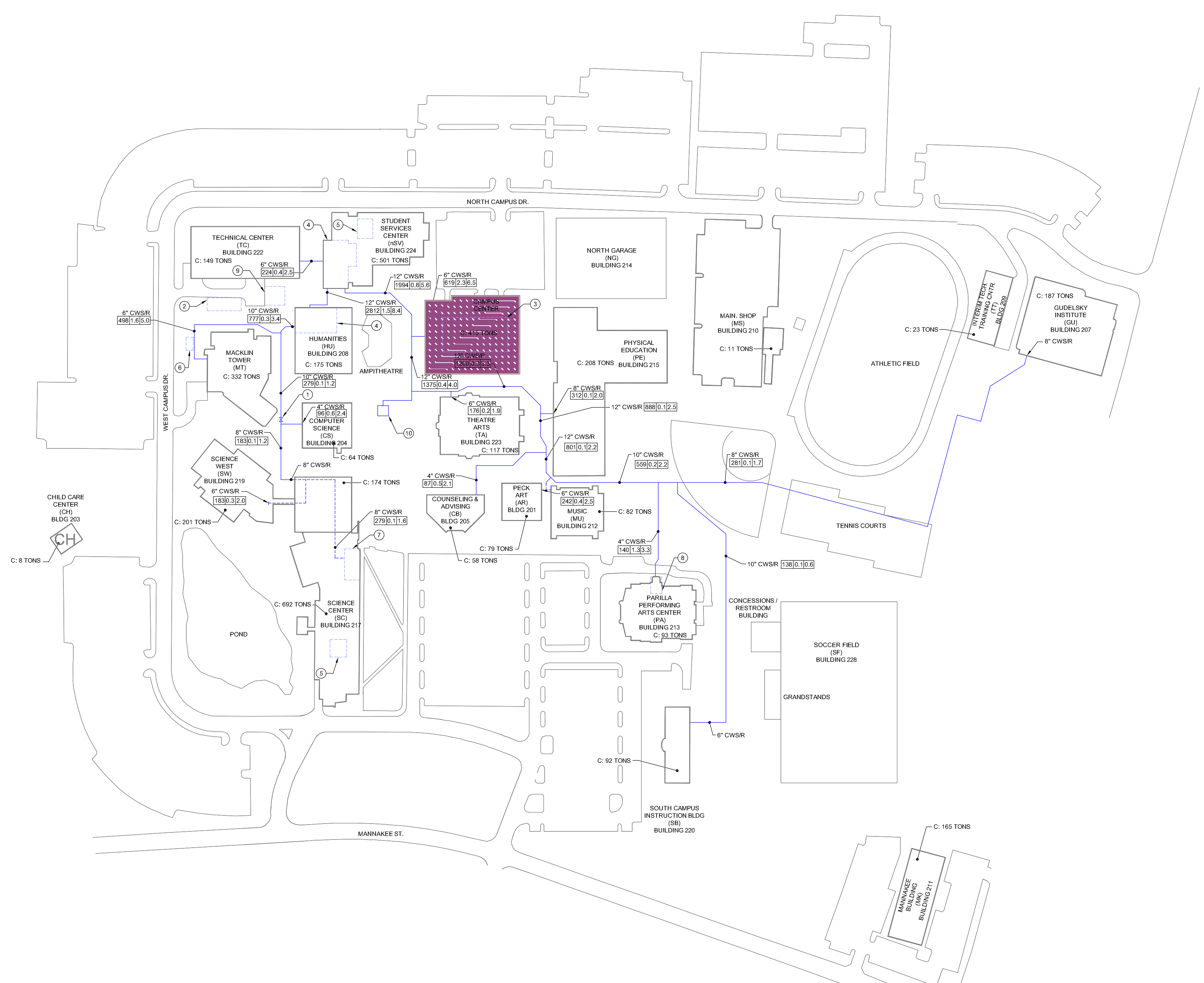
CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
CHILLED WATER
EXISTING CONDITIONS

DRAWING NO:
M1.01

BKM# 19021.02



SITE PLAN - CHILLED WATER - NEAR-TERM FUTURE (2022-2033)

1 SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NORMALLY CLOSED SHUT-OFF VALVES WITHIN PIPING VAULT.
2. GRADE MOUNTED ICE MODULES.
3. NEW CAMPUS CENTER BUILDING ASSUMED TO INCLUDE CHILLER PLANT SIZED FOR BUILDING LOAD SIMILAR TO THE ORIGINAL CAMPUS CENTER BUILDING.
4. CENTRAL CHILLER LOCATED IN BASEMENT MECHANICAL ROOM.
5. ROOF MOUNTED COOLING TOWER.
6. GRADE MOUNTED STANDALONE CHILLER SERVING MACKLIN TOWER.
7. CENTRAL CHILLER PLANT LOCATED IN 1ST FLOOR MECHANICAL ROOM.
8. SATELLITE CHILLER PLANT LOCATED IN 1ST FLOOR MECHANICAL ROOM WITH AIR COOLED CHILLER LOCATED ON GRADE.
9. GRADE MOUNTED COOLING TOWERS SERVING HUMANITIES BUILDING WATER COOLED CHILLERS.
10. VALVE VAULT WITH 10" CHILLED AND HEATING WATER MAINS CAPPED FOR FUTURE CONNECTION.

LEGEND:

FLOW RATE	WATER PRESSURE	VELOCITY
GPM	FT HD/100 LF	FPS

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
CHILLED WATER
NEAR-TERM FUTURE
(2022-2033)

DRAWING NO:

M1.02

BKM# 19021.02

1 SITE PLAN - CHILLED WATER - LONG-TERM FUTURE (2034-BEYOND)

SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NORMALLY CLOSED SHUT-OFF VALVES WITHIN PIPING VAULT.
2. GRADE MOUNTED STANDALONE CHILLER SERVING MACKLIN TOWER.
3. NEW CAMPUS CENTER BUILDING ASSUMED TO INCLUDE CHILLER PLANT SIZED FOR BUILDING LOAD SIMILAR TO THE ORIGINAL CAMPUS CENTER BUILDING.
4. CENTRAL CHILLER LOCATED IN BASEMENT MECHANICAL ROOM.
5. ROOF MOUNTED COOLING TOWER.
6. GRADE MOUNTED ICE MODULES.
7. SATELLITE CHILLER PLANT LOCATED IN 1ST FLOOR MECHANICAL ROOM.
8. NEW CHILLER PLANT ASSUMED TO BE CONSTRUCTED WITHT HE ADDITION TO THE PARILLA PERFORMING ARTS BUILDING.
9. GRADE MOUNTED COOLING TOWERS SERVING HUMANITIES BUILDING WATER COOLED CHILLERS.
10. VALVE VAULT WITH 10" CHILLED AND HEATING WATER MAINS CAPPED FOR FUTURE CONNECTION.

LEGEND:

FLOW RATE	WATER PRESSURE	VELOCITY
GPM	FT HD/100 LF	FPS

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

SCALE: 1" = 100'

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
CHILLED WATER
LONG-TERM FUTURE
(2034-BEYOND)

DRAWING NO:
M1.03

BKM# 19021.02

SITE PLAN - HEATING WATER - EXISTING CONDITIONS

1 SCALE: 1" = 100'-0"

GENERAL NOTES:

1. THESE DRAWINGS ARE DIAGRAMMATIC FOR PLANNING PURPOSES ONLY, FOR EXACT LOCATION AND SIZE OF UTILITY INFRASTRUCTURE, REFER TO SUB-SURFACE ENGINEERING STUDIES AND UTILITY LOCATING SERVICES.
2. REFER TO TABLES 2-4 THROUGH 2-6 FOR HEATING WATER LOAD SUMMARIES AND TABLE 2-8 FOR HEATING EQUIPMENT SUMMARY.

DRAWING NOTES:

1. NORMALLY CLOSED SHUT-OFF VALVES WITHIN PIPING VAULT. PIPING SCHEDULED TO BE REPLACED SUMMER 2021.
2. SATELLITE BOILER PLANT LOCATED IN PENTHOUSE.
3. DECOMMISSIONED CENTRAL BOILER PLANT LOCATED IN BASEMENT MECHANICAL ROOM.
4. PIPING VAULT FOR FUTURE CONNECTION TO TC.
5. VALVE VAULT WITH 4" HEATING WATER MAINS CAPPED FOR FUTURE CONNECTION.
6. BUILDING SERVED BY TO PACKAGED DX ROOF TOP UNITS WITH VAV REHEAT.
7. BUILDING SERVED BY HEAT PUMP AND ELECTRICAL RESISTANCE HEATING.
8. BUILDING SERVED BY HEAT PUMPS.
9. BUILDING SERVED BY A PACKAGED DX ROOFTOP UNIT.

LEGEND:

FLOW RATE	WATER PRESSURE	VELOCITY
GPM	FT HD/100 LF	FPS

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 20' 50' 100' 150' 200' 300'
SCALE: 1" = 100'

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JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

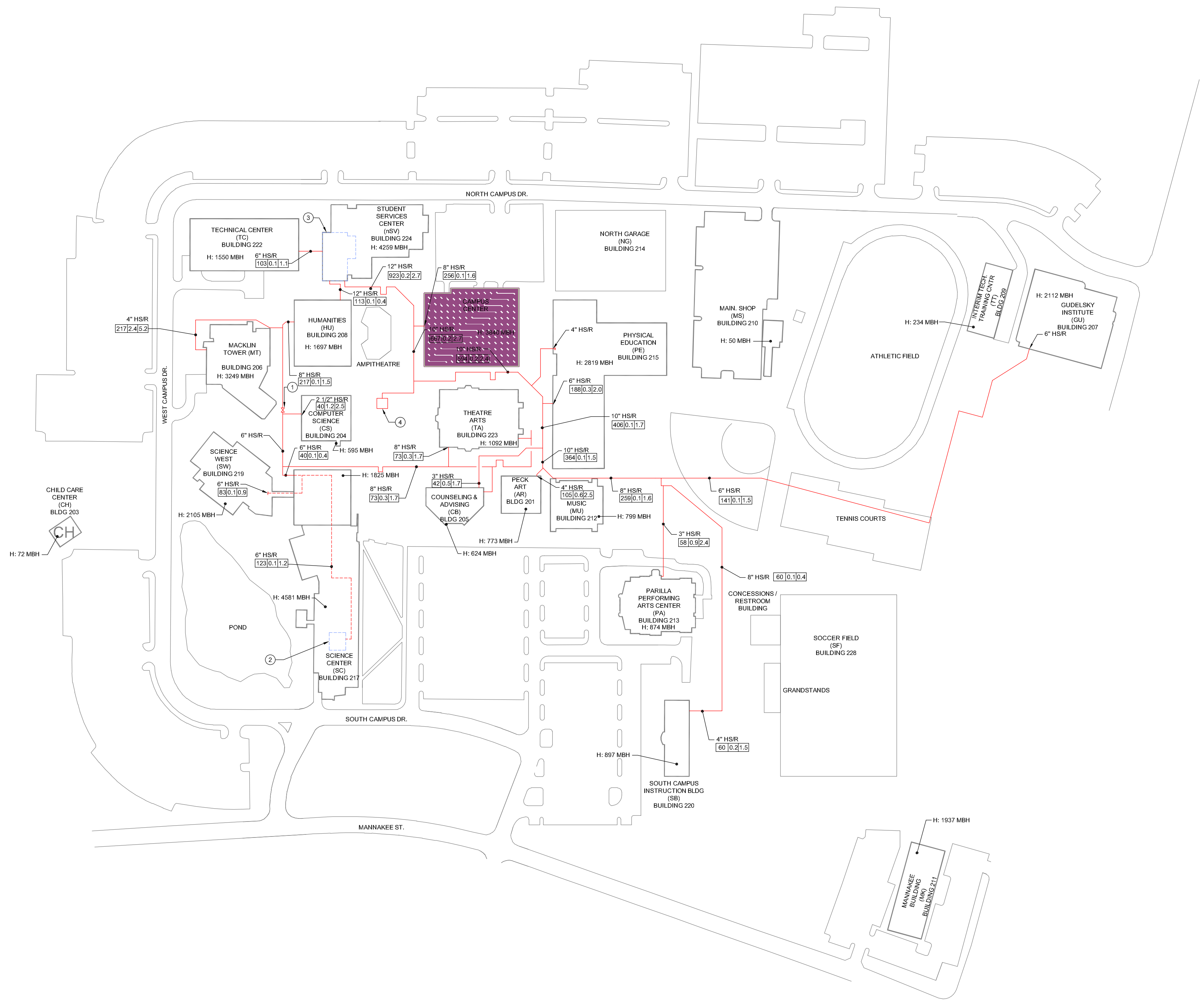
CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
HEATING WATER
EXISTING CONDITIONS

DRAWING NO:
M1.11

BKM# 19021.02



1 SITE PLAN - HEATING WATER - NEAR-TERM FUTURE (2022-2033)

SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NORMALLY CLOSED SHUT-OFF VALVES WITHIN PIPING VAULT.
2. SATELLITE BOILER PLANT LOCATED IN PENTHOUSE.
3. CENTRAL BOILER PLANT.
4. VALVE VAULT WITH 10" CHILLED AND HEATING WATER MAINS CAPPED FOR FUTURE CONNECTION.

LEGEND:

FLOW RATE	WATER PRESSURE	VELOCITY
GPM	FT HD/100 LF	FPS

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 20' 60' 100' 150' 200' 300'

SCALE: 1" = 100'

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JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
HEATING WATER
NEAR-TERM FUTURE
(2022-2033)

DRAWING NO:

M1.12

BKM# 19021.02

SITE PLAN - HEATING WATER - LONG-TERM FUTURE (2034-BEYOND)

1 SCALE: 1" = 100'-0"

DRAWING NOTES:

1. NORMALLY CLOSED SHUT-OFF VALVES WITHIN PIPING VAULT.
2. SATELLITE BOILER PLANT LOCATED IN PENTHOUSE.
3. CENTRAL BOILER PLANT.
4. NEW BOILER PLANT CONSTRUCTED DURING THE 2089 ADDITION TO THE PARILLA PERFORMING ARTS CENTER.
5. VALVE VAULT WITH 10" CHILLED AND HEATING WATER MAINS CAPPED FOR FUTURE CONNECTION.

LEGEND:

FLOW RATE	WATER PRESSURE	VELOCITY
GPM	FT HD/100 LF	FPS

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

SCALE: 1" = 100'

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

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DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

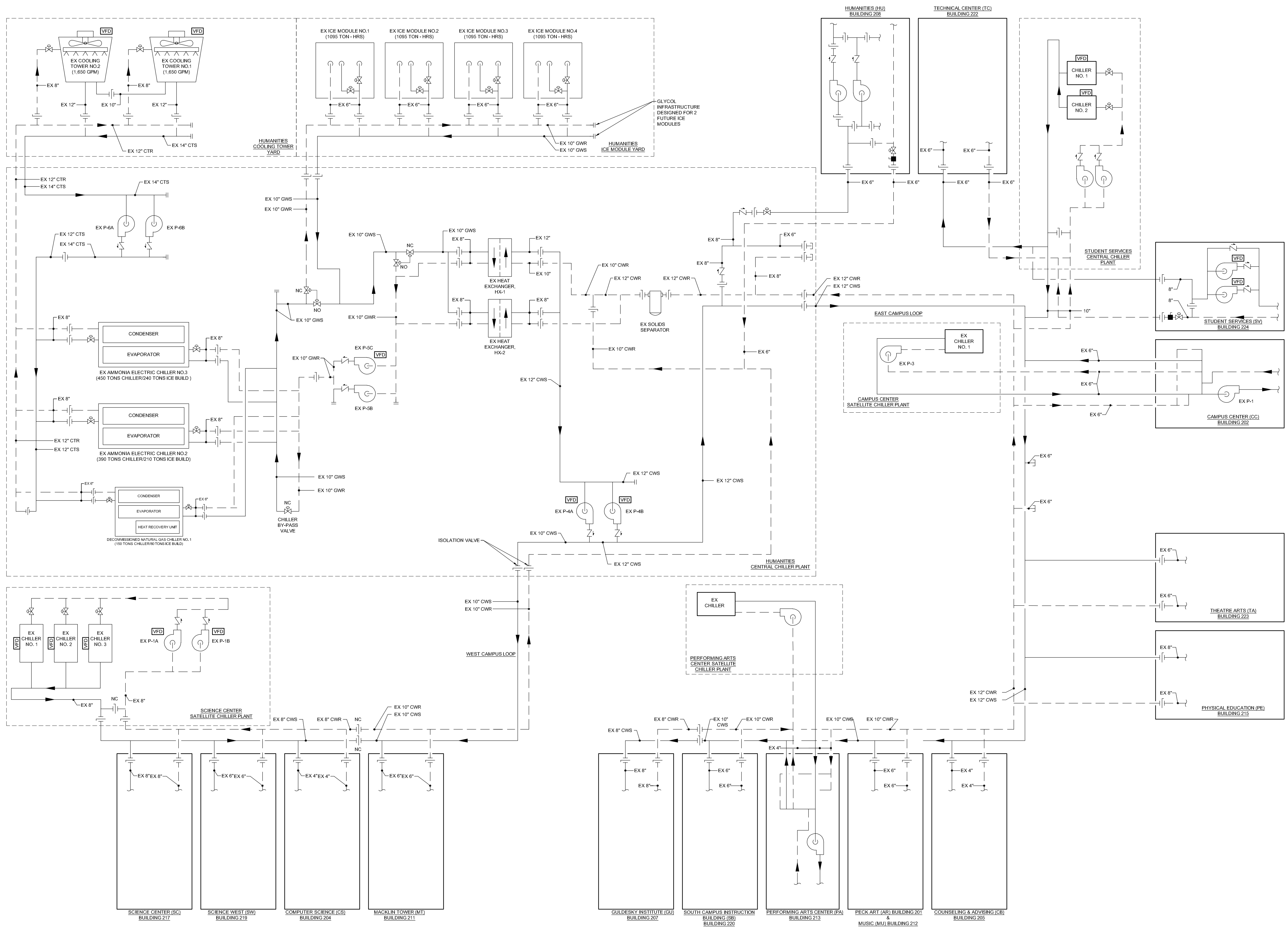
CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
HEATING WATER
LONG-TERM FUTURE
(2034-BEYOND)

DRAWING NO:
M1.13

BKM# 19021.02



1 SCHEMATIC - CAMPUS CHILLED WATER SYSTEM - EXISTING CONDITIONS

NO SCALE

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:

SCHEMATIC - CAMPUS CHILLED WATER SYSTEM EXISTING CONDITIONS

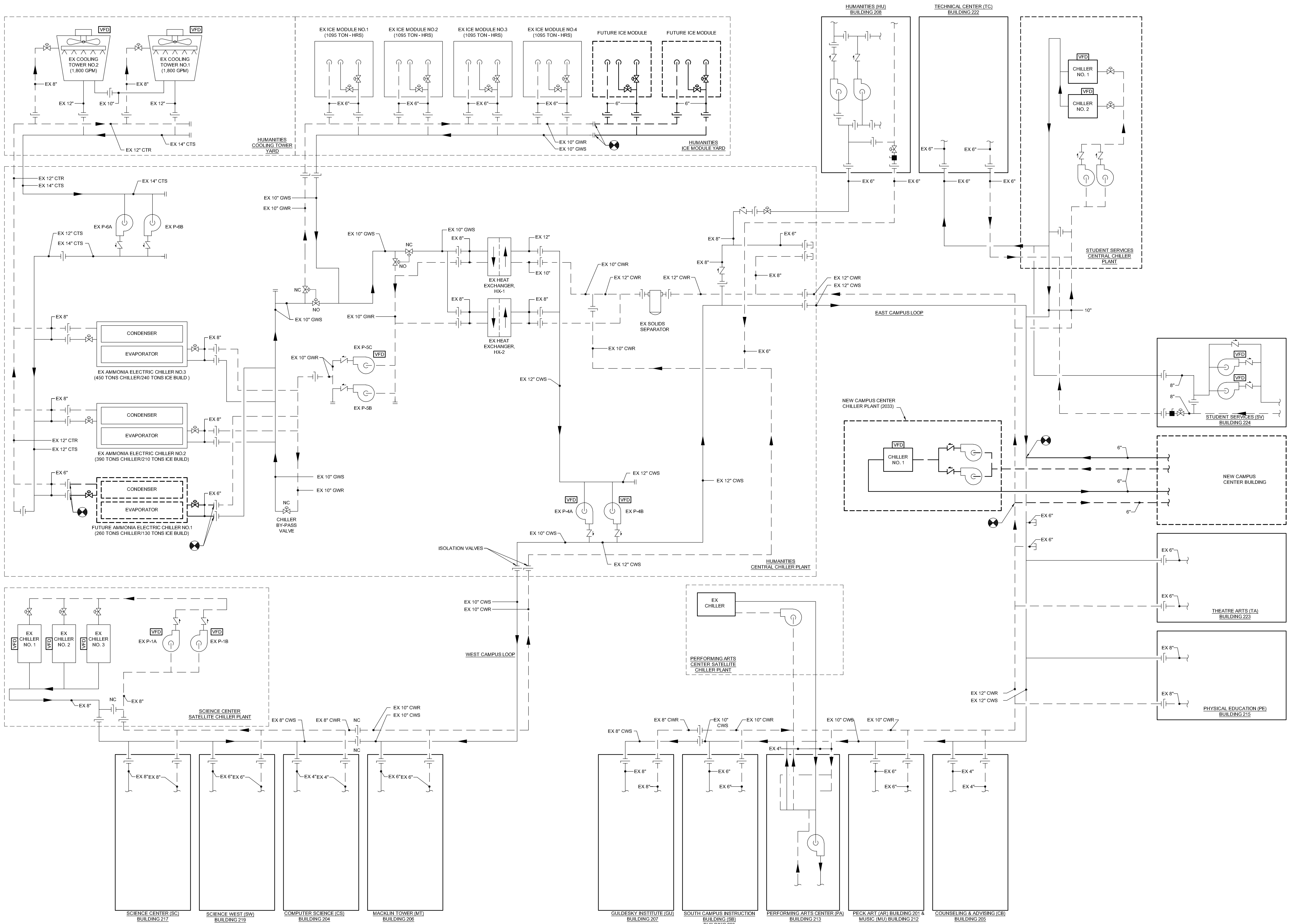
DRAWING NO:

M2.01

BKM# 19021.02

ARL: G:\19021.02\Drawings\Acad\M\M2.01 - Schematic - Campus Chilled Water - Existing Conditions

Plotted By: Bill Jamieson | 6/15/2022 3:32 PM



1 SCHEMATIC - CAMPUS CHILLED WATER SYSTEM - NEAR-TERM FUTURE (2022-2034)

NO SCALE

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

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JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

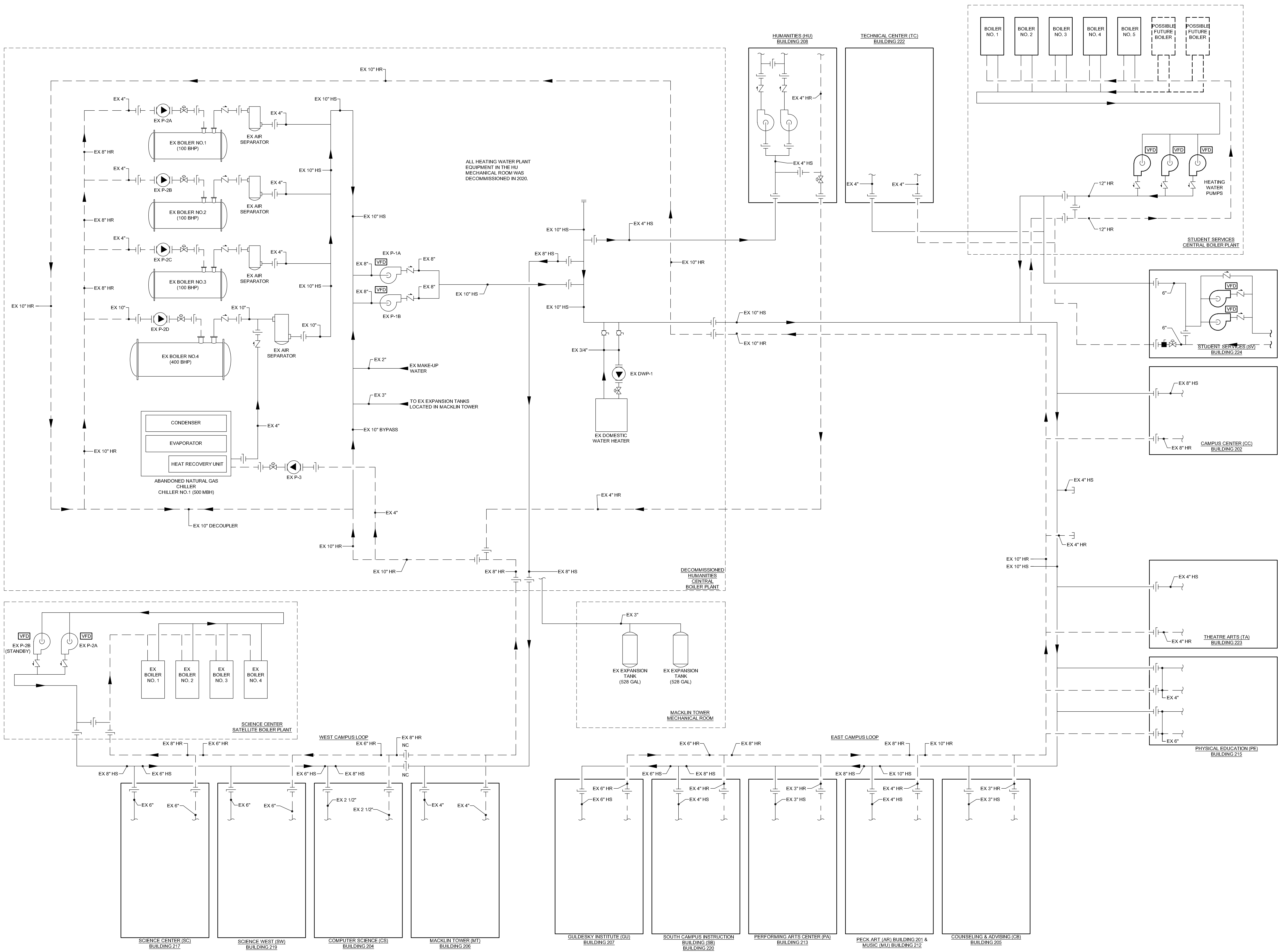
CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SCHEMATIC - CAMPUS CHILLED WATER SYSTEM NEAR-TERM FUTURE (2022-2034)

DRAWING NO:
M2.02

BKM# 19021.02



(1) **SCHEMATIC - CAMPUS HEATING WATER SYSTEM - EXISTING CONDITIONS**

NO SCALE

bkm
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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

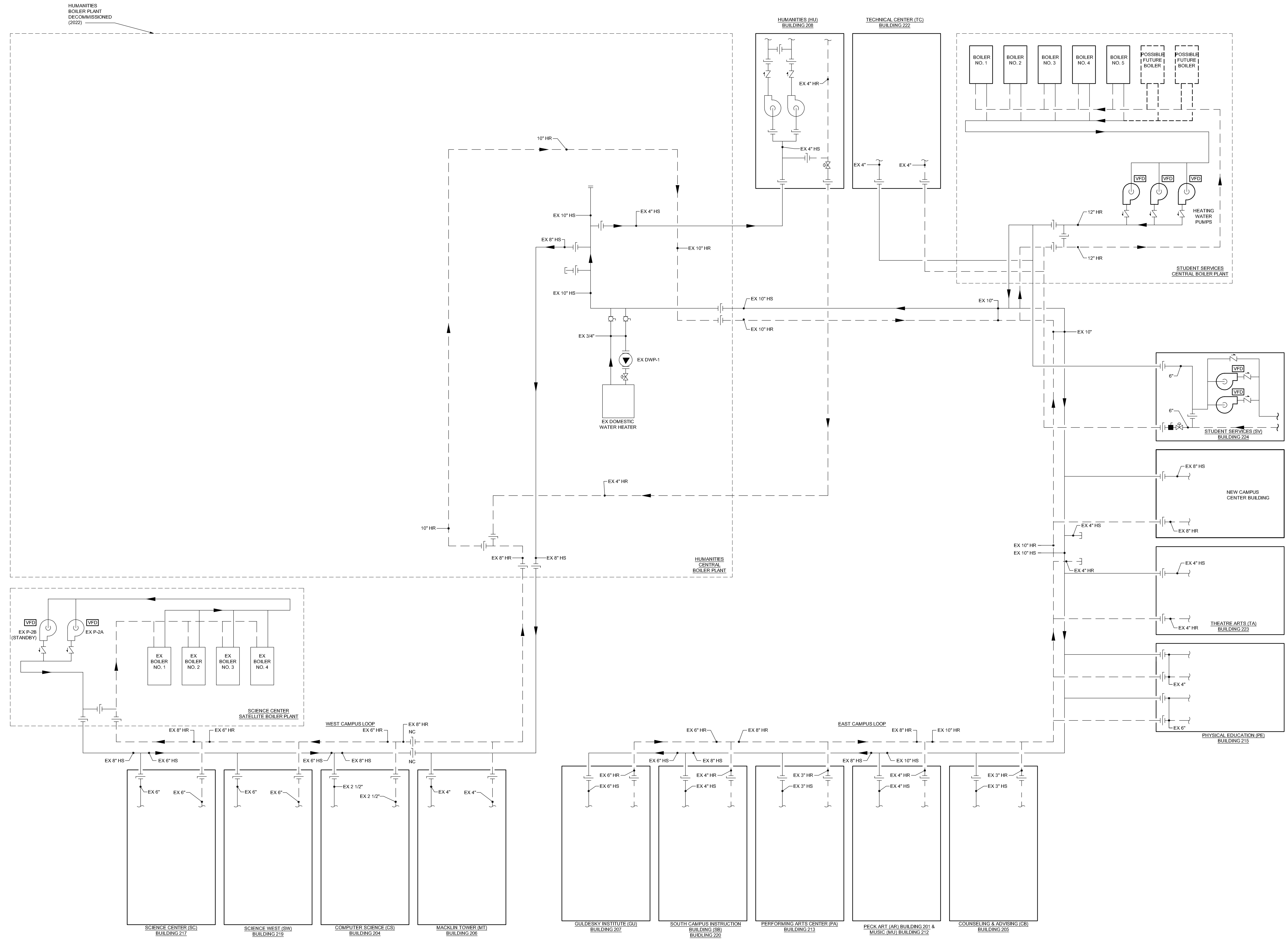
SHEET TITLE:

SCHEMATIC - CAMPUS HEATING WATER SYSTEM EXISTING CONDITIONS

DRAWING NO:

M2.11

BKM# 19021.02



1 SCHEMATIC - CAMPUS HEATING WATER SYSTEM - NEAR-TERM FUTURE (2022-2034)

NO SCALE

bkm
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DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:

SCHEMATIC - CAMPUS HEATING WATER SYSTEM NEAR-TERM FUTURE (2022-2034)

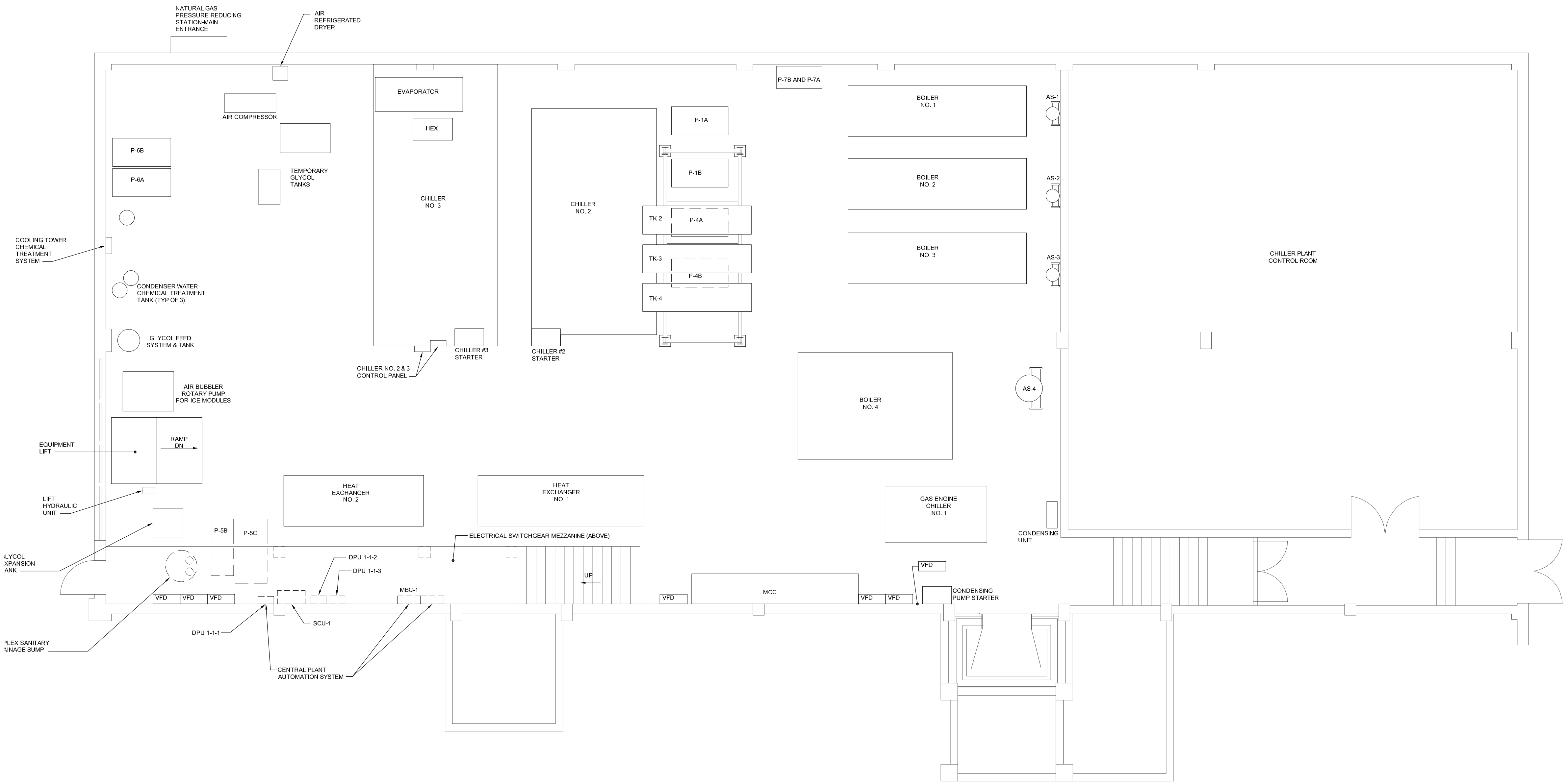
DRAWING NO:

M2.12

BKM# 19021.02

ARL: G:\19021.02\Drawings\Acad\M\M2.12 - Schematic - Campus Heating Water - Future Conditions

Plotted By: Bill Jamieson | 6/15/2022 4:19 PM



EQUIPMENT PLAN - HUMANITIES BUILDING (HU) BUILDING 208 EXISTING CONDITIONS

1 SCALE: 1/4" = 1'-0"

KEY PLAN
NOT TO SCALE

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 2' 4' 8' 12'
SCALE: 1/4" = 1'-0"

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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

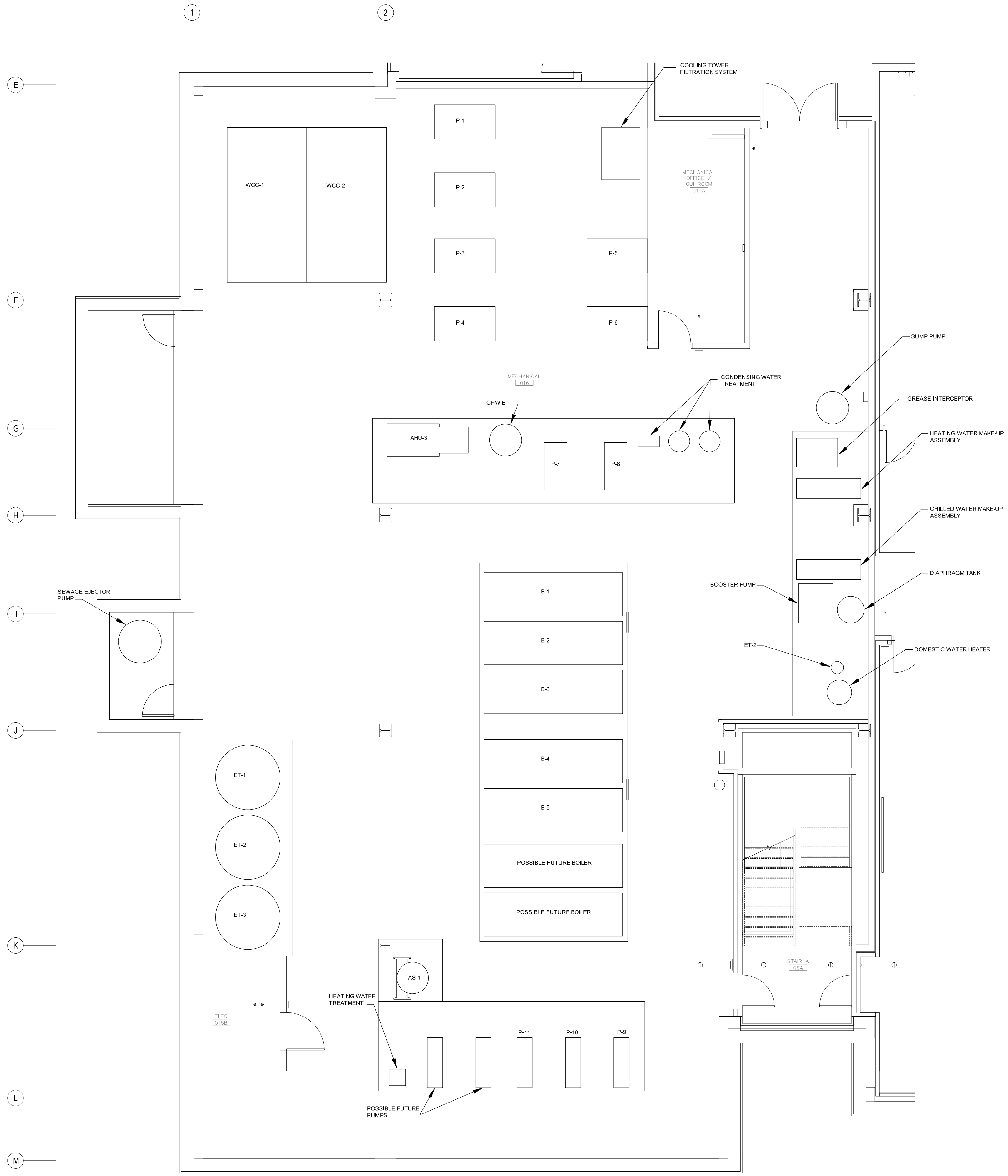
SHEET TITLE:

EQUIPMENT PLAN HUMANITIES BUILDING EXISTING CONDITIONS

DRAWING NO:

M3.01

BKM# 19021.02



EQUIPMENT PLAN - STUDENT SERVICES CENTER (SV) BUILDING 224 EXISTING CONDITIONS

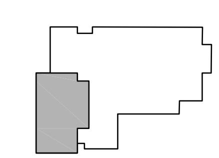
1 SCALE: 1/4" = 1'-0"

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 2' 4' 8' 12'

SCALE: 1/4" = 1'-0"



KEY PLAN

NOT TO SCALE

bkm
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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

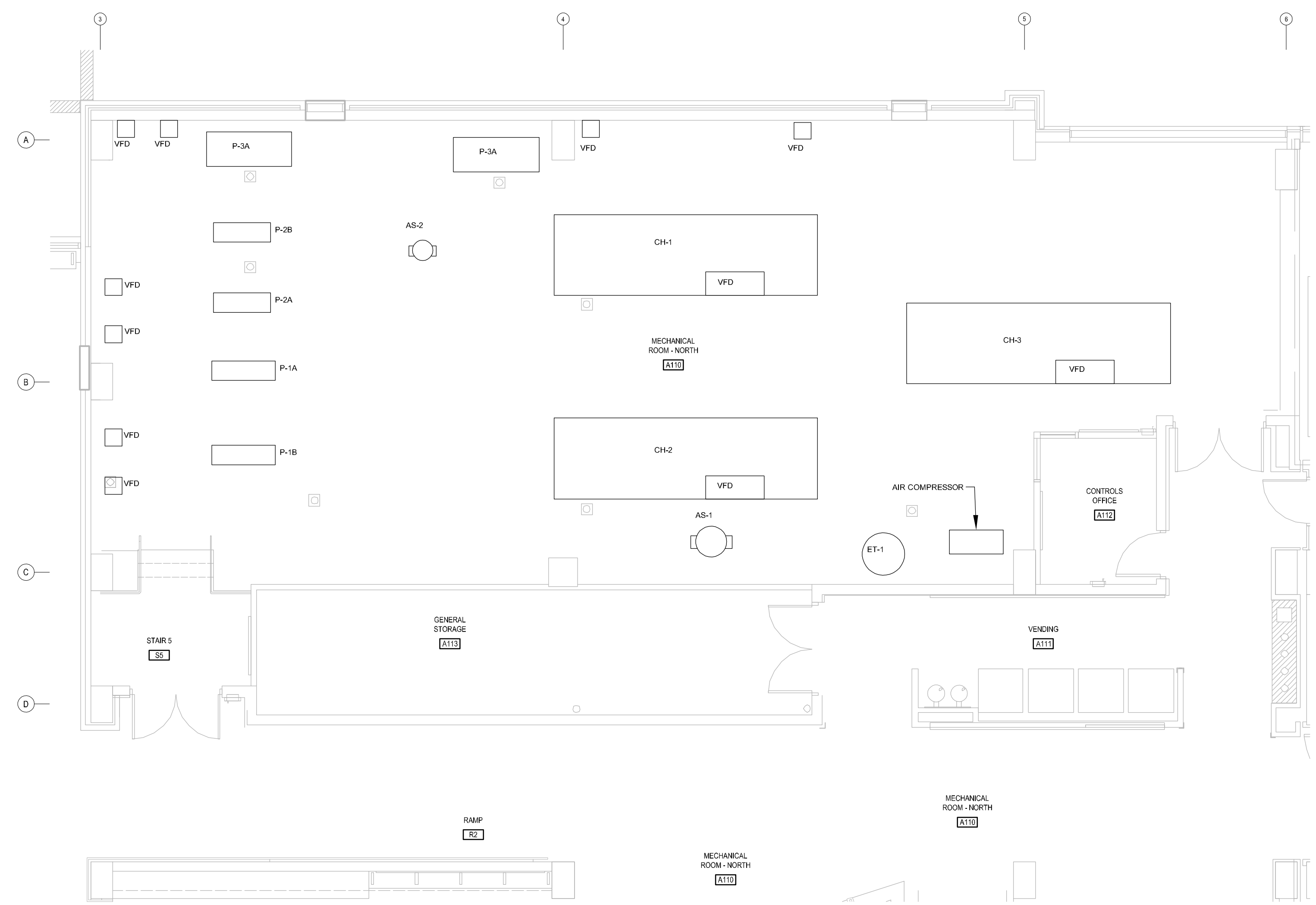
SHEET TITLE:

EQUIPMENT PLAN - STUDENT SERVICES CENTER EXISTING CONDITIONS

DRAWING NO:

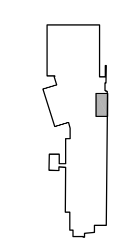
M3.02

BKM# 19021.02



EQUIPMENT PLAN - SCIENCE CENTER (SC) BUILDING 217
FIRST FLOOR MECHANICAL ROOM - EXISTING CONDITIONS

1 SCALE: 1/4" = 1'-0"



IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 2' 4' 8' 12'
SCALE: 1/4" = 1'-0"

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

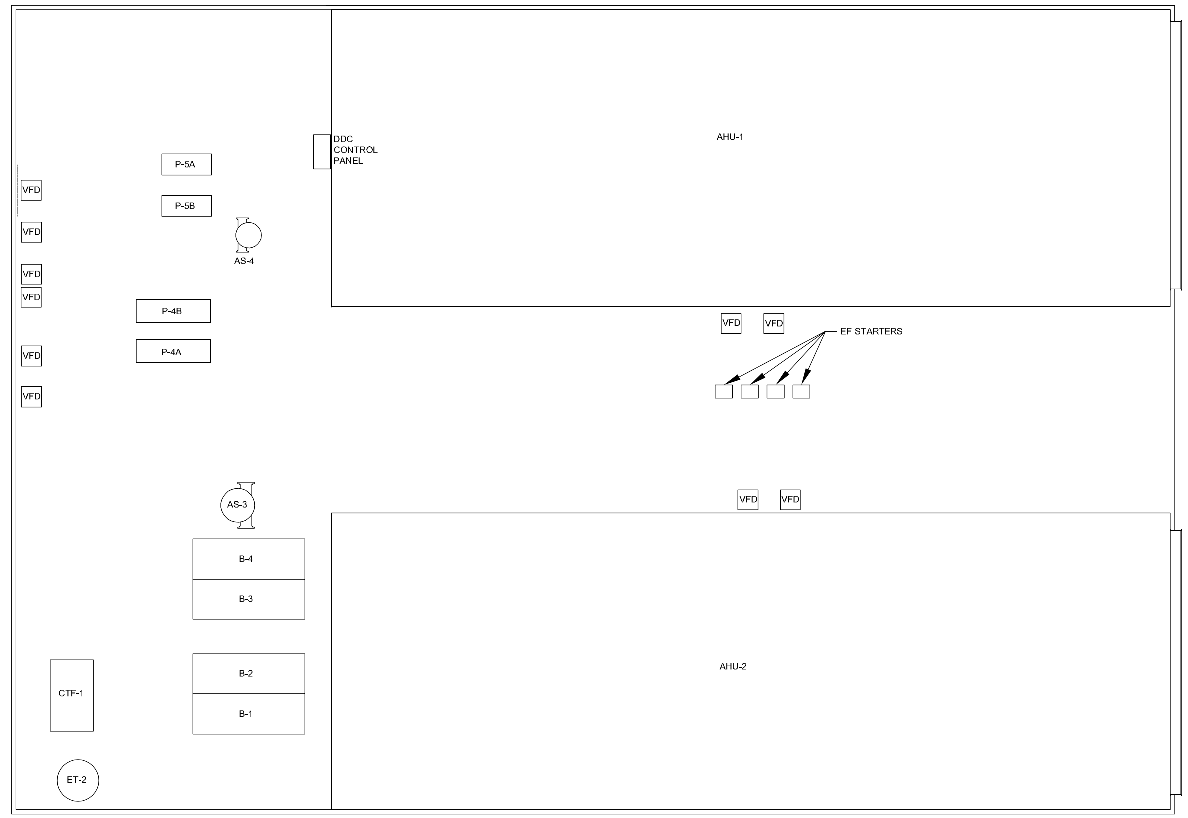
SHEET TITLE:

EQUIPMENT PLAN
SCIENCE CENTER
EXISTING CONDITIONS

DRAWING NO:

M3.03A

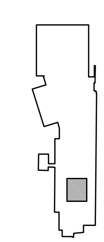
BKM# 19021.02



EQUIPMENT PLAN - SCIENCE CENTER (SC) BUILDING 217 PENTHOUSE EXISTING CONDITIONS

1

SCALE: 1/4" = 1'-0"



KEY PLAN

NOT TO SCALE

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N

0 2' 4' 8' 12'

SCALE: 1/4" = 1'-0"

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SHEET TITLE:

EQUIPMENT PLAN SCIENCE CENTER EXISTING CONDITIONS

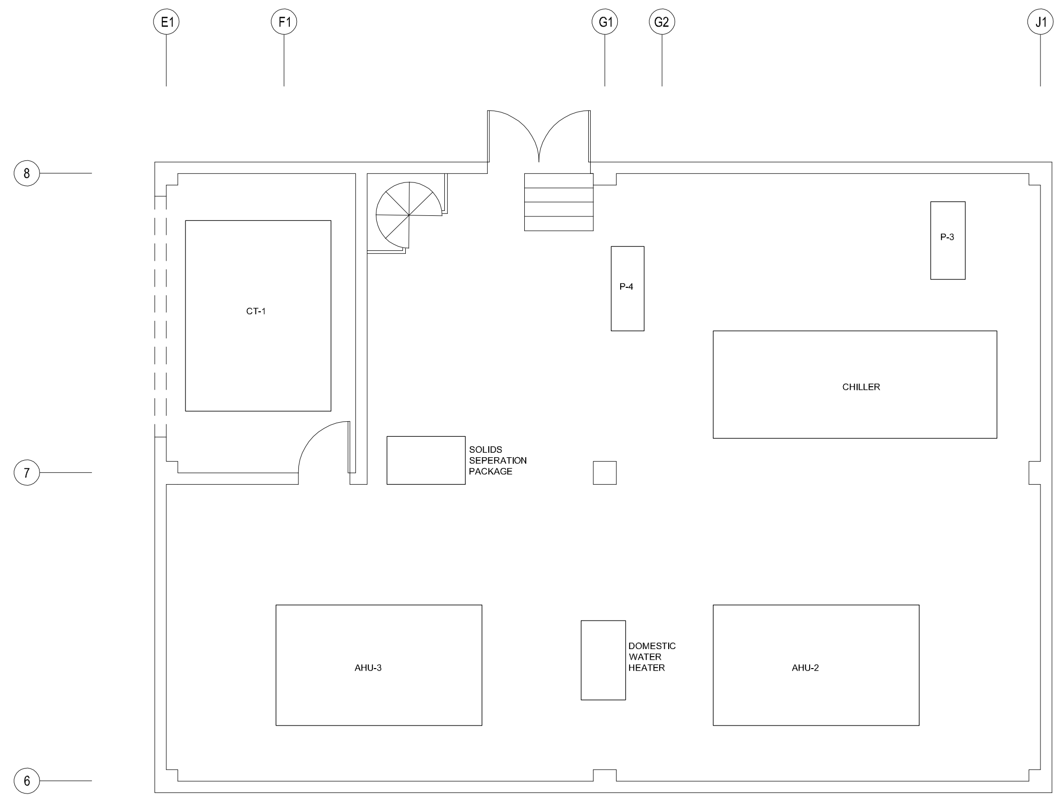
DRAWING NO:

M3.03B

BKM# 19021.02

Plotted By: Bill Jamieson | 6/14/2022 10:32 AM

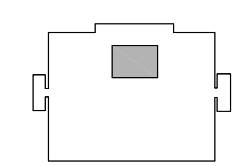
ARL: G:\19021.02\Drawings\Acad\M\M303B - Equipment Plan - Science Center (SC) - Existing Conditions



EQUIPMENT PLAN - CAMPUS CENTER (CC) BUILDING 202 PENTHOUSE EXISTING CONDITIONS

1

SCALE: 1/4" = 1'-0"



KEY PLAN

NOT TO SCALE

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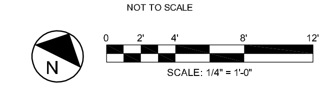

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:

EQUIPMENT PLAN CAMPUS CENTER EXISTING CONDITIONS

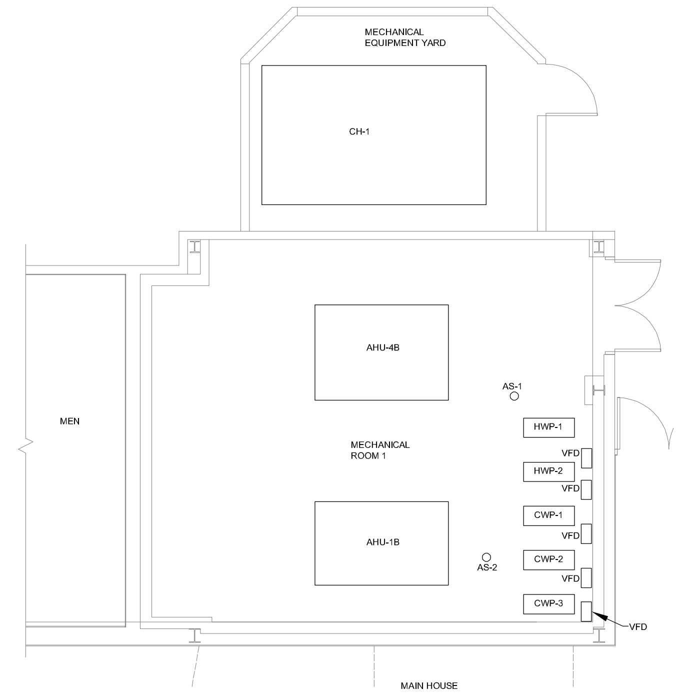
DRAWING NO:

M3.04

BKM# 19021.02

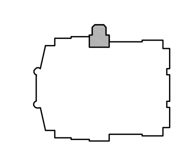
Plotted By: Bill Jamieson | 6/14/2022 10:31 AM

ARL: G:\19021.02\Drawings\Acad\M\M304 - Equipment Plan - Campus Center (CC) - Existing Conditions



EQUIPMENT PLAN - PERFORMING ARTS CENTER (PA) BUILDING 213 EXISTING CONDITIONS

1 SCALE: 1/4" = 1'-0"



KEY PLAN

NOT TO SCALE

IF THIS DRAWING IS A REDUCTION. GRAPHIC SCALE MUST BE USED.

N

0 2' 4' 8' 12'

SCALE: 1/4" = 1'-0"

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:

EQUIPMENT PLAN PERFORMING ARTS CENTER EXISTING CONDITIONS

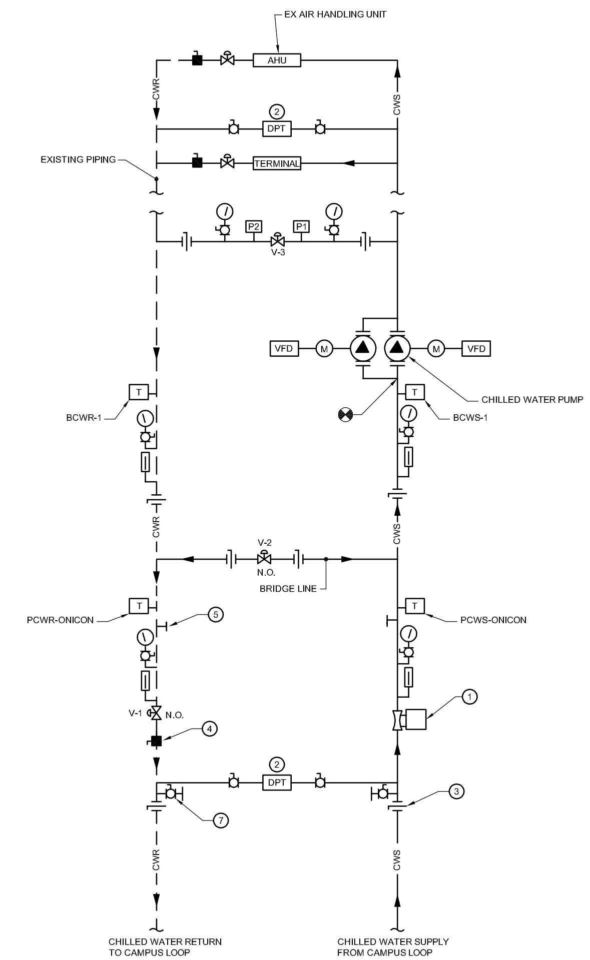
DRAWING NO:

M3.05

BKM# 19021.02

ARL: G:\19021.02\Drawings\Acad\M\M305 - Equipment Plan - Performing Arts Center (PA) - Existing Conditions

Plotted By: Bill Jamieson | 6/14/2022 10:31 AM

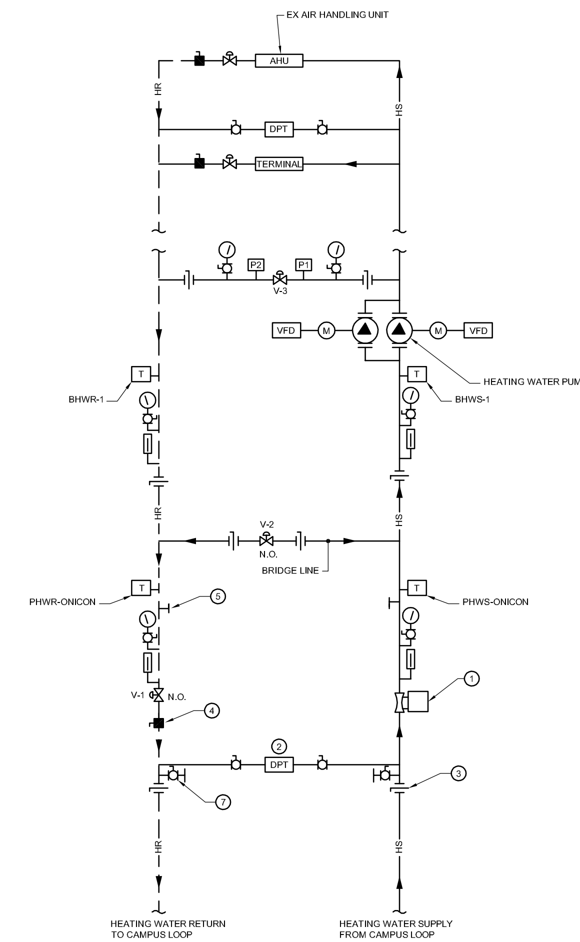


1 TYPICAL CHILLED WATER PIPING - CENTRAL PLANT TO BUILDING CONNECTION DETAIL

NO SCALE

DRAWING NOTES:

1. ONICON SYSTEM 10 BTU METER.
2. DIFFERENTIAL PRESSURE TRANSMITTER.
3. HIGH PERFORMANCE BUTTERFLY VALVE (TYPICAL FOR ALL BUTTERFLY VALVES).
4. FLOW METER FITTING (VENTURI TYPE). TYPICAL.
5. TEMPERATURE/PRESSURE TEST PORT.
6. 2-WAY MODULATING DIFFERENTIAL PRESSURE CONTROL VALVE.
7. LOW POINT DRAIN (TYPICAL).



1 TYPICAL HEATING WATER PIPING - CENTRAL PLANT TO BUILDING CONNECTION DETAIL

NO SCALE

DRAWING NOTES:

1. ONICON SYSTEM 10 BTU METER.
2. DIFFERENTIAL PRESSURE TRANSMITTER.
3. HIGH PERFORMANCE BUTTERFLY VALVE (TYPICAL FOR ALL BUTTERFLY VALVES).
4. FLOW METER FITTING (VENTURI TYPE). TYPICAL.
5. TEMPERATURE/PRESSURE TEST PORT.
6. 2-WAY MODULATING DIFFERENTIAL PRESSURE CONTROL VALVE.
7. LOW POINT DRAIN (TYPICAL).

GENERAL NOTES:

1. SV, SC, HU, CC, AND PA INCLUDE CONNECTIONS FOR CHILLERS LOCATED IN THOSE BUILDINGS.
2. SOME BUILDINGS INCLUDE CONNECTIONS DOMESTIC HOT WATER HEAT EXCHANGERS AND POOL HEATING EQUIPMENT.

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ROCKVILLE CAMPUS UTILITY MASTER PLAN

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PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

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DATE: JUNE 2022

SHEET TITLE:

TYPICAL BUILDING CONNECTION DETAILS

DRAWING NO:

M4.01

BKM# 19021.02

Plotted By: Bill Jamieson | 6/14/2022 10:31 AM
ARL: G:\19021.02\Drawings\Acad\M\M401 - Details

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Appendix 4
Electrical Systems

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TABLE 4-1 - Electrical Loads - Existing Buildings

Year Built	Bldg Abbrev	Building Name	Bldg No	Bldg Area (GSF)	Pepco Account Number	Pepco Meter Number	Service Voltage	Service Entrance Ampacity	Service Entrance Equipment Type	Service Entrance Equipment Manufacturer	Measured Peak Demand Load (kW) (1)	Calculated Peak Demand Load (kVA) (2)	Calculated VA per Square Foot (VA/SF)	Existing Building Generator	Notes
1966	CC	Campus Center	202	74,302	5502 4190 179	KZD353380495	208Y/120V	2,500A	Switchboard	Eaton Cutler Hammer PowerLine C	428.00	594.44	8.00	200kW Diesel (Detroit Diesel)	
1966	HU	Humanities Building	208	73,912	5502 4157 384	KZD353381580	208Y/120V	1,200A	Switchboard	Eaton Cutler Hammer	164.00	227.78	3.08	80kW Diesel (MTU)	Shared between HU and TC
		Humanities Central Plant		-	5501 9550 106	KZD353381444	480Y/277V	3,000A	Switchboard	Eaton Cutler Hammer	984.00	1366.67	-	-	
1966	PE	Physical Education	215	84,949	5502 4190 245	X8D350573831	208Y/120V	2,000A	Switchboard	General Electric	163.00	226.39	2.66	Inverter, No Generator	
1966	TC	Technical Center	222	55,908	5502 4157 681	X8D350899478	208Y/120V	1,600A	Switchboard	Eaton Cutler Hammer	110.00	152.78	2.73	80kW Diesel (MTU)	Shared between HU and TC
1966	TA	Theatre Arts	223	35,032	5502 4190 088	X8D350573829	208Y/120V	2,500A	Switchboard	Chanllenger H367C	112.00	155.56	4.44	Inverter, No Generator	
1966	CS	Computer Science	204	20,862	5502 4157 848	KZD353381559	208Y/120V	1,600A	Switchboard	Federal Pacific	150.00	208.33	9.99	250kW Diesel (Cummins)	
1966	SV	Student Services Center	224	10,448	5502 4157 996	X8D350573878	208Y/120V	800A	Panelboard	ITE	31.00	27.56	2.64	15 KW Diesel (Kohler)	Existing Student Services Bldg
1969	CB	Counseling & Advising	205	17,696	5502 4157 327	-	-	-	-	-	76.00	105.56	5.96	No Generator	Building Closed
1971	MT	Gordon & Marilyn Macklin Tower	206	117,282	5502 0820 290	KZD357697905	480Y/277V	2,000A	Switchboard	Eaton Cutler Hammer	311.00	431.94	3.68	125KW Diesel (Kohler)	
1971	AR	Paul Peck Art Building	201	25,594	5501 5512 878	KZD341181817	208Y/120V	3,000A	Switchboard	Eaton Cutler Hammer	126.00	175.00	3.75	UPS, No Generator	Demand Load is for both AR and MU Buildings
1971	MU	Music Building	212	21,050	-	-	208Y/120V	1,600A	Switchboard	Eaton Cutler Hammer	-	-	-	UPS, No Generator	Building Is Supplied from AR Switchboard
1971	SW	Science Center West	219	41,988	5000 4712 712		480Y/277V	1,600A	Switchboard		117.00	162.50	3.87	100kW Diesel (Kohler)	
1984	PA	Parilla Performing Arts Center	213	28,000	5501 5960 408	KZD353380501	208Y/120V	1,600A	Switchboard	Eaton Cutler Hammer PowerLine C	159.00	220.83	7.89	55KW Diesel (Kohler)	
1985	MK	Mannakee Building	211	42,102	5501 4422 459	KZD350218666	480Y/277V	3,000A	Switchboard	Westinghouse PowrLine	252.00	350.00	8.31	15KW Diesel (Marathon)	
1988	TT	Interim Technical Training Center	209	9,360	5501 6677 506	X8D350899598	208Y/120V	1,200A	Panelboard	Square D	67.00	93.06	9.94	No Generator	
1992	GU	Gudelsky Institute for Technical Education	207	64,000	5501 6905 188	X8D350898960	208Y/120V	2,000A	Switchboard	Square D QED	130.00	180.56	2.82	Inverter, No Generator	
1996	SB	South Campus Instruction Building	220	29,900	5501 9709 603	KZD350747696	208Y/120V	800A	Panelboard	General Electric Spectra	59.00	81.94	2.74	Inverter, No Generator	
2011	SC	Science Center	217	140,700	5502 0884 601	KZD357697411	480Y/277V	4,000A	Switchboard	Eaton Cutler Hammer	912.00	1266.67	9.00	250kW Diesel (MTU)	
	BF	Ball Field Lights	228	-	5501 4361 962	KZD350746623			Panelboard		111.00	154.17	-	No Generator	To Become Lights for Soccer Compex (SF)
	MS	Maintenance Shop	210	4,720	5501 5451 614				Panelboard		29.00	40.28	8.53	No Generator	
2018	NG	North Garage	214		5000 7749 638				Switchboard		119.00	165.28		125KW Diesel (MTU)	

(1) MAXIMUM MONTHLY PEAK DEMAND VALUE BASED ON PEPCO HISTORICAL DATA.

(2) MEASURED PEAK DEMAND kW DIVIDED BY 0.9 (POWER FACTOR CONVERSION FROM kW TO kVA) AND MULTIPLED BY 1.25 (IN ACCORDANCE WITH NEC ARTICLE 220.87).

ESTIMATED CURRENT TOTAL CAMPUS PEAK DEMAND LOAD (kVA)	6387

TABLE 4-2 - Electrical Loads - Future Buildings

Year Built	Bldg Abbrev	Building Name	Bldg Area (GSF)	Bldg No	Total Existing Load (kVA)	Total Removed Load (kVA)	Total Added Load (kVA)	Campus Cumulative Proposed Load (KVA)	Notes
								6,387	ESTIMATED CURRENT TOTAL CAMPUS PEAK DEMAND LOAD FROM TABLE 4-1
2020	SV	Student Services Center - Demolition	10,448	221	44.40	44.40	0.00	6,343	
2020	SV	Student Services Center - New Building	127,960	224	-	0.00	1,920.00	8,263	UNDER CONSTRUCTION. OPENS SPRING 2020.
2022	HU	Central Heating Plant - Demolition	-	208	1366.67	0.00	248.58	8,511	INCLUDES NEW 260 TON CHILLER
2023	MT	Macklin Tower - Renovation	117,282	206	431.94	0.00	0.00	8,511	ASSUME NO CHANGE IN ELECTRICAL LOADS
2033	CC	Campus Center - Demolition	74,302	202	594.44	594.44	0.00	7,917	
2033	CC	Campus Center - New Building	128,000	TBD	-	0.00	1,920.00	9,837	INCLUDES NEW 460 TON CHILLER FOR THIS BUILDING
2057	MT	Gordon and Maklin Tower - Renovation	63,652	206	431.94	0.00	0.00	9,837	ASSUME NO CHANGE IN ELECTRICAL LOADS
2063	TT	Interim Technical Training Center - Demolition	9,360	209	93.06	93.06	0.00	9,744	
2063	TBD	Technical Training Center - New Building	84,000	TBD	-	0.00	1,260.00	11,004	
2069	CB	Counseling and Advising Building Demolition	17,696	205	105.56	105.56	0.00	10,898	
2069	TBD	Media Arts - New Building	48,000	TBD	-	0.00	720.00	11,618	
2075	TC	Technical Center - Demolition	55,908	222	152.78	152.78	0.00	11,466	
2075	TBD	Humanities and Social Sciences - New Building	136,000	TBD	-	0.00	2,040.00	13,506	
2084	HU	Humanities Building - Renovation	73,912	208	227.78	0.00	0.00	13,506	ASSUME NO CHANGE IN ELECTRICAL LOADS
2087	PA	Robert E. Parilla Performing Arts Center - Renovation	28,000	213	220.83	0.00	0.00	13,506	ASSUME NO CHANGE IN ELECTRICAL LOADS
2087	PA	Robert E. Parilla Performing Arts Center - Addition	28,325	213	-	0.00	1,207.33	14,713	INCLUDES NEW 500 TON CHILLER
2090	CS	Computer Science - Renovation	20,900	204	208.33	0.00	0.00	14,713	ASSUME NO CHANGE IN ELECTRICAL LOADS
2093	PE	Physical Education Building - Renovation	84,949	215	226.39	0.00	0.00	14,713	ASSUME NO CHANGE IN ELECTRICAL LOADS
2096	MK	Mannakee Building - Renovation	42,102	211	350.00	0.00	0.00	14,713	ASSUME NO CHANGE IN ELECTRICAL LOADS

TABLE 4-3 - Photovoltaic System - Near- Future Buildings

Campus Area	Bldg Abbreviation	Bldg No	Surface Type	Existing Solar? (Y/N)	Age of Roof (yrs)	Potential PV Surface Area (ft^2)	Estimated power from PV (in kW)*	Estimated Annual (kWh/Year)**	Estimated Annual Cost Savings from PV ****	Notes
Campus Center	CC	202	Roof	N	-	14,500	145	274,920	$30,214	***
Humanities Building	HU	208	Roof	N	-	12,227	122	231,824	$25,477	***
Physical Education Building	PE	215	Roof	N	-	12,829	128	243,238	$26,732	***
Technical Center	TC	222	Roof	N	-	6,599	66	125,117	$13,750	***
Theatre Arts	TA	223	Roof	N	-	4951	50	93,871	$10,316	***
Computer Science	CS	204	Roof	N	-	5120	51	97,075	$10,669	***
Student Services Center	SV	224	Roof	N	-	13,272	133	251,637	$27,655	***
Counseling & Advising	CB	205	Roof	N	-	1,163	12	22,050	$2,423	***
Gordon & Marilyn Macklin Tower	MT	207	Roof	N	-	12,636	126	239,579	$26,330	***
Paul Peck Art Building	AR	201	Roof	N	-	1,505	15	28,535	$3,136	***
Music Building	MU	212	Roof	N	-	6,964	70	132,037	$14,511	***
Science Center West	SW	219	Roof	N	-	3,450	35	65,412	$7,189	***
Parilla Performing Arts Center	PA	213	Roof	N	-	1,894	19	35,910	$3,947	***
Mannakee Building	MK	211	Roof	N	-	6691	67	126,861	$13,942	***
Interim Technical Training Center	TT	209	Roof	N	-	1474	15	27,947	$3,071	***
Gudelsky Institute for Technical Education	GU	207	Roof	N	-	9,253	93	175,437	$19,281	***
South Campus Instruction Building	SB	220	Roof	N	-	1,781	18	33,768	$3,711	***
Science Center	SC	217	Roof	N	-	5,125	51	97,170	$10,679	***
Parking Lots	-	-	Parking Lot Canopy			448,572	4,486	8,621,554	$947,509	
Grounds	-	-	Ground			119,047	1,190	2,257,131	$248,059	

* Assumes 10W/SF
** Estimated values obtained from PVWatts by National Renewable Energy Laboratory (NREL). Refer to drawing E1.04 for additional information.
*** PV located on roof will need either an existing structure capable of supporting solar panels or roof needs to be four years old or less.
**** Values obtained from multiplying Estimated Annaul kWh/Year times 10.99 cents/kWh. 10.99 cents rate obtained from electric.com. Actual annual cost savings from PV would be provided by project specific PV PPA service provider.

1 SITE PLAN - POWER - EXISTING CONDITIONS

SCALE: 1" = 80'-0"

GENERAL NOTES:

1. REFER TO TABLE 1-1 FOR A BUILDING ABBREVIATIONS LIST.
2. REFER TO TABLE 1-2 FOR A PROJECT ABBREVIATIONS LIST.

DRAWING NOTES:

1. COUNSELING AND ADVISING BUILDING CLOSED.
2. NEW STUDENT SERVICES CENTER UNDER CONSTRUCTION. OPENS SPRING 2020.

ELECTRICAL LEGEND

—OHE— OHE—	OVERHEAD ELECTRIC
—UGE— UGE—	UNDERGROUND ELECTRIC
E ☒ (E)	ELECTRIC MANHOLE

0 40' 80' 120' 160' 240'

SCALE: 1" = 80'-0"

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SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:

SITE PLAN - POWER - EXISTING CONDITIONS

DRAWING NO:

E1.01

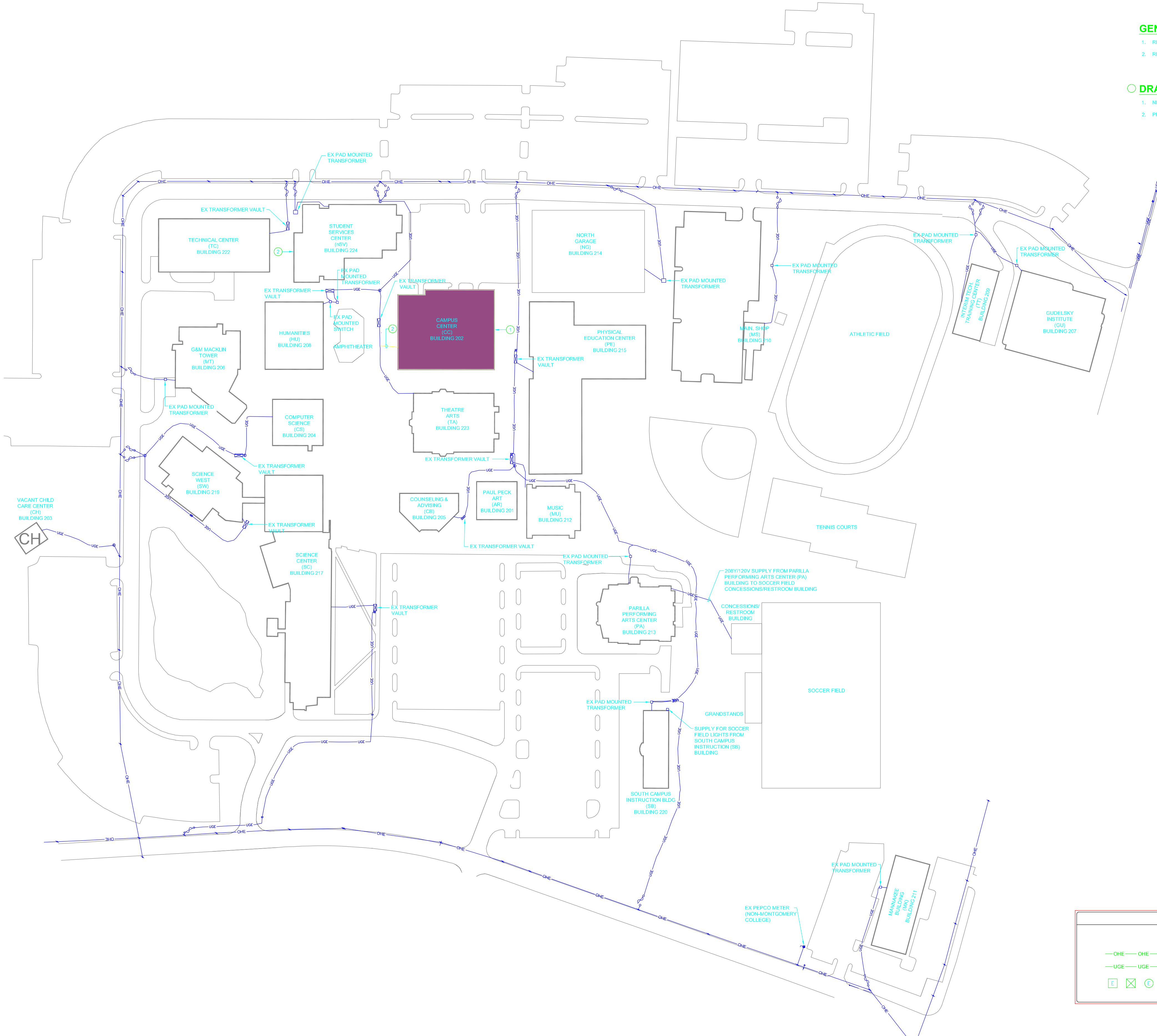
BKM# 19021.02

GENERAL NOTES:

1. REFER TO TABLE 1-1 FOR A BUILDING ABBREVIATIONS LIST.
2. REFER TO TABLE 1-2 FOR A PROJECT ABBREVIATIONS LIST.

DRAWING NOTES:

1. NEW CAMPUS CENTER. CONSTRUCTION IN 2039.
2. PROPOSED ELECTRICAL SERVICE ENTRANCE CONNECTION FOR NEW BUILDING.



SITE PLAN - POWER - NEAR-TERM FUTURE CONDITIONS (2022-2033)

SCALE: 1" = 80'-0"

ELECTRICAL LEGEND

—OHE—— OHE—	OVERHEAD ELECTRIC
—UGE—— UGE—	UNDERGROUND ELECTRIC
E ⊠ E	ELECTRIC MANHOLE

0 40' 80' 120' 160' 240'

SCALE: 1" = 80'-0"

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SHEET TITLE:
SITE PLAN
POWER
NEAR-TERM
FUTURE CONDITIONS (2022-2033)

DRAWING NO:
E1.02

BKM# 19021.02

GENERAL NOTES:

1. REFER TO TABLE 1-1 FOR A BUILDING ABBREVIATIONS LIST.
2. REFER TO TABLE 1-2 FOR A PROJECT ABBREVIATIONS LIST.

DRAWING NOTES:

1. NEW TECHNICAL TRAINING CENTER. CONSTRUCTION 2068.
2. NEW MEDIA ARTS BUILDING. CONSTRUCTION 2074.
3. NEW HUMANITIES AND SOCIAL SCIENCES BUILDING. CONSTRUCTION 2080.
4. ADDITION TO PERFORMING ARTS CENTER. CONSTRUCTION 2089.
5. PROPOSED ELECTRICAL SERVICE ENTRANCE CONNECTION FOR NEW BUILDING.
6. PROPOSED MODIFICATION TO EXISTING UNDERGROUND ELECTRICAL AS REQUIRED FOR NEW BUILDING CONSTRUCTION.

1 SITE PLAN - POWER - LONG-TERM FUTURE CONDITIONS (2034-BEYOND)
SCALE: 1" = 80'-0"

ELECTRICAL LEGEND

—OHE—— OHE—	OVERHEAD ELECTRIC
—UGE—— UGE—	UNDERGROUND ELECTRIC
E ☒ E	ELECTRIC MANHOLE

0 40' 80' 120' 160' 240'
SCALE: 1" = 80'-0"

bkm
Burdette, Koehler, Murphy & Associates, Inc.
Mechanical / Electrical Engineers
6300 Blair Hill Lane Suite 400 | Baltimore, Maryland 21209
P: 410.323.0600 | www.bkma.com

PROJECT NAME:

Montgomery College

MONTGOMERY COLLEGE

Central Administration
Office of Facilities
9221 Corporate Boulevard
Rockville, MD 20850
Telephone: 240-567-7363

ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

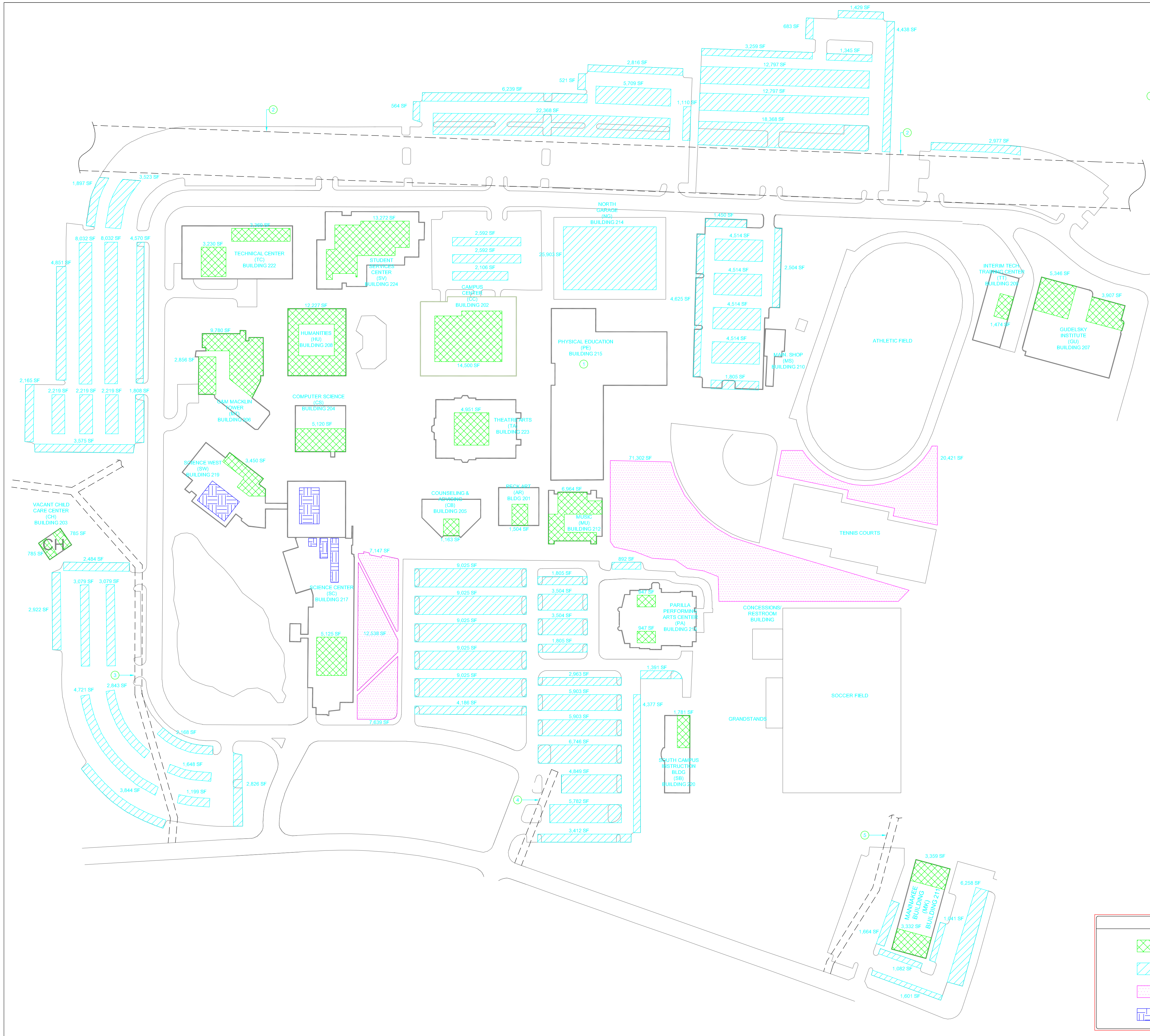
CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
POWER
LONG- TERM FUTURE
CONDITIONS (2034-BEYOND)

DRAWING NO:
E1.03

BKM# 19021.02



GENERAL NOTES:

1. REFER TO TABLE 1-1 FOR A BUILDING ABBREVIATIONS LIST.
2. REFER TO TABLE 1-2 FOR A PROJECT ABBREVIATIONS LIST.

DRAWING NOTES:

1. PHOTOVOLTAIC INSTALLATION IS NOT BEING CONSIDERED FOR LONG SPAN ROOF STRUCTURE AREAS DUE TO STRUCTURAL CONSIDERATIONS.
2. EXISTING GAS PIPELINE RIGHT OF WAY. PHOTOVOLTAIC INSTALLATION NOT ALLOWED.
3. EXISTING SANITARY SEWER EASEMENT. PHOTOVOLTAIC INSTALLATION NOT ALLOWED.
4. EXISTING STORM DRAIN EASEMENT. PHOTOVOLTAIC INSTALLATION NOT ALLOWED.
5. EXISTING SEWER EASEMENT. PHOTOVOLTAIC INSTALLATION NOT ALLOWED.

ELECTRICAL LEGEND

TYPE 1 - ROOFTOP

TYPE 2 - PARKING LOT (CANOPY MOUNTED)

TYPE 3 - GROUND

EXISTING TYPE 1 - ROOFTOP (APPROX. 25 KVA)

0 40' 80' 120' 160' 240'

SCALE: 1" = 80'-0"

1 SITE PLAN - POTENTIAL PHOTOVOLTAIC LOCATIONS

SCALE: 1" = 80'-0"

bkm
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Mechanical / Electrical Engineers
6300 Blair Hill Lane Suite 400 | Baltimore, Maryland 21209
P: 410.323.0600 | www.bkma.com

PROJECT NAME:

Montgomery College

MONTGOMERY COLLEGE

Central Administration
Office of Facilities
9221 Corporate Boulevard
Rockville, MD 20850
Telephone: 240-567-7363

ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

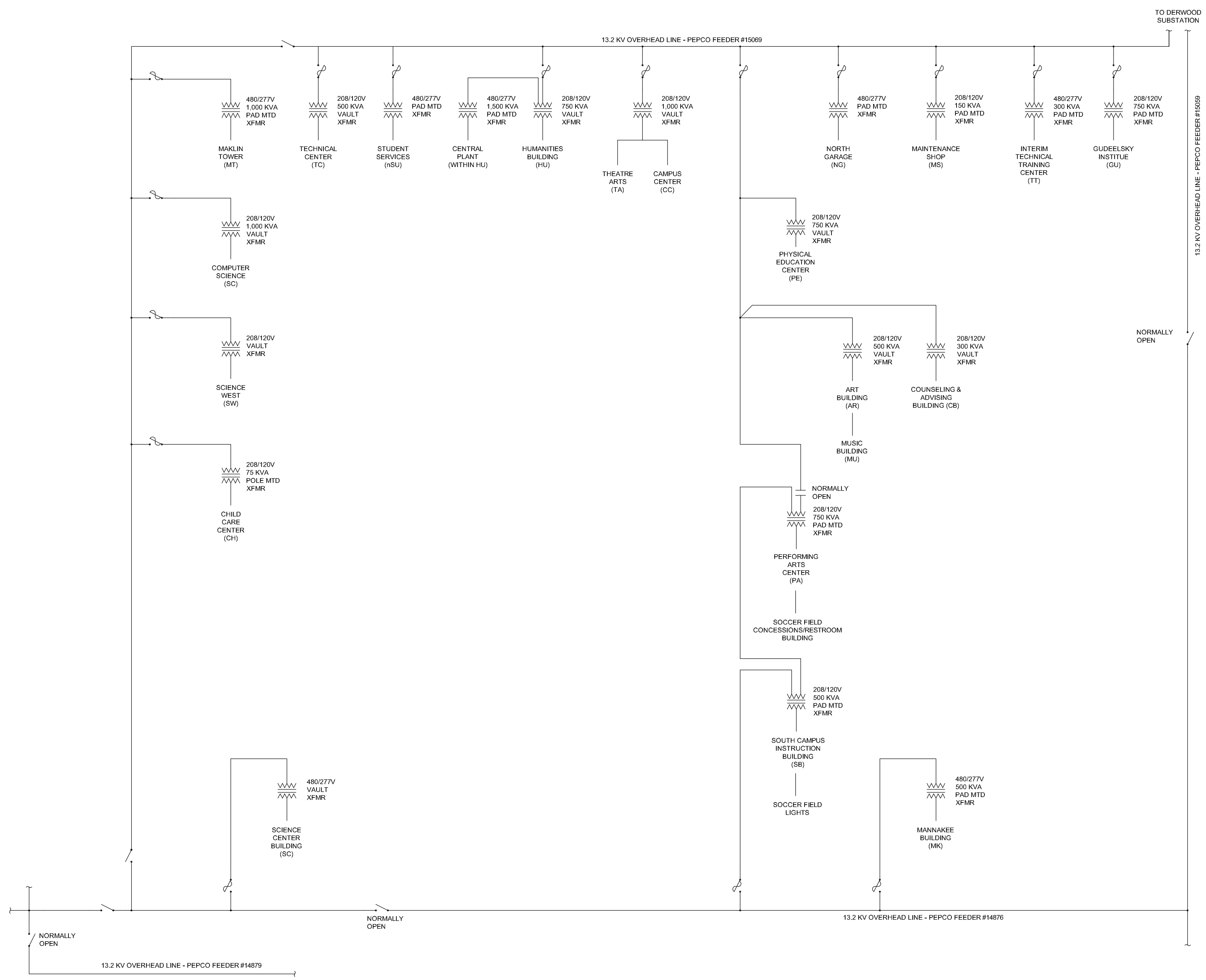
DATE: JUNE 2022

SHEET TITLE:
SITE PLAN
POTENTIAL PHOTOVOLTAIC LOCATIONS

DRAWING NO:
E1.04

BKM# 19021.02

Plotted By: Bill Jamieson | 6/16/2022 8:40 AM



1 SINGLE LINE DIAGRAM - POWER - EXISTING CONDITIONS

SCALE: NONE

ELECTRICAL LEGEND

- OVERHEAD OR UNDERGROUND UTILITY FEEDER SWITCH
- OVERHEAD OR UNDERGROUND UTILITY FEEDER FUSES
- UTILITY FEEDER TAP/CONNECTION POINT
- UTILITY TRANSFORMER

bkm
Burdette, Koehler, Murphy & Associates, Inc.
Mechanical / Electrical Engineers
6300 Blair Hill Lane Suite 400 | Baltimore, Maryland 21209
P: 410.323.0600 | www.bkma.com

PROJECT NAME:

Montgomery College

MC MONTGOMERY COLLEGE

Central Administration
Office of Facilities
9221 Corporate Boulevard
Rockville, MD 20850
Telephone: 240-567-7363

ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:

SINGLE LINE DIAGRAM - POWER - EXISTING CONDITIONS

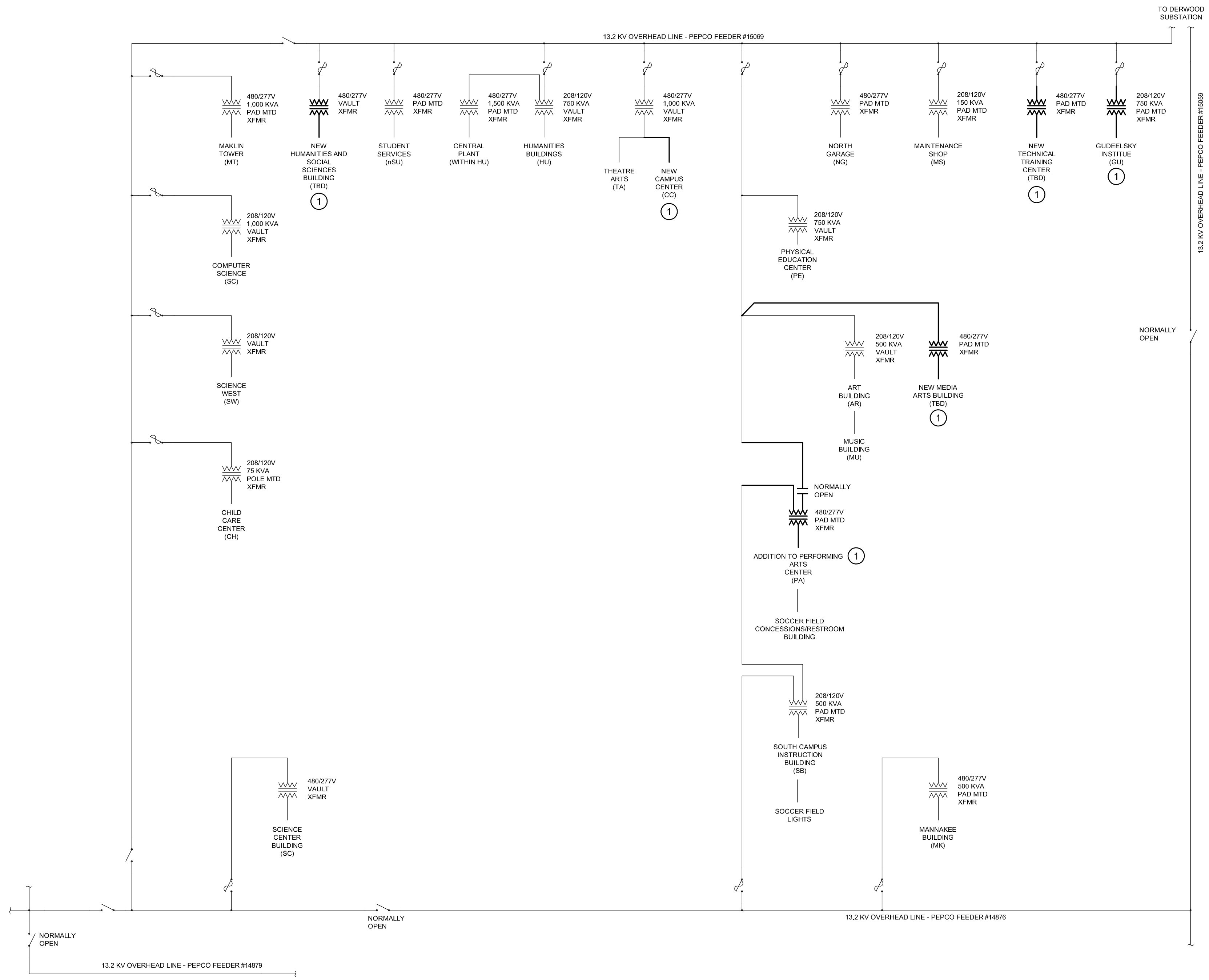
DRAWING NO:

E2.01

BKM# 19021.02

DRAWING NOTES:

1. PROVIDE MODIFICATION AS REQUIRED FOR NEW BUILDING PEPCO ELECTRICAL SERVICE ENTRANCE.



1 **SINGLE LINE DIAGRAM - POWER - LONG-TERM FUTURE CONDITIONS**

SCALE: NONE

ELECTRICAL LEGEND	
	OVERHEAD OR UNDERGROUND UTILITY FEEDER SWITCH
	OVERHEAD OR UNDERGROUND UTILITY FEEDER FUSES
	UTILITY FEEDER TAP/CONNECTION POINT
	UTILITY TRANSFORMER

bkm
Burdette, Koehler, Murphy & Associates, Inc.
Mechanical / Electrical Engineers
6300 Blair Hill Lane Suite 400 | Baltimore, Maryland 21209
P: 410.323.0600 | www.bkma.com

PROJECT NAME:

Montgomery College

MONTGOMERY COLLEGE

Central Administration
Office of Facilities
9221 Corporate Boulevard
Rockville, MD 20850
Telephone: 240-567-7363

ROCKVILLE CAMPUS UTILITY MASTER PLAN

ISSUED FOR:

DATE:	DESCRIPTION:
JUNE 2022	FINAL

PROJECT NO: BKM # 19021.02

SCALE: AS NOTED

DRAWN BY: BKM

CHECKED BY: BKM

DATE: JUNE 2022

SHEET TITLE:

SINGLE LINE DIAGRAM - POWER - LONG-TERM FUTURE CONDITIONS

DRAWING NO:

E2.02

BKM# 19021.02

ARL: G:\19021.02\Drawings\Acad\E\E202 One-Line - Future

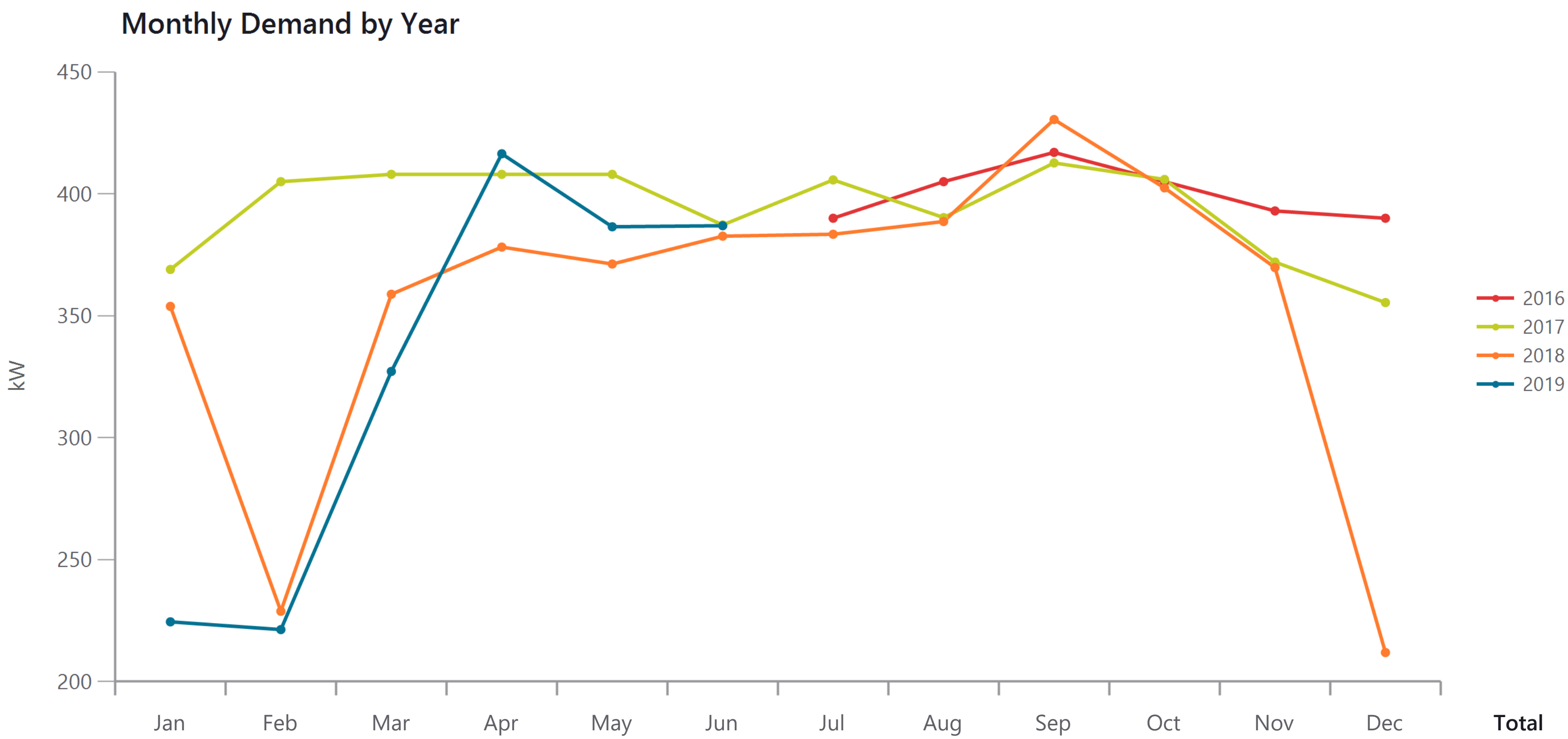
Plotted By: Bill Jamieson | 6/16/2022 7:45 AM

bkm

Appendix 5
MC Provided Information

Burdette, Koehler, Murphy and Associates, Inc.
6300 Blair Hill Lane, Suite 400 | Baltimore, MD 21209 | 410.323.0600 | bkma.com

Executive Summary (kW)



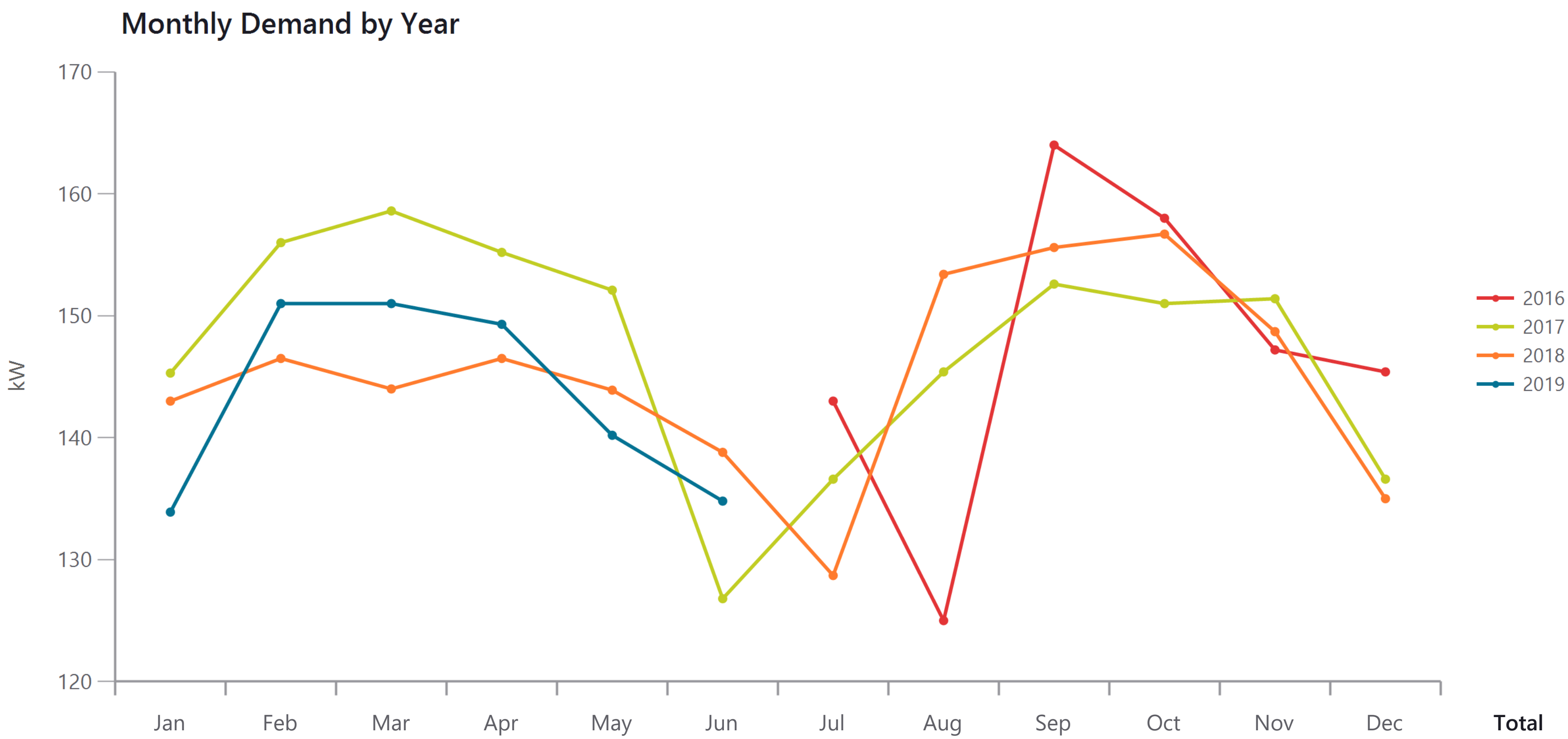
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							390	405	417	405	393	390	2,400
2017	369	405	408	408	408	387	406	390	413	406	372	355	4,727
2018	354	229	359	378	371	383	383	389	430	402	370	212	4,260
2019	224	221	327	416	386	387							1,963

Montgomery College
Energy CAP

RV Campus - Humanities Bldg. (HU)

Monthly Demand by Year

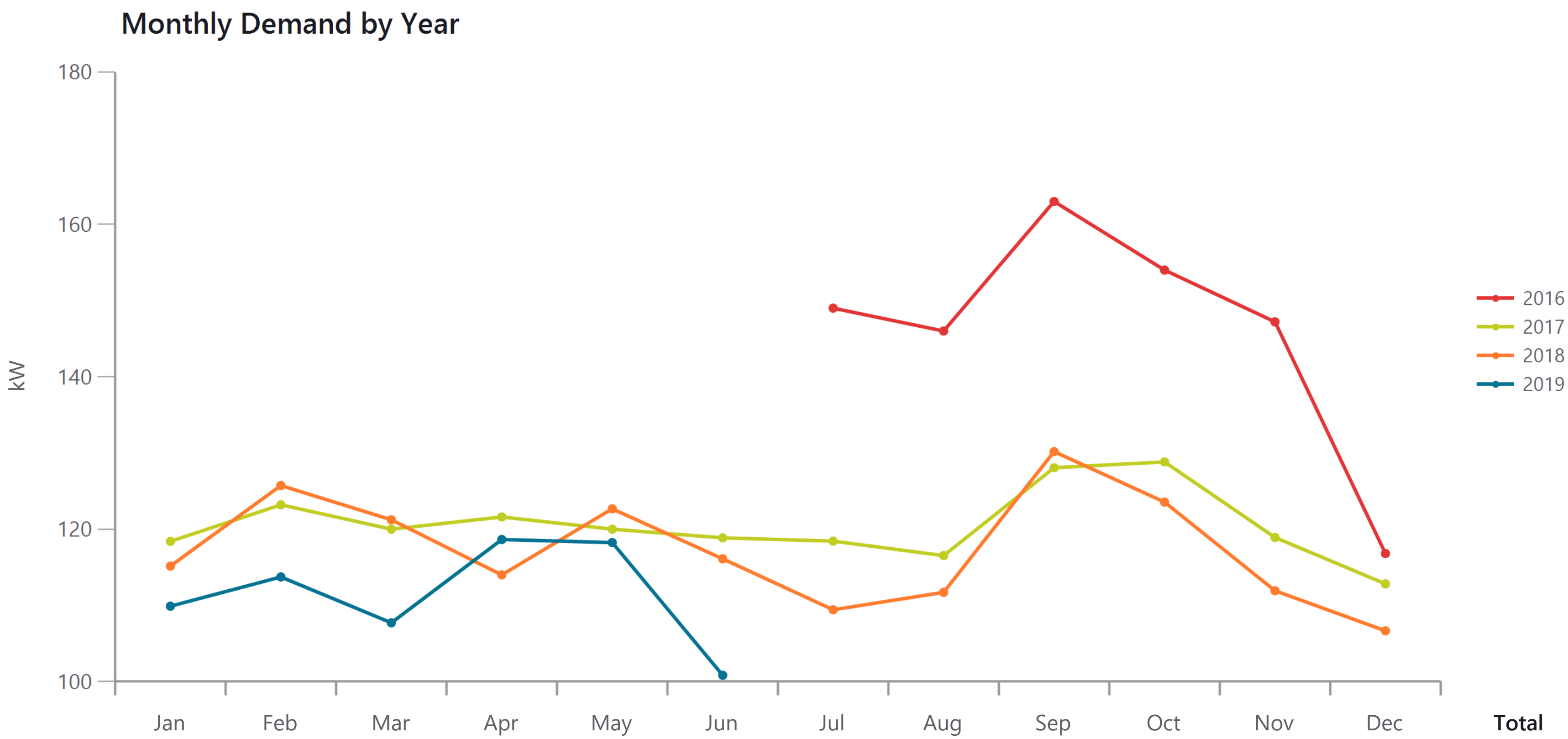
Executive Summary (kW)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							143	125	164	158	147	145	883
2017	145	156	159	155	152	127	137	145	153	151	151	137	1,768
2018	143	147	144	147	144	139	129	153	156	157	149	135	1,741
2019	134	151	151	149	140	135							860

Monthly Demand by Year

Executive Summary (kW)



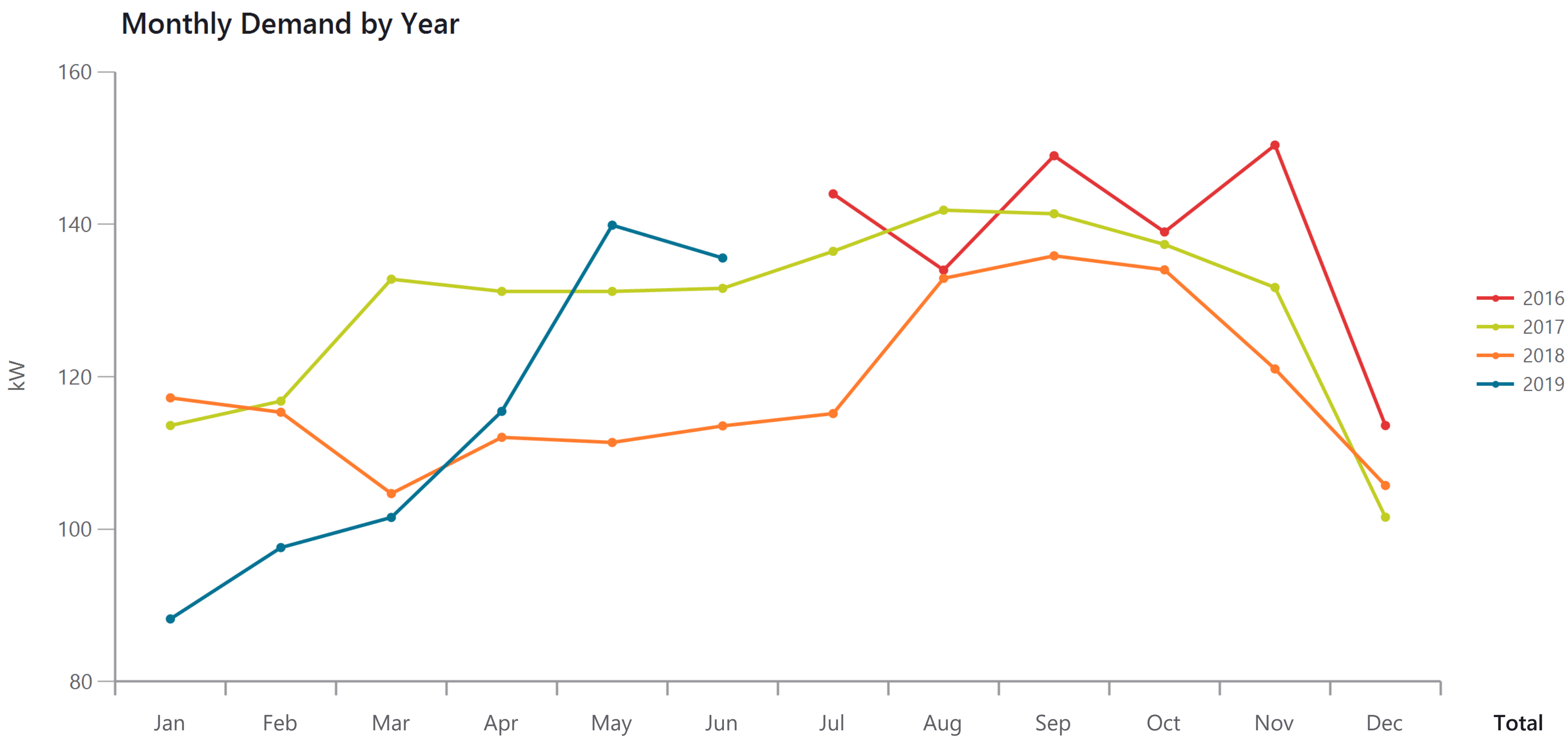
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							149	146	163	154	147	117	876
2017	118	123	120	122	120	119	118	117	128	129	119	113	1,446
2018	115	126	121	114	123	116	109	112	130	124	112	107	1,408
2019	110	114	108	119	118	101							669

Montgomery College
Energy CAP

RV Campus - Computer Science (CS)

Monthly Demand by Year

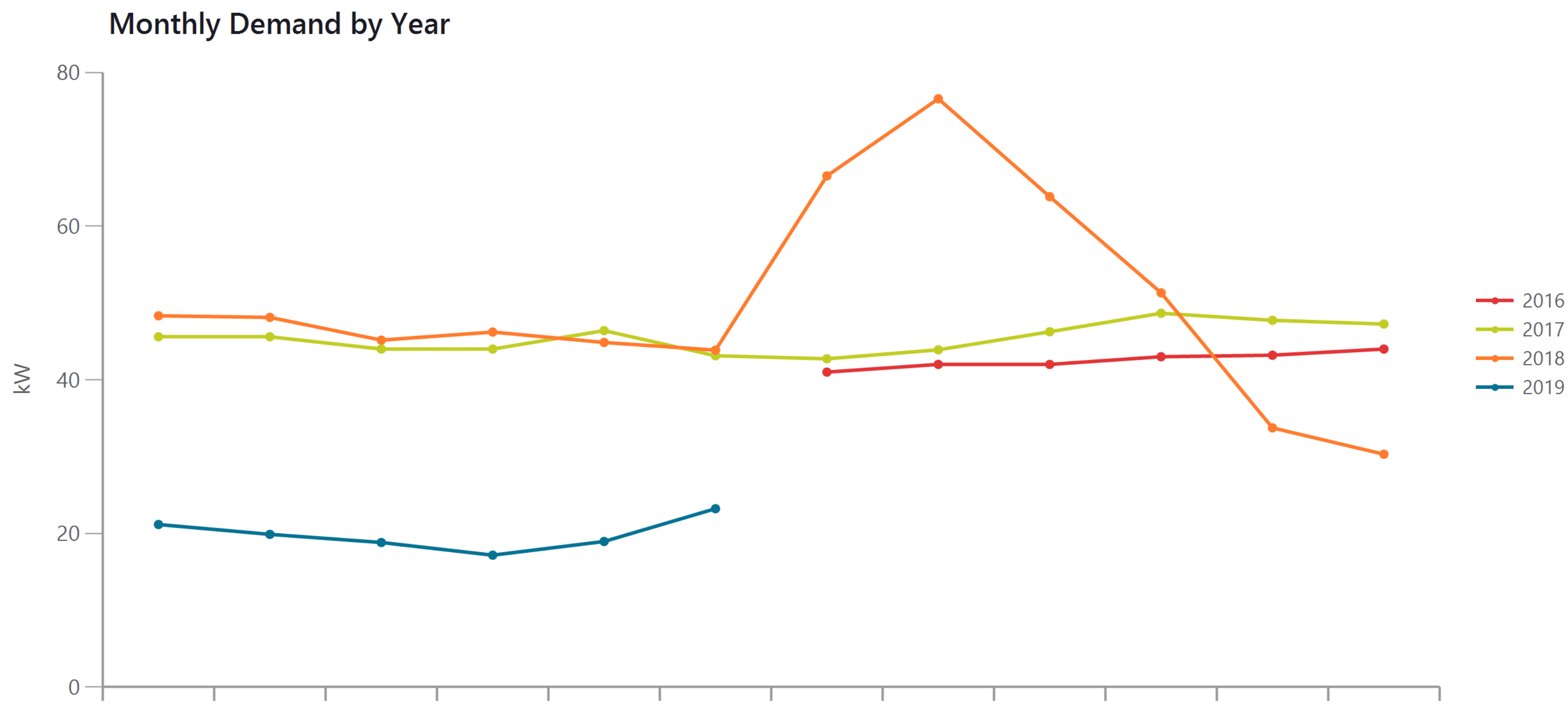
Executive Summary (kW)



Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	**Total**
2016							144	134	149	139	150	114	830
2017	114	117	133	131	131	132	136	142	141	137	132	102	1,548
2018	117	115	105	112	111	114	115	133	136	134	121	106	1,419
2019	88	98	102	115	140	136							678

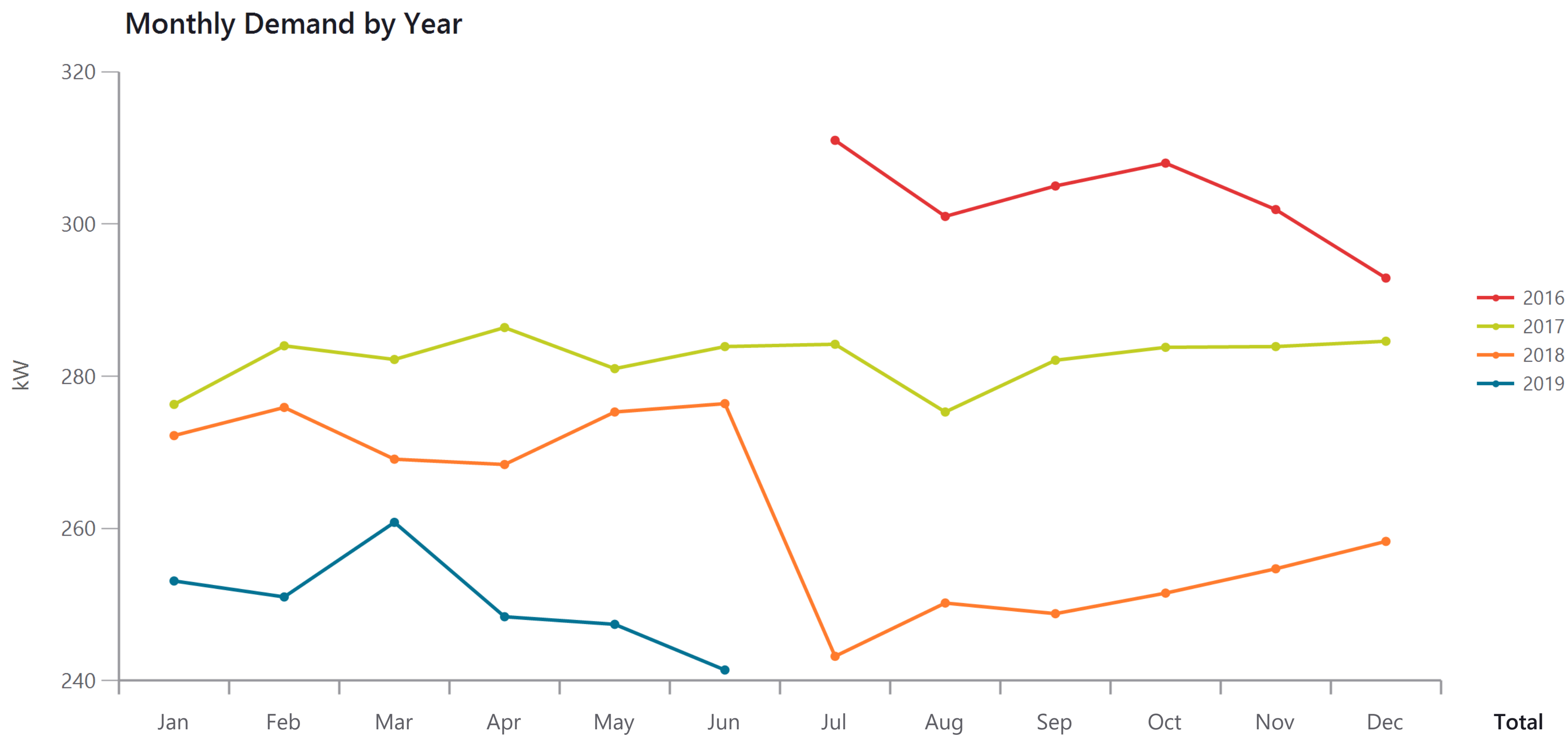
Monthly Demand by Year

Executive Summary (kW)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							41	42	42	43	43	44	255
2017	46	46	44	44	46	43	43	44	46	49	48	47	545
2018	48	48	45	46	45	44	67	77	64	51	34	30	599
2019	21	20	19	17	19	23							119

Executive Summary (kW)

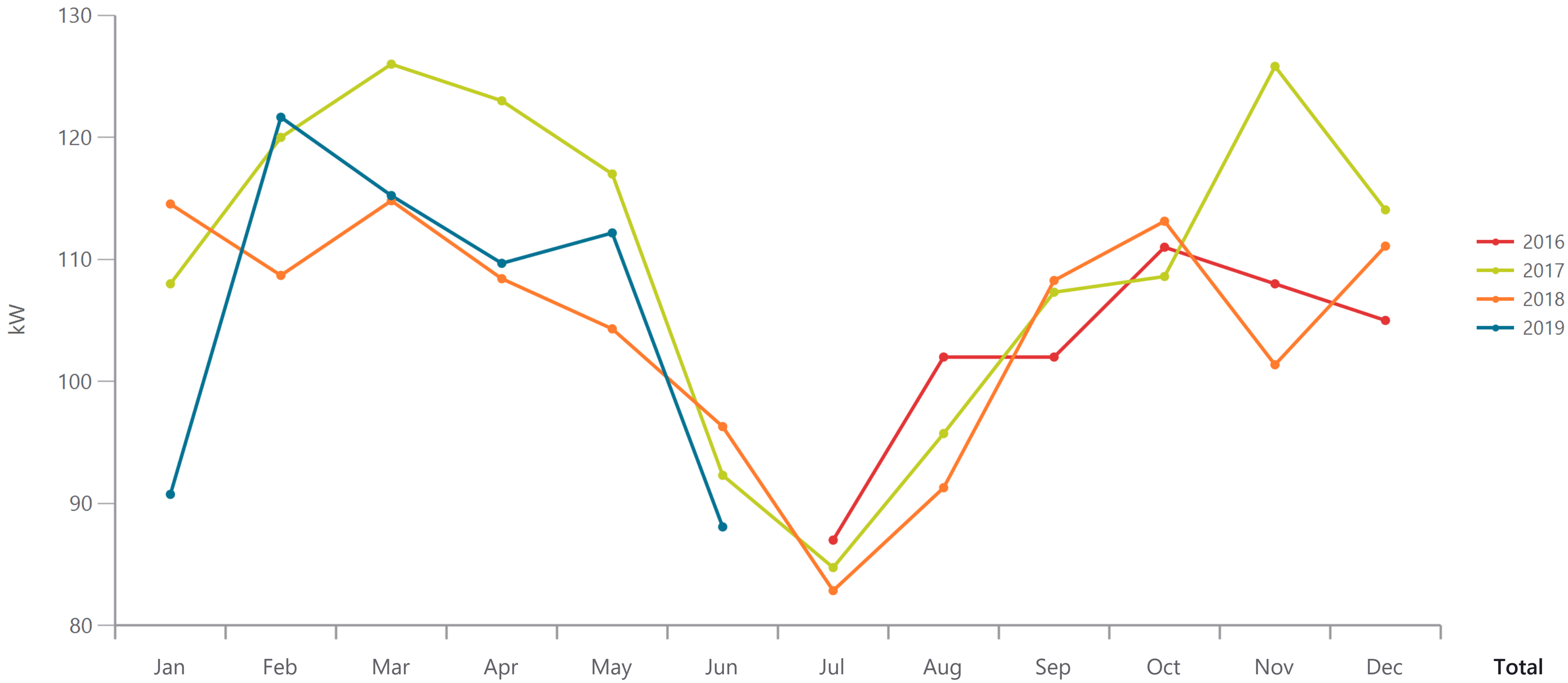


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							311	301	305	308	302	293	1,820
2017	276	284	282	286	281	284	284	275	282	284	284	285	3,388
2018	272	276	269	268	275	276	243	250	249	252	255	258	3,144
2019	253	251	261	248	247	241							1,502

Monthly Demand by Year

Executive Summary (kW)

Monthly Demand by Year



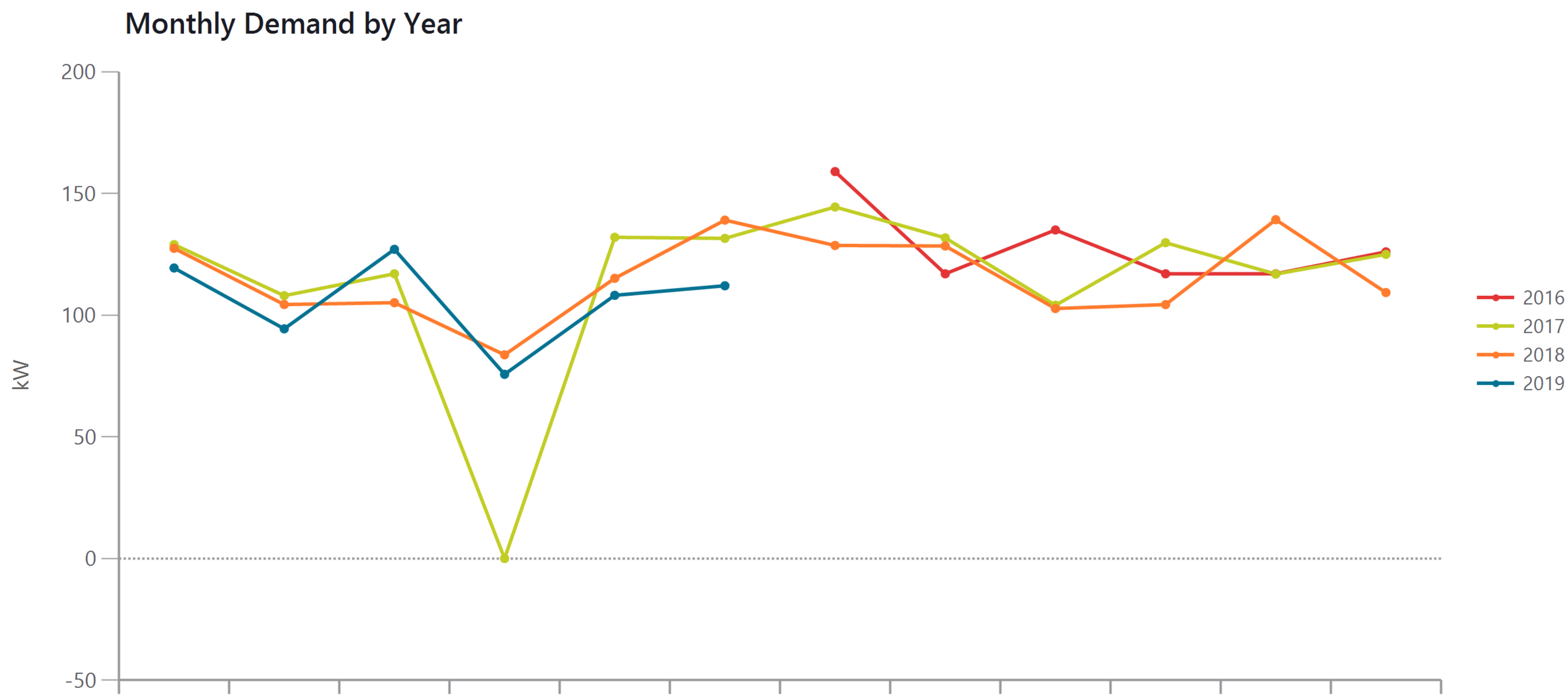
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
	2016							87	102	102	111	108	105	615
	2017	108	120	126	123	117	92	85	96	107	109	126	114	1,323
	2018	115	109	115	108	104	96	83	91	108	113	101	111	1,255
	2019	91	122	115	110	112	88							638

Montgomery College
Energy CAP

RV Campus - Parilla Performing Arts Cntr (PA)

Monthly Demand by Year

Executive Summary (kW)

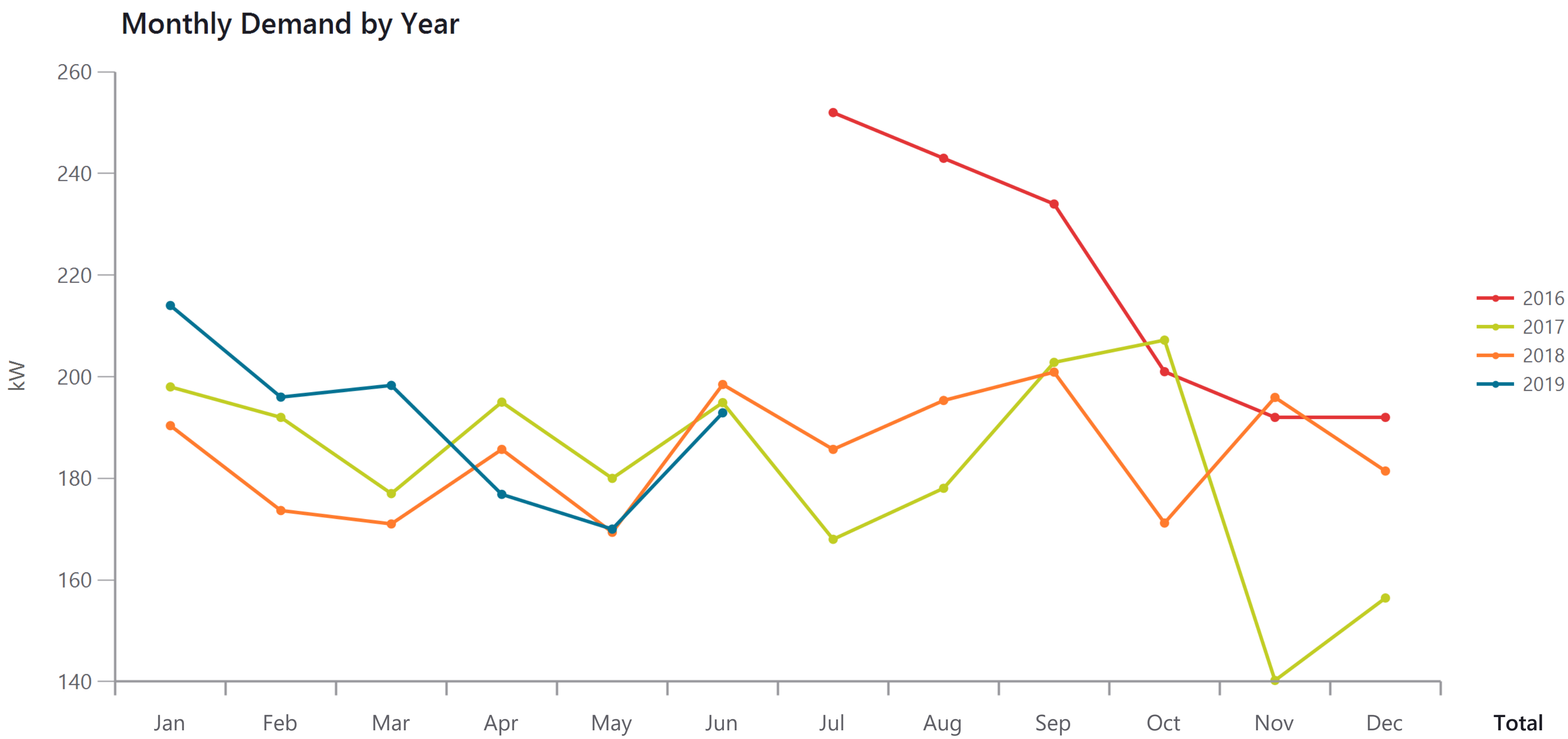


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							159	117	135	117	117	126	771
2017	129	108	117	0	132	132	144	132	104	130	117	125	1,369
2018	127	104	105	84	115	139	129	128	103	104	139	109	1,388
2019	119	94	127	76	108	112							637

*Two month bill: 3/31/2017 to 5/30/2019

Monthly Demand by Year

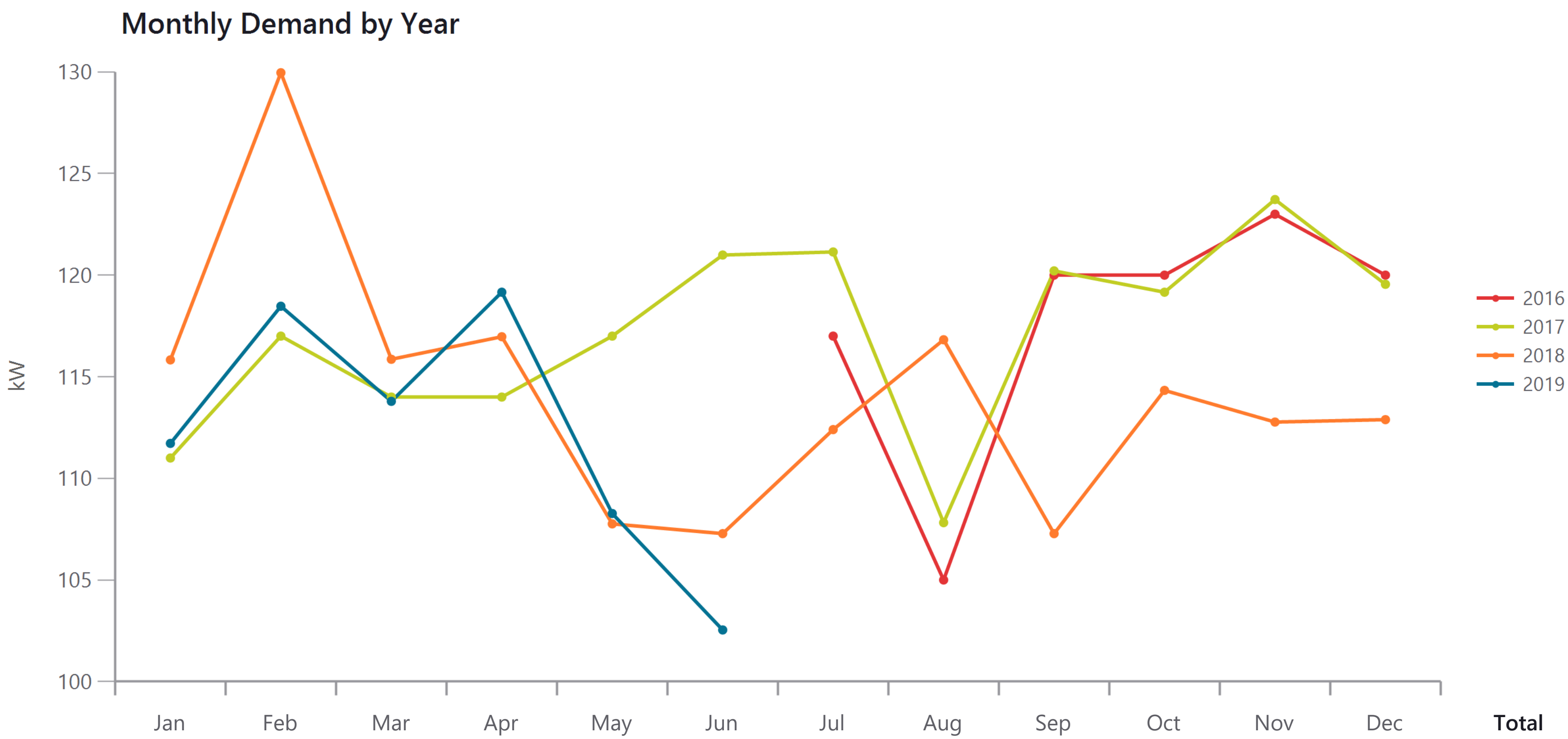
Executive Summary (kW)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							252	243	234	201	192	192	1,314
2017	198	192	177	195	180	195	168	178	203	207	140	156	2,190
2018	190	174	171	186	169	198	186	195	201	171	196	181	2,219
2019	214	196	198	177	170	193							1,148

Monthly Demand by Year

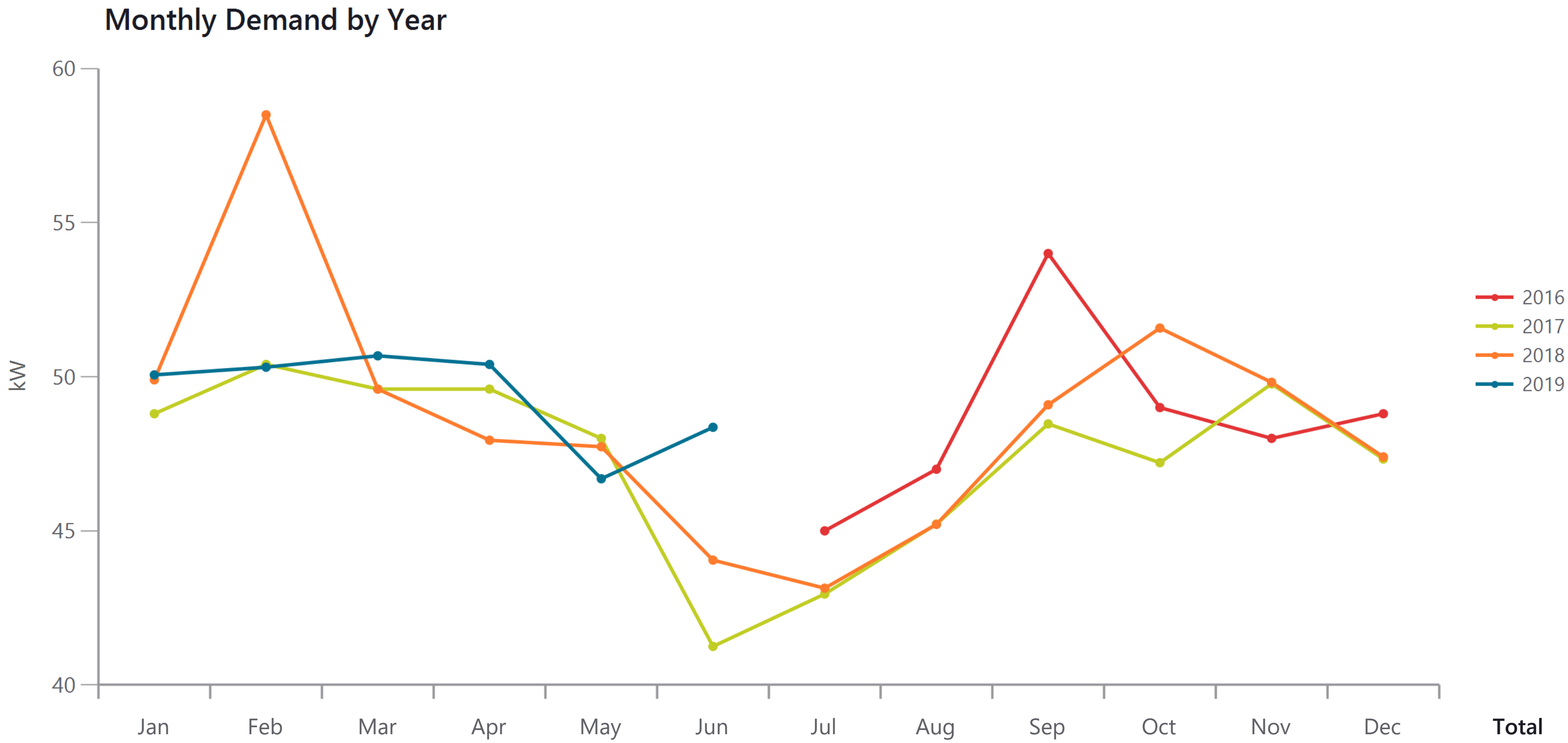
Executive Summary (kW)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							117	105	120	120	123	120	705
2017	111	117	114	114	117	121	121	108	120	119	124	120	1,406
2018	116	130	116	117	108	107	112	117	107	114	113	113	1,370
2019	112	118	114	119	108	103							674

Monthly Demand by Year

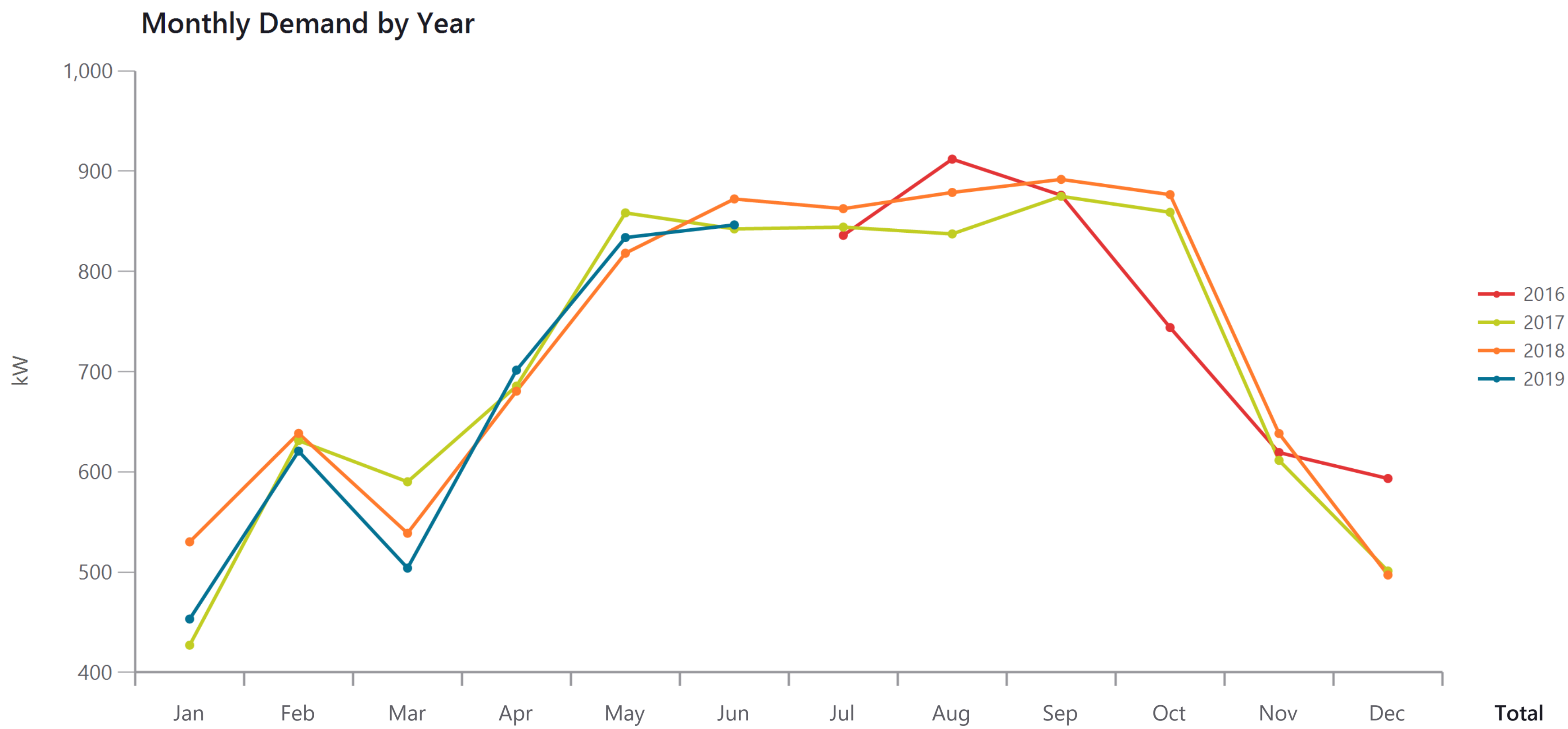
Executive Summary (kW)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							45	47	54	49	48	49	292
2017	49	50	50	50	48	41	43	45	48	47	50	47	569
2018	50	59	50	48	48	44	43	45	49	52	50	47	584
2019	50	50	51	50	47	48							297

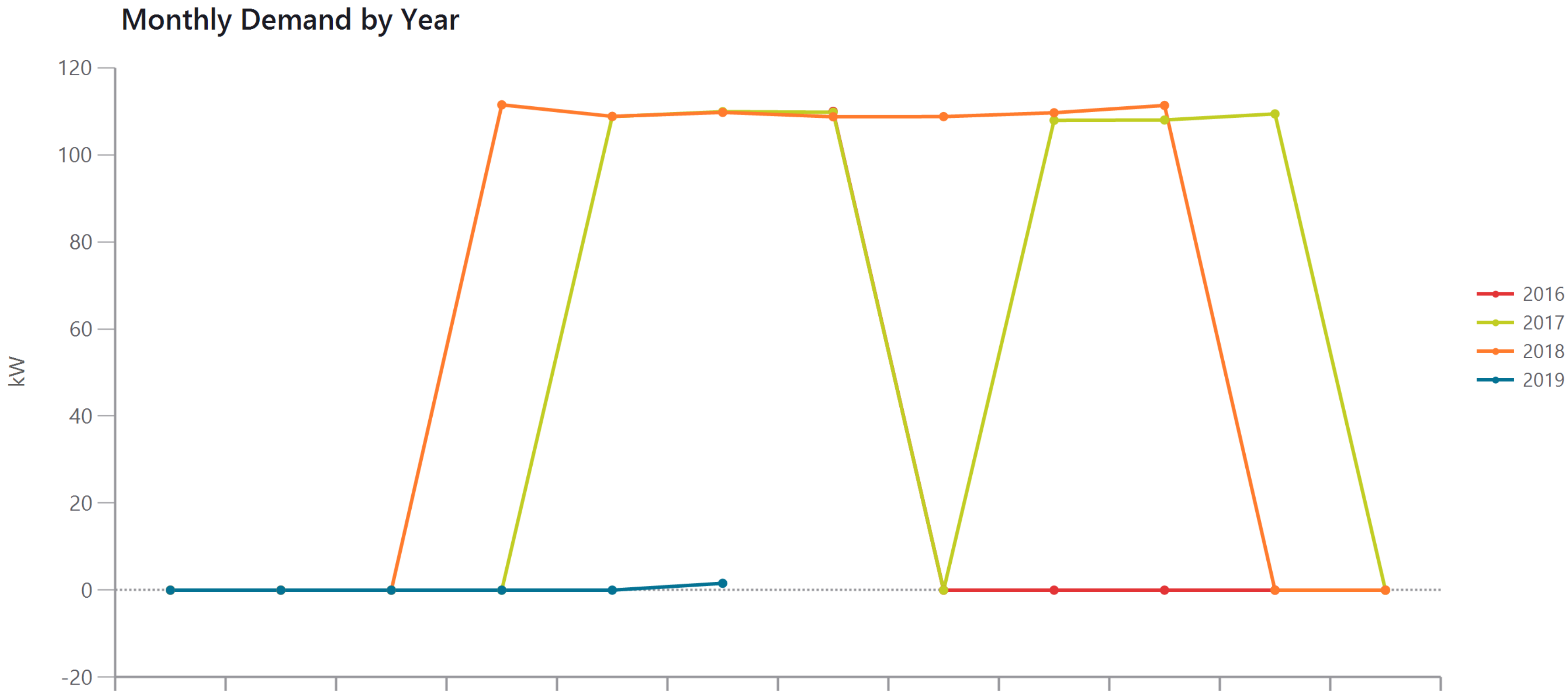
Monthly Demand by Year

Executive Summary (kW)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							836	912	876	744	619	593	4,581
2017	427	631	590	686	858	842	844	837	875	859	612	501	8,563
2018	530	638	539	681	818	872	863	879	892	877	638	497	8,724
2019	453	621	504	702	834	846							3,960

Executive Summary (kW)

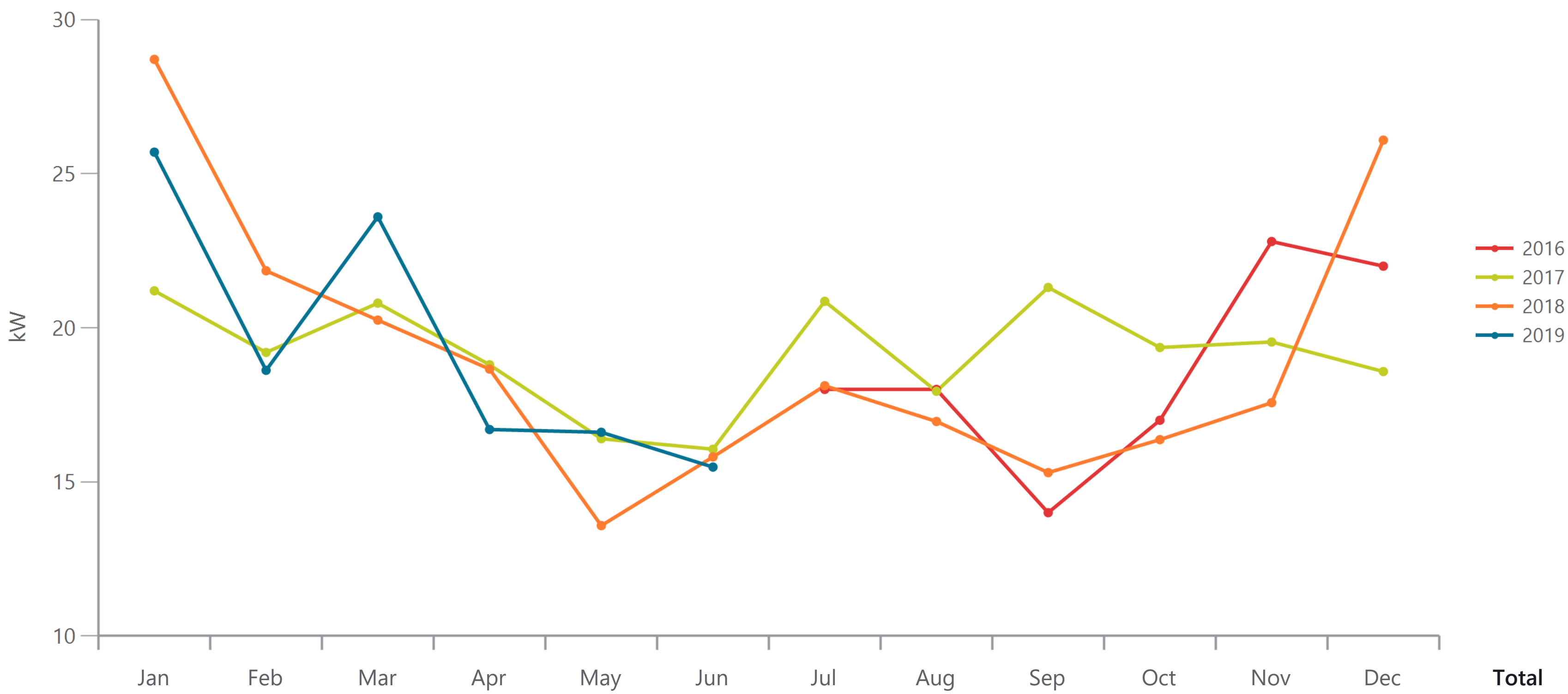


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							110	0	0	0	0	0	110
2017	0	0	0	0	109	110	110	0	108	108	109	0	654
2018	0	0	0	111	109	110	109	109	110	111	0	0	769
2019	0	0	0	0	0	2							2

Monthly Demand by Year

Executive Summary (kW)

Monthly Demand by Year



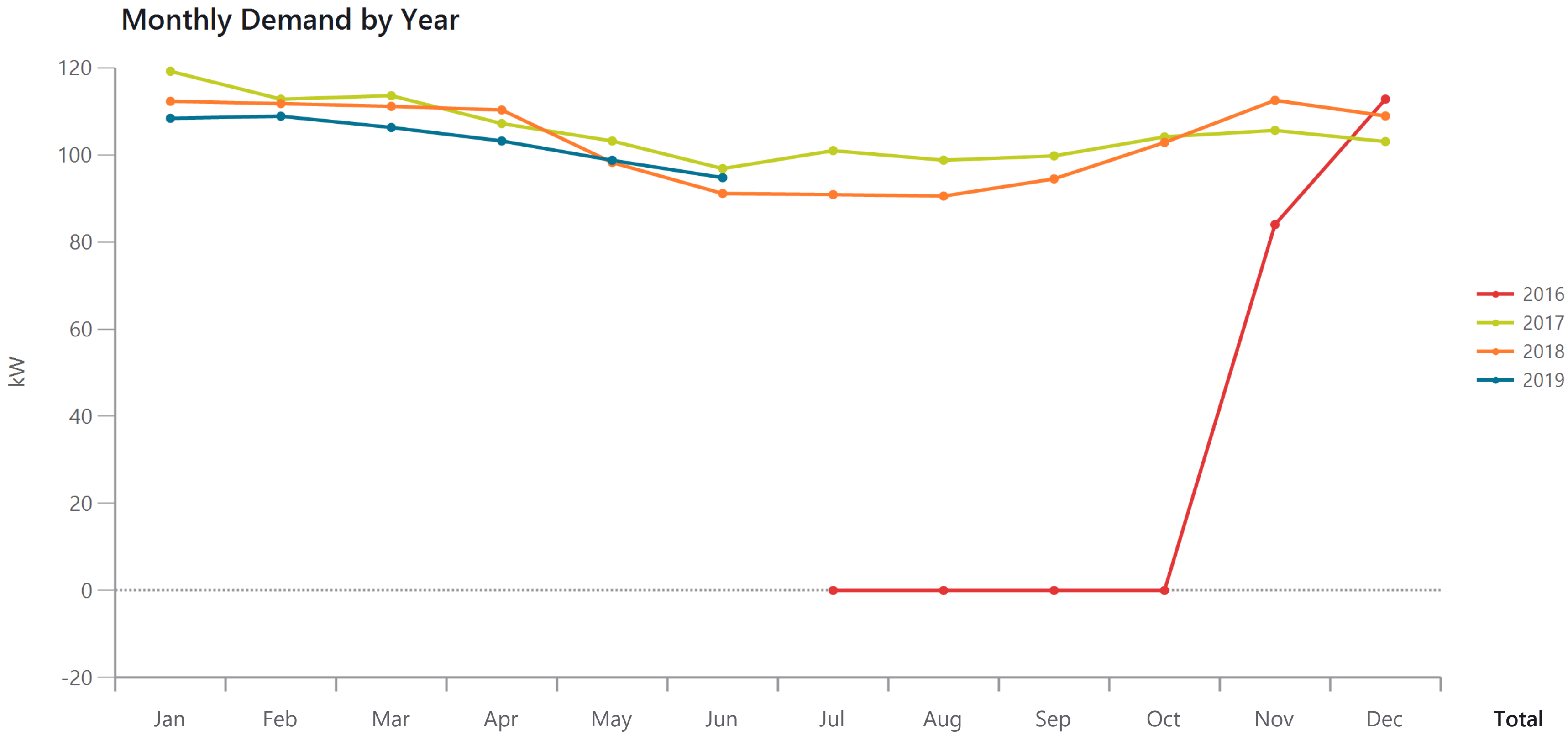
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							18	18	14	17	23	22	112
2017	21	19	21	19	16	16	21	18	21	19	20	19	230
2018	29	22	20	19	14	16	18	17	15	16	18	26	229
2019	26	19	24	17	17	15							117

Montgomery College
Energy CAP

RV Campus - North Garage (NG)

Monthly Demand by Year

Executive Summary (kW)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2016							0	0	0	0	84	113	197
2017	119	113	114	107	103	97	101	99	100	104	106	103	1,265
2018	112	112	111	110	98	91	91	91	95	103	113	109	1,235
2019	108	109	106	103	99	95							620

Monthly Electric Demand by Year

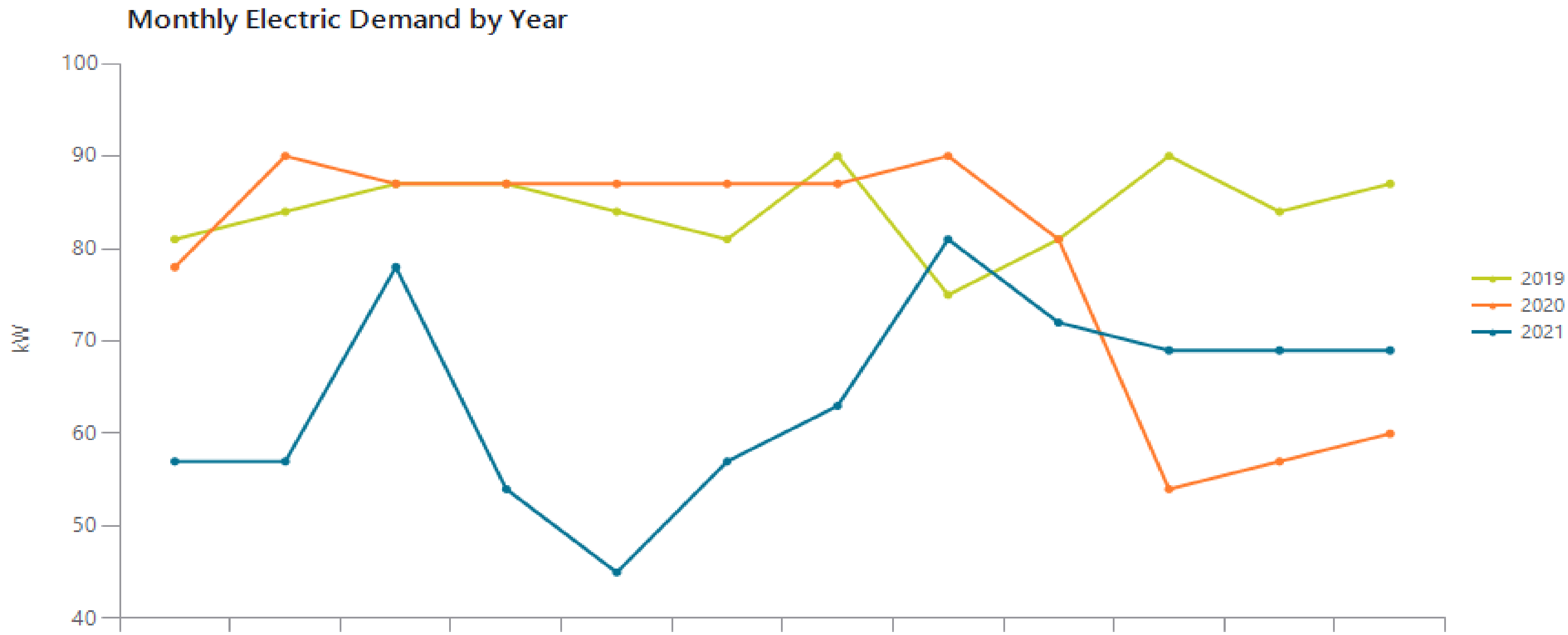
[SW (219) - ELEC]

Active (kW)
Status

PEPCO
Vendor

51 Mannakee Street
Rockville, MD, US 20850

Address



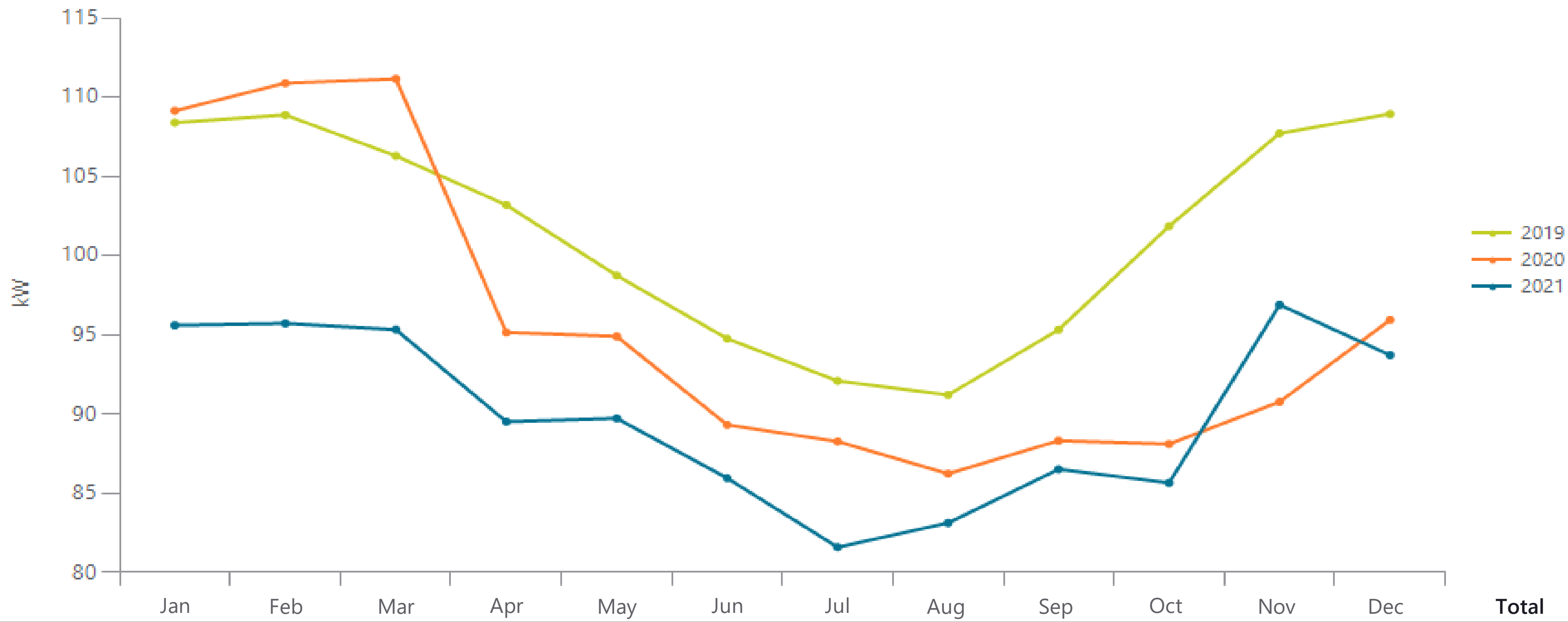
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	81	84	87	87	84	81	90	75	81	90	84	87	1,011
2020	78	90	87	87	87	87	87	90	81	54	57	60	945
2021	57	57	78	54	45	57	63	81	72	69	69	69	771

Monthly Electric Demand by Year

[NG (214) - ELEC]

Active (kW)	PEPCO	51 Mannakee Street Garage Rockville, MD, US 20850
Status	Vendor	Address

Monthly Electric Demand by Year



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	108	109	106	103	99	95	92	91	95	102	108	109	1,217
2020	109	111	111	95	95	89	88	86	88	88	91	96	1,148
2021	96	96	95	90	90	86	82	83	87	86	97	94	1,080

Monthly Electric Demand by Year

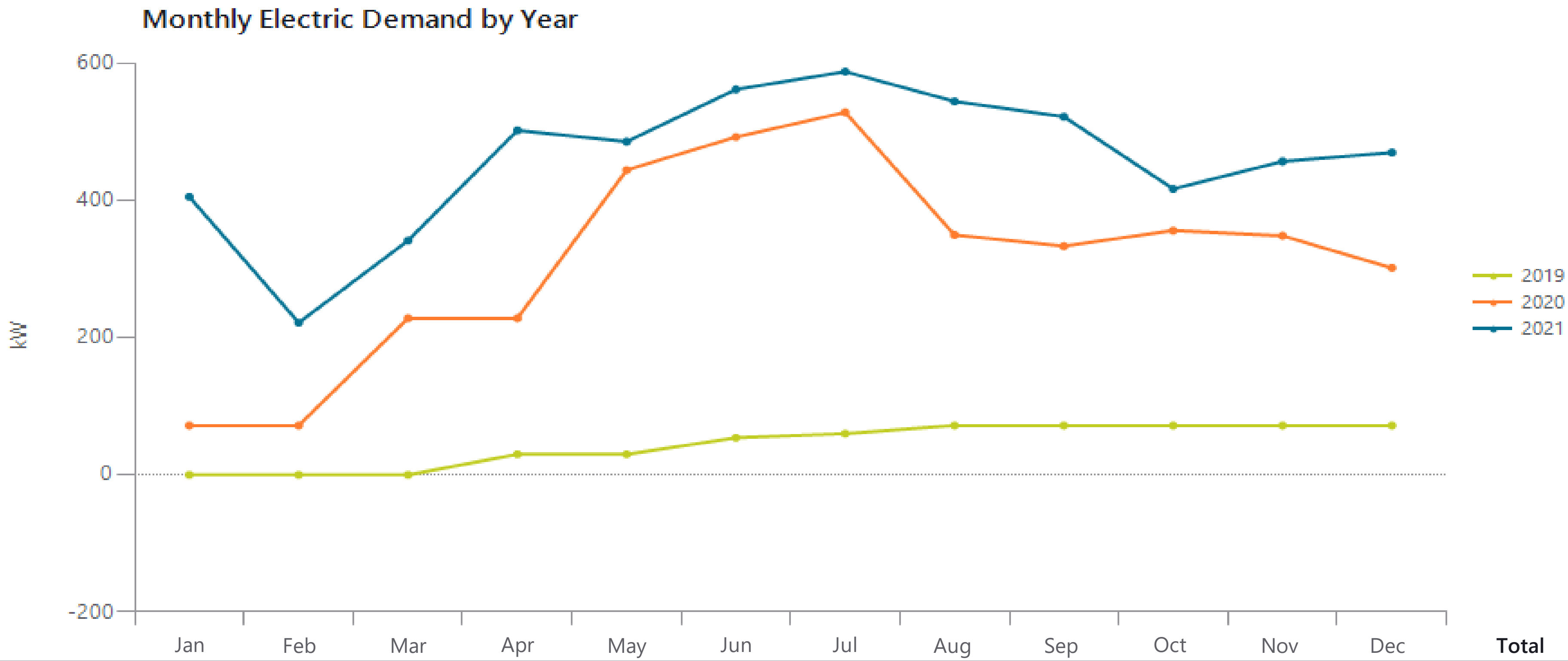
[SV (224) - ELEC_PLANT]

Active (kW)
Status

PEPCO
Vendor

Rockville, MD, US 20850

Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	0	0	0	30	30	54	60	72	72	72	72	72	534
2020	72	72	228	228	444	492	528	349	333	356	348	301	3,752
2021	405	222	341	502	485	561	587	544	522	416	456	469	5,511

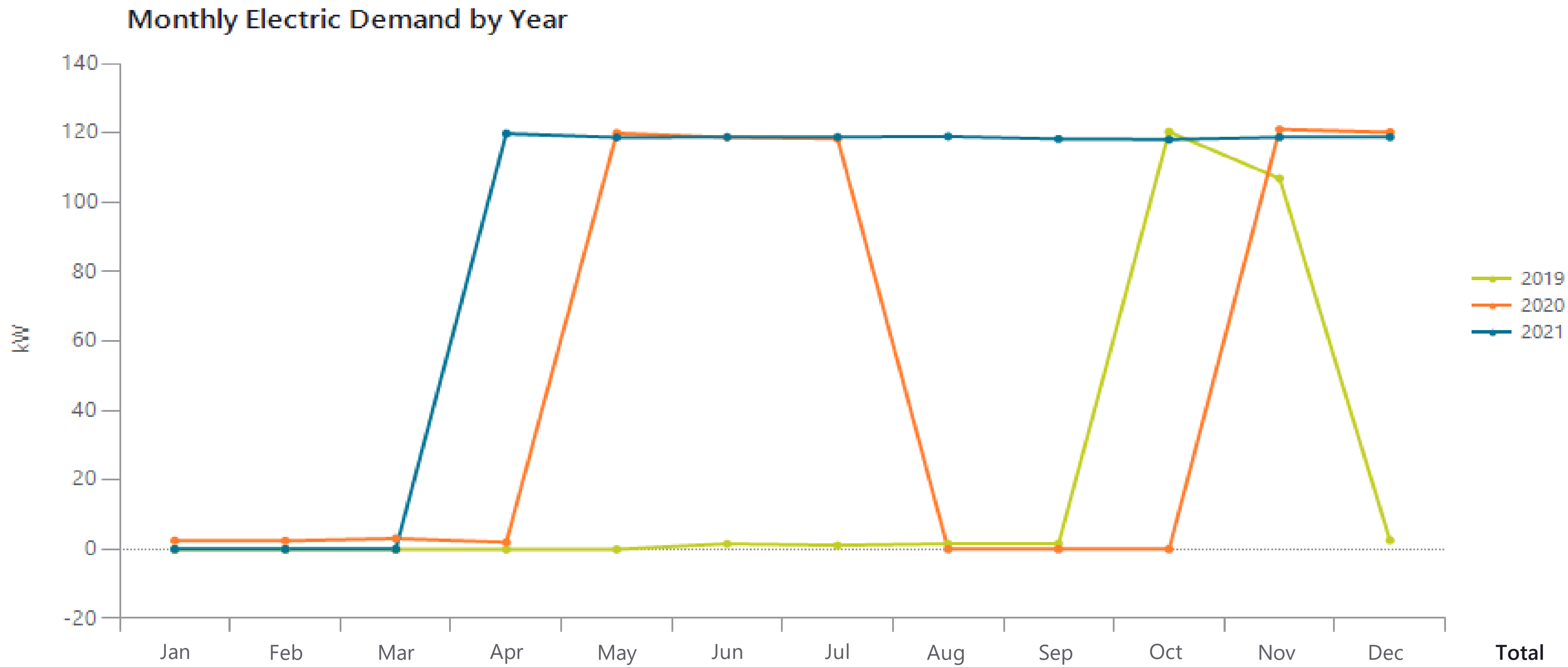
Monthly Electric Demand by Year

[SF (228) - ELEC]

Active (kW)
Status

PEPCO
Vendor

Rockville, MD, US 20850
Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	0	0	0	0	0	2	1	2	2	120	107	3	236
2020	2	2	3	2	120	119	118	0	0	0	121	120	608
2021	0	0	0	120	119	119	119	119	118	118	119	119	1,069

Monthly Electric Demand by Year

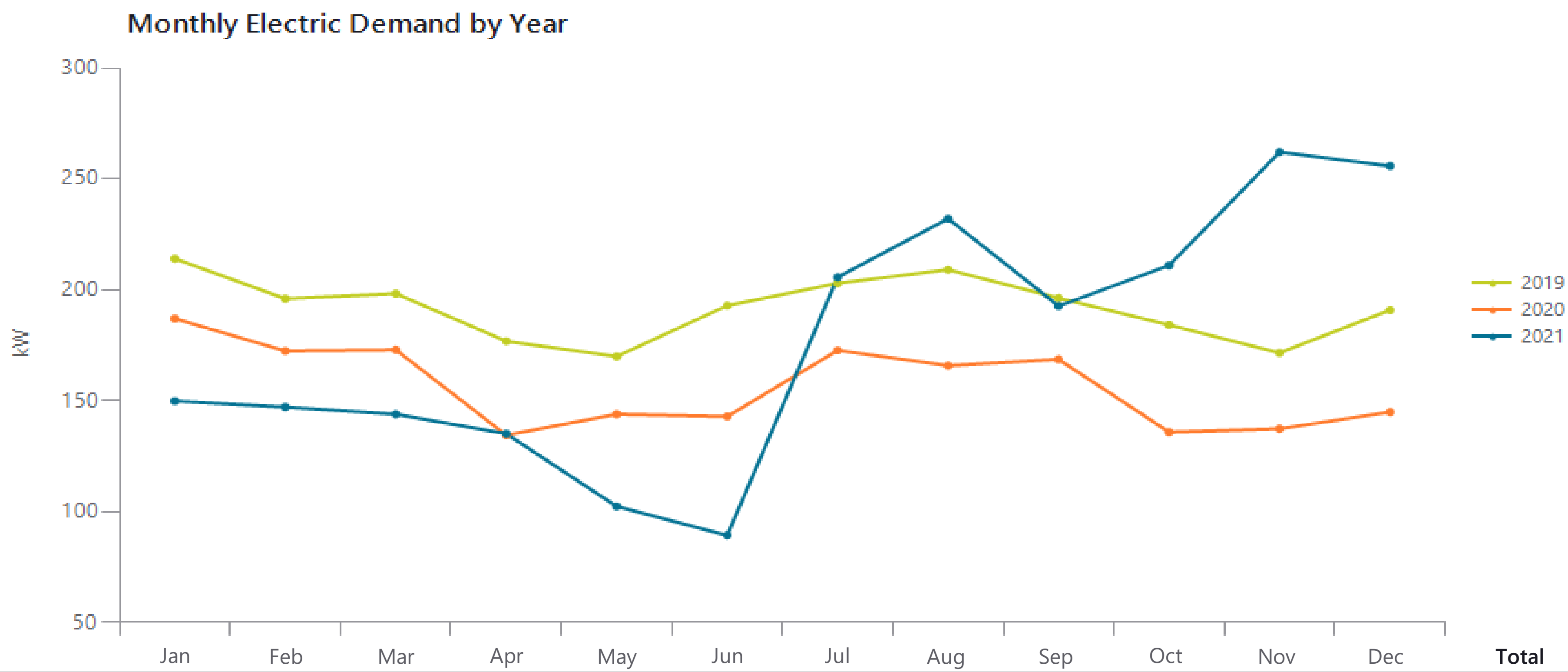
[MK (211) - ELEC]

Active (kW)
Status

PEPCO
Vendor

900 HUNGERFORD DR
US 20850

Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	214	196	198	177	170	193	203	209	196	184	172	191	2,303
2020	187	172	173	135	144	143	173	166	169	136	137	145	1,879
2021	150	147	144	135	102	89	206	232	193	211	262	256	2,127

Monthly Electric Demand by Year

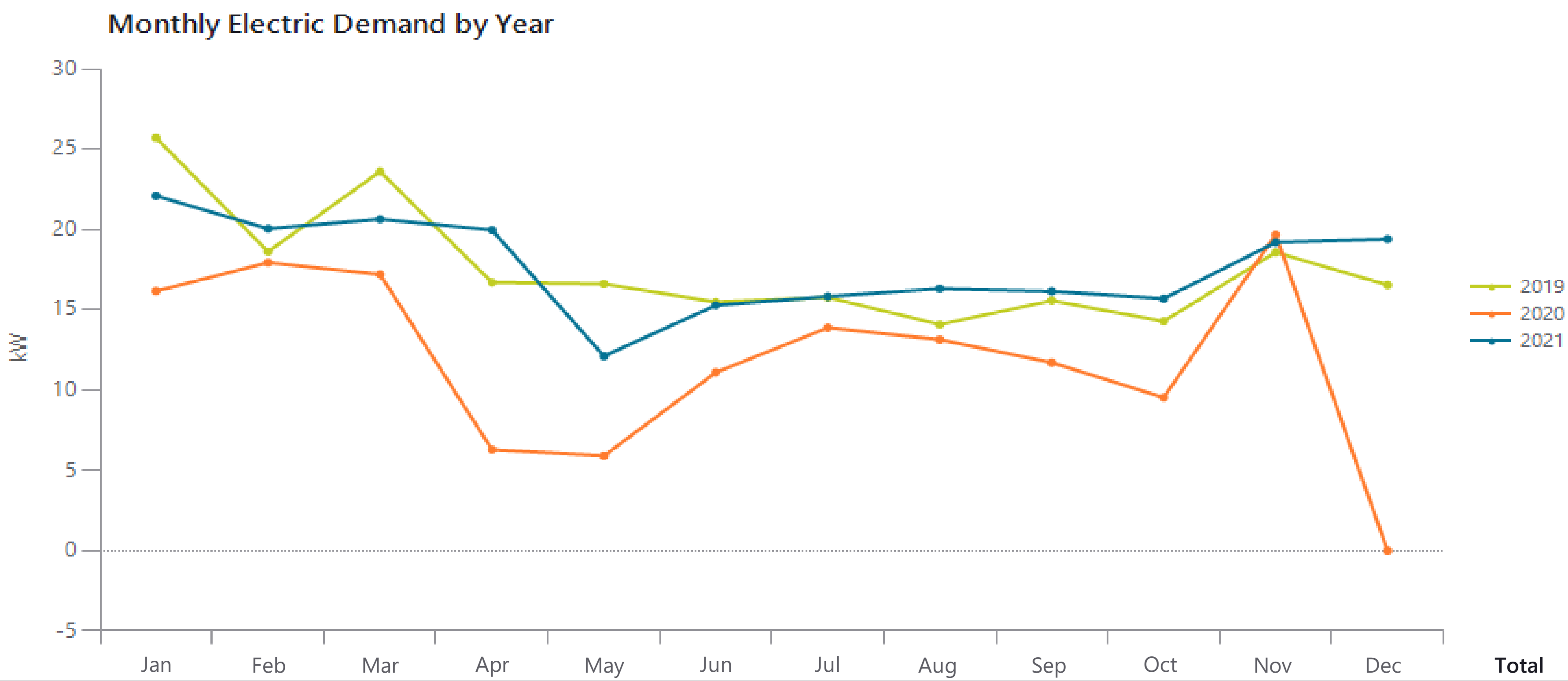
[MS (210) - ELEC]

Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS
Rockville, MD, US 20850

Address

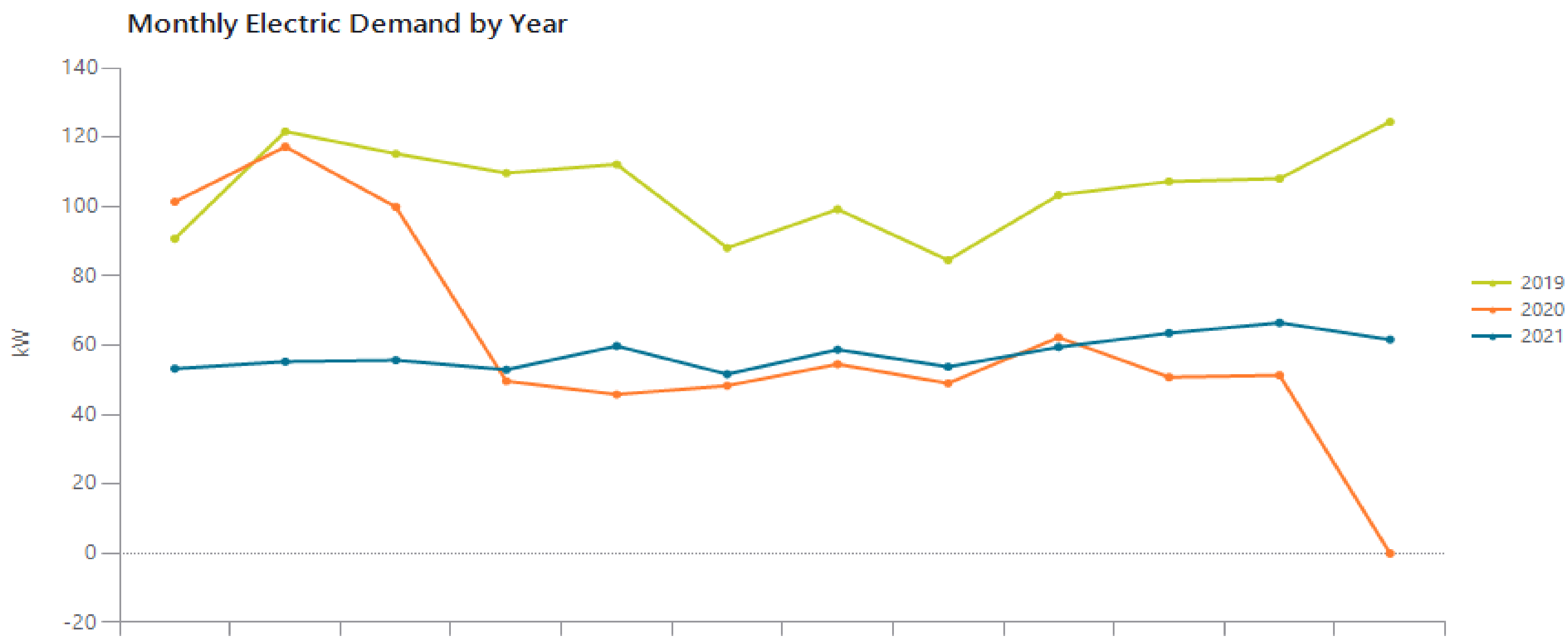


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	26	19	24	17	17	15	16	14	16	14	19	17	212
2020	16	18	17	6	6	11	14	13	12	10	20	0	143
2021	22	20	21	20	12	15	16	16	16	16	19	19	213

Monthly Electric Demand by Year

[AR/MU (201/212) - ELEC]

Active (kW)	PEPCO	ROCKVILLE CAMPUS Rockville, MD, US 20850
Status	Vendor	Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	91	122	115	110	112	88	99	85	103	107	108	124	1,264
2020	101	117	100	50	46	48	55	49	62	51	51	0	730
2021	53	55	56	53	60	52	59	54	59	64	66	62	692

Monthly Electric Demand by Year

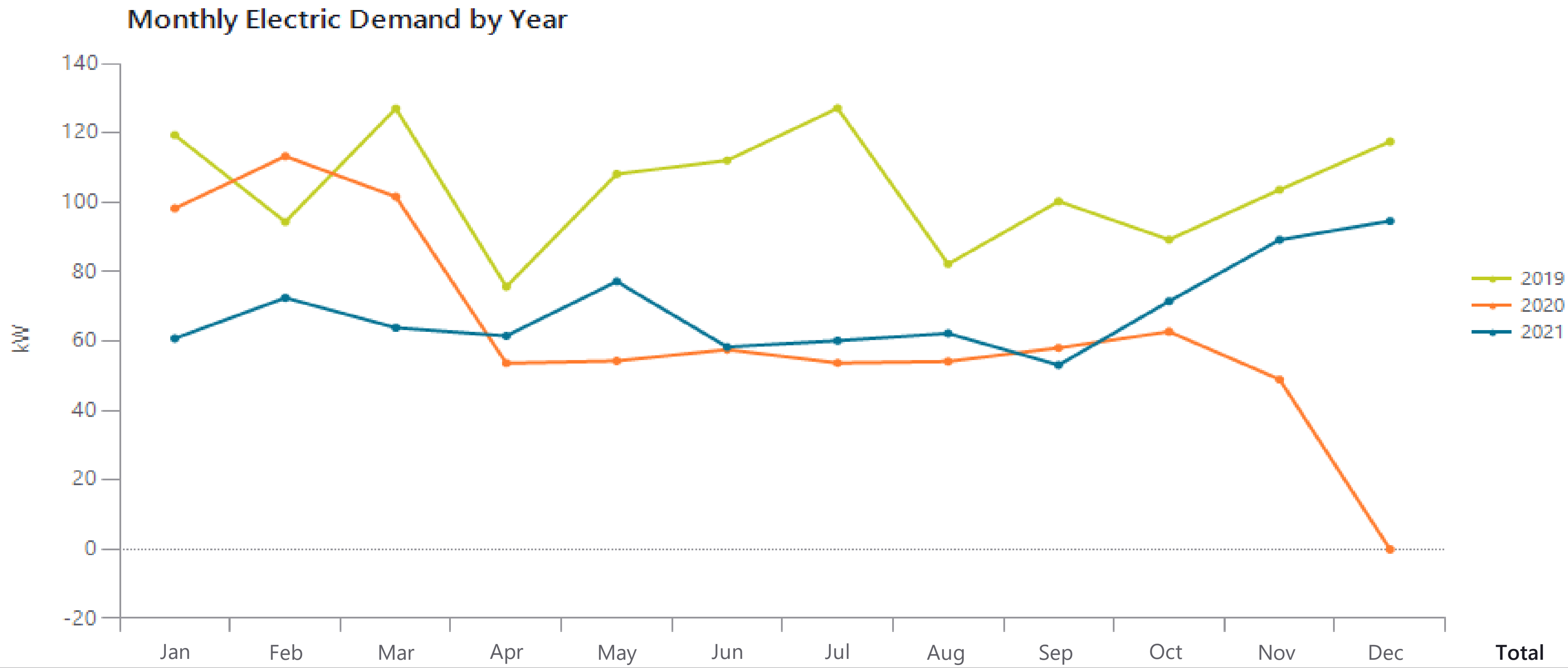
[PA (213) - ELEC]

Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS
Rockville, MD, US 20850

Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	119	94	127	76	108	112	127	82	100	89	104	118	1,257
2020	98	113	102	54	54	58	54	54	58	63	49	0	756
2021	61	72	64	62	77	58	60	62	53	71	89	95	825

Monthly Electric Demand by Year

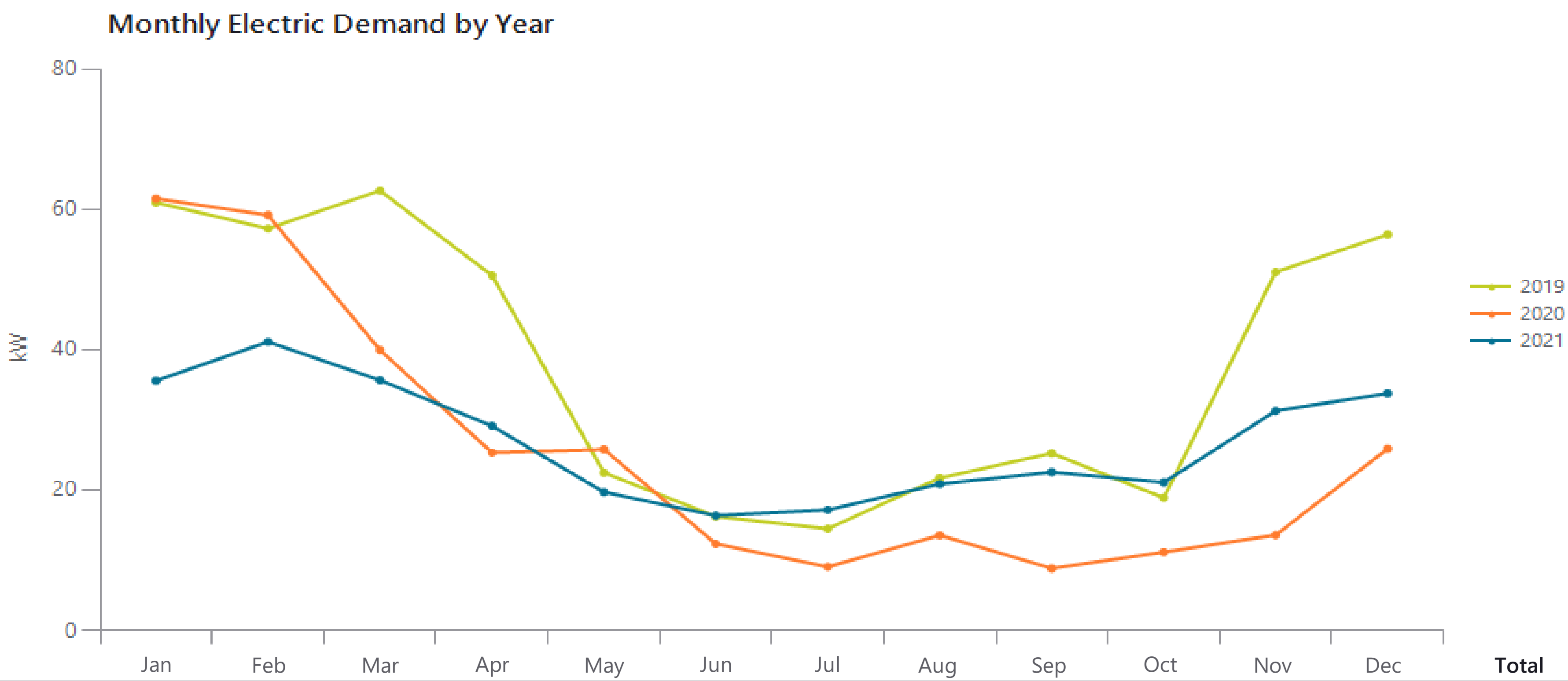
[TT (209) - ELEC]

Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS
Rockville, MD, US 20850

Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	61	57	63	51	23	16	15	22	25	19	51	56	458
2020	62	59	40	25	26	12	9	14	9	11	14	26	307
2021	36	41	36	29	20	16	17	21	23	21	31	34	325

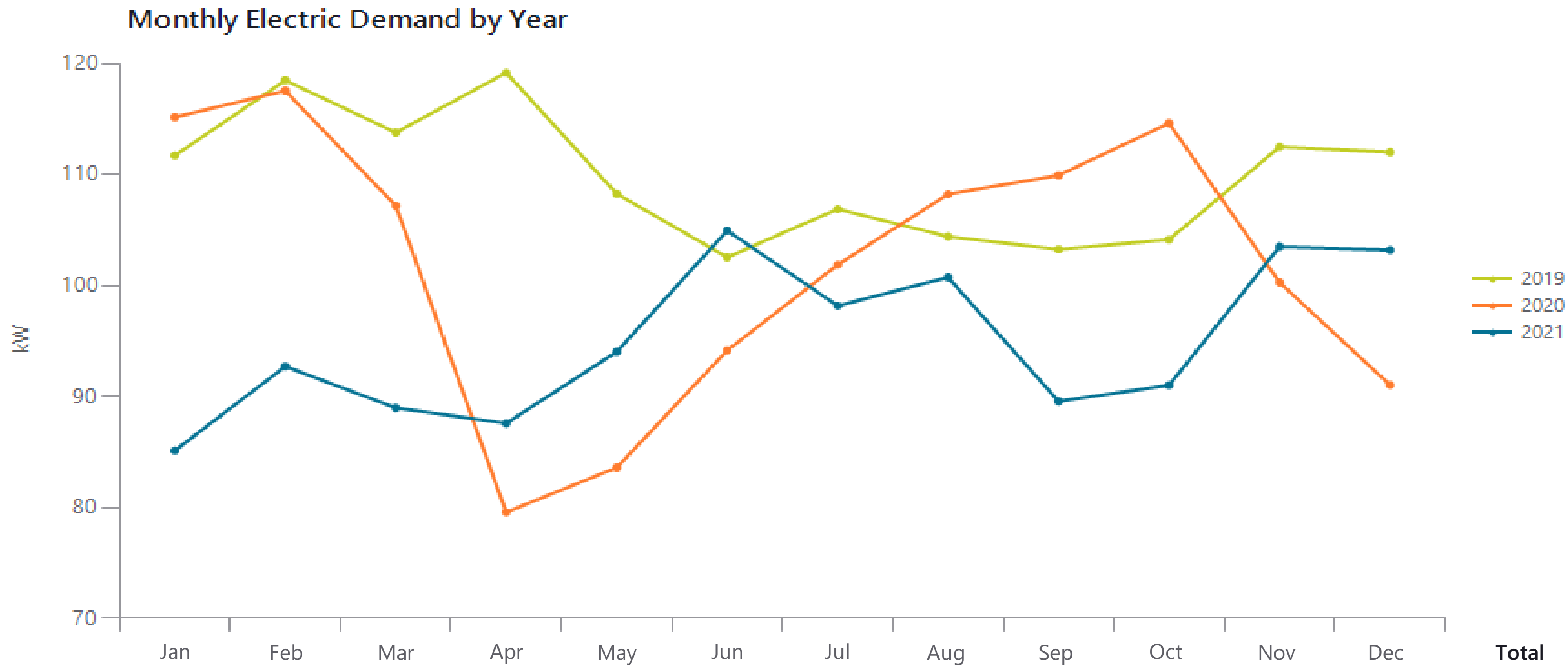
Monthly Electric Demand by Year

[GU (207) - ELEC]

Active (kW)
Status

PEPCO
Vendor

51 MANNAKEE ST.
Rockville, MD, US 20850
Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	112	118	114	119	108	103	107	104	103	104	113	112	1,317
2020	115	118	107	80	84	94	102	108	110	115	100	91	1,223
2021	85	93	89	88	94	105	98	101	90	91	104	103	1,140

Monthly Electric Demand by Year

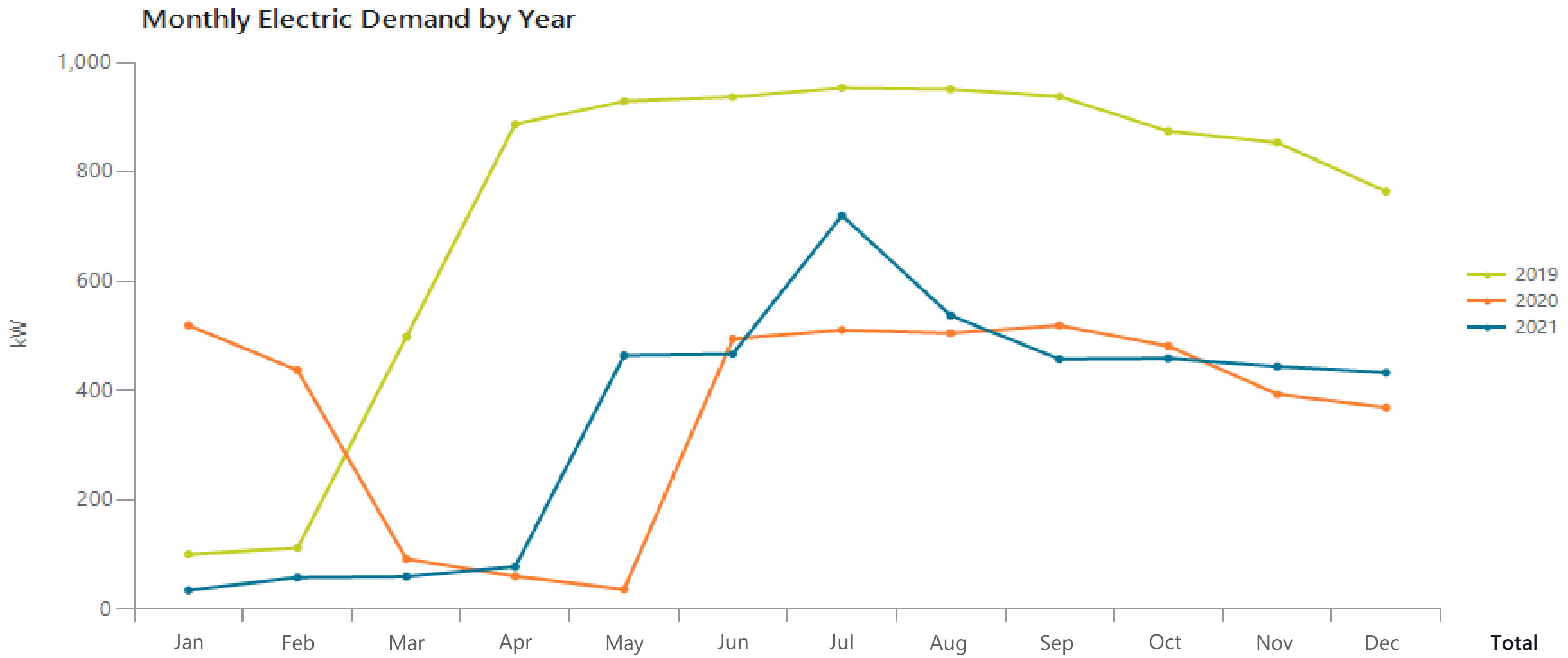
[HU (208) - ELEC_PLANT]

Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS HUM. BLD.
Rockville, MD, US 20850

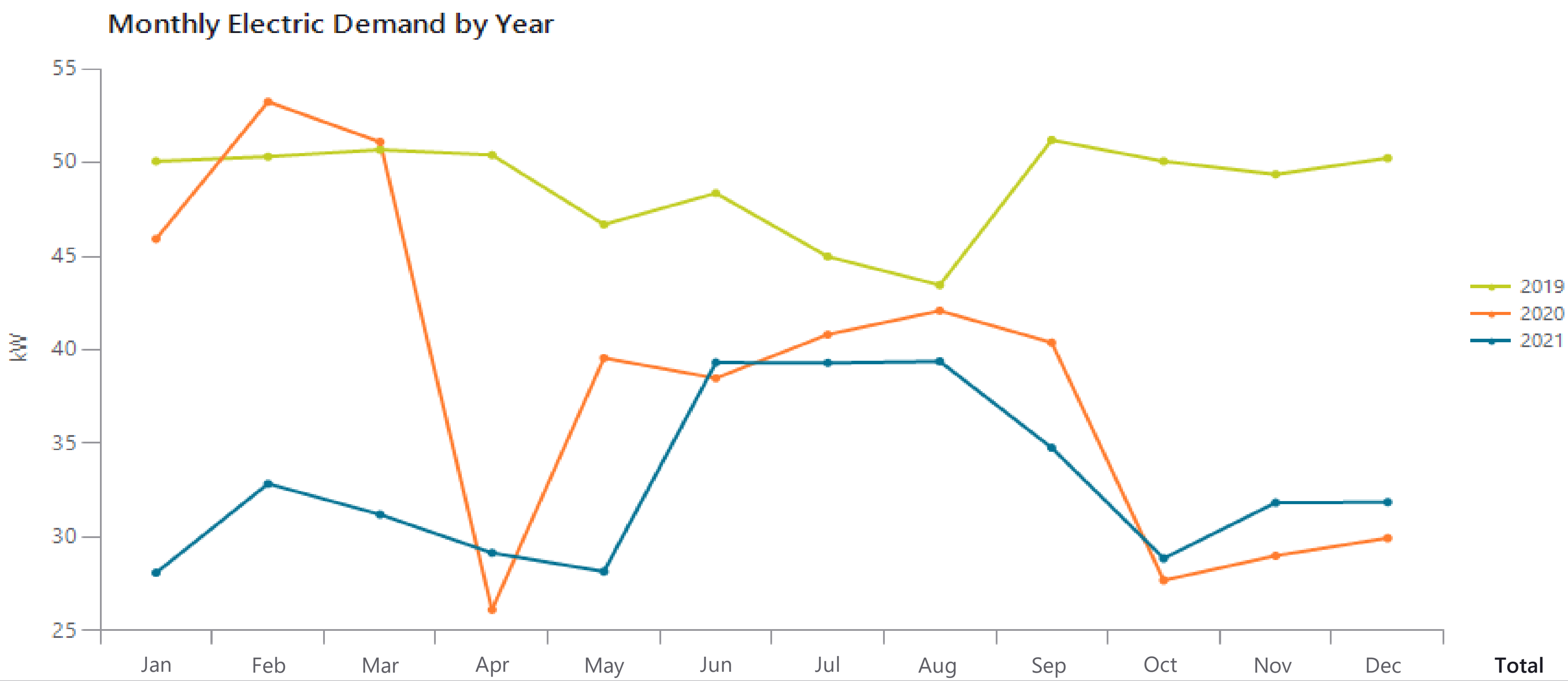
Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	101	112	499	888	929	937	954	951	938	874	854	764	8,802
2020	519	438	92	61	37	495	511	505	519	482	394	369	4,421
2021	36	58	60	78	464	467	720	538	458	459	444	433	4,216

[SB (220) - ELEC]

Active (kW)	PEPCO	51 Mannakee ST Rockville, MD, US 20850
Status	Vendor	Address

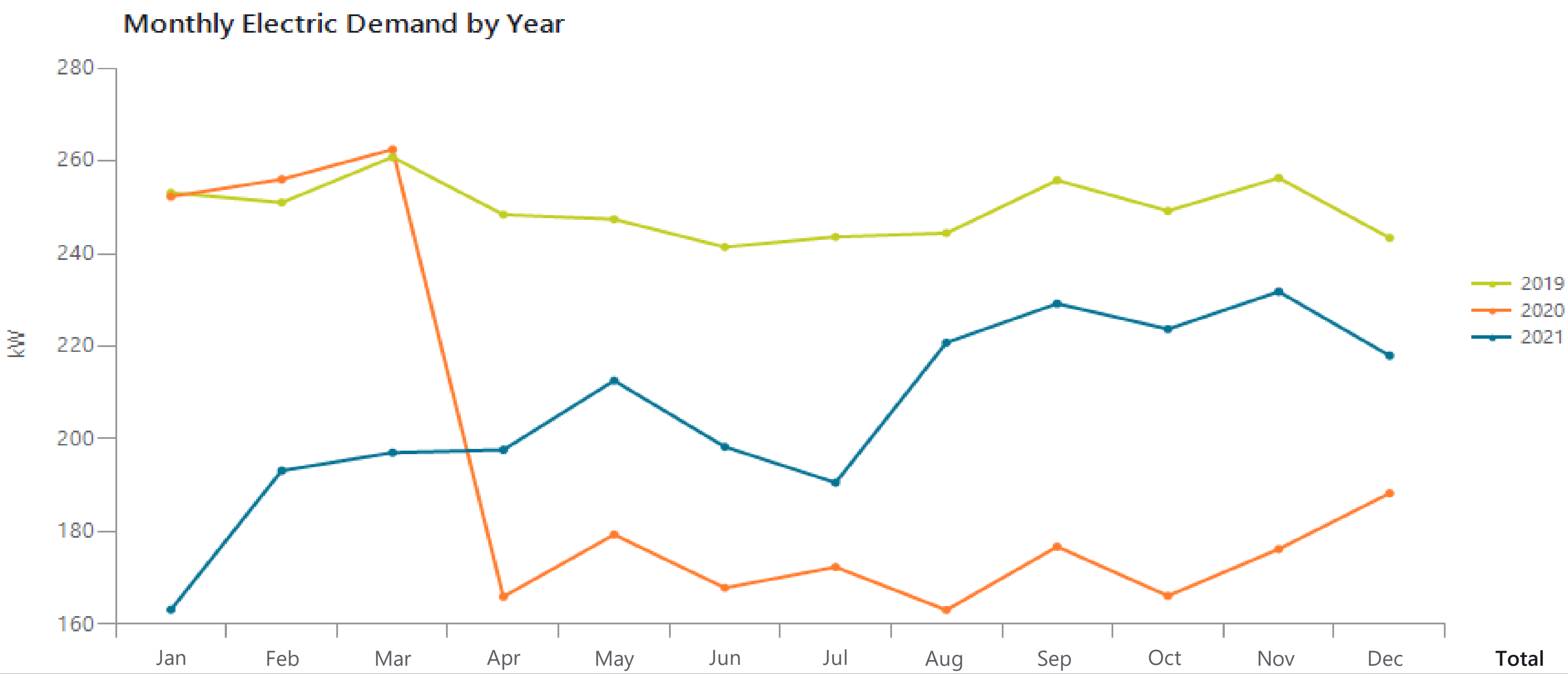


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	50	50	51	50	47	48	45	43	51	50	49	50	586
2020	46	53	51	26	40	38	41	42	40	28	29	30	464
2021	28	33	31	29	28	39	39	39	35	29	32	32	395

Monthly Electric Demand by Year

[MT (206) - ELEC]

Active (kW)	PEPCO	ROCKVILLE CAMPUS Rockville, MD, US 20850
Status	Vendor	Address

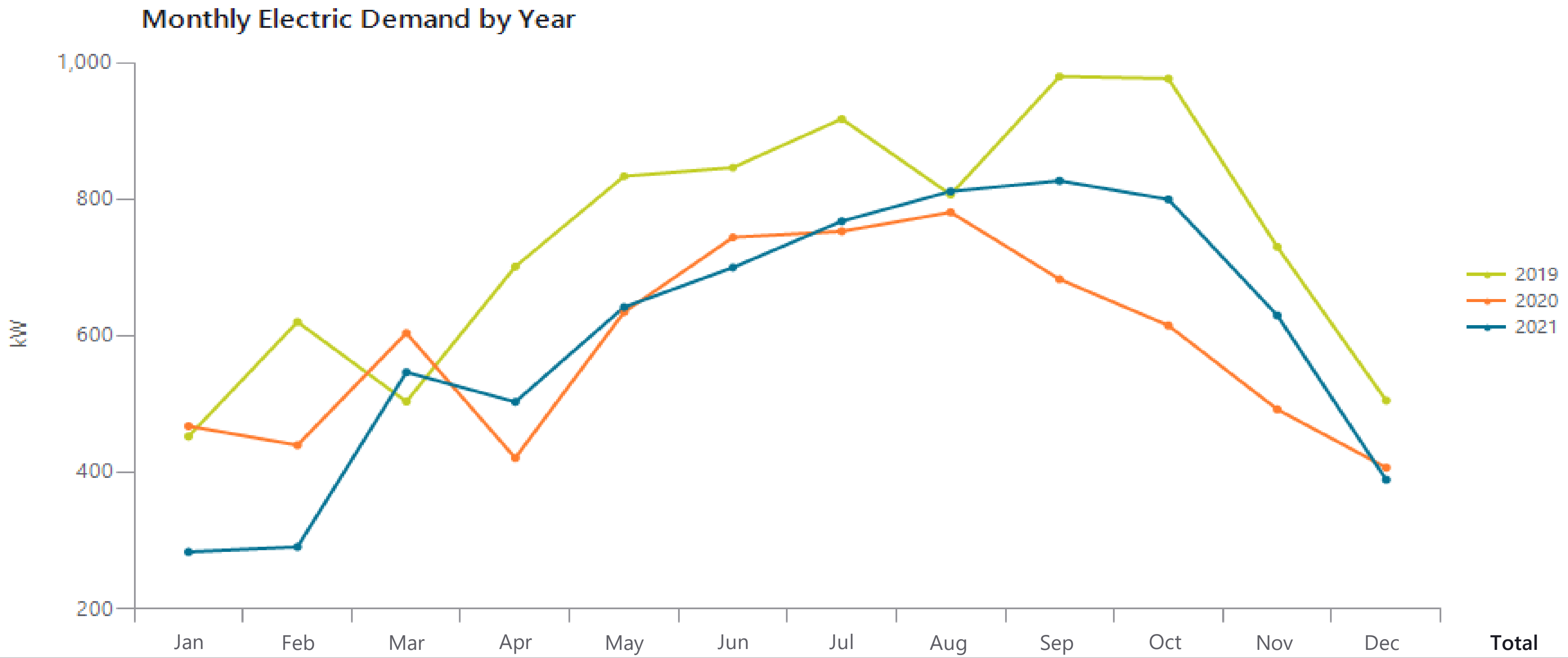


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	253	251	261	248	247	241	244	244	256	249	256	243	2,995
2020	252	256	262	166	179	168	172	163	177	166	176	188	2,327
2021	163	193	197	198	213	198	191	221	229	224	232	218	2,476

Monthly Electric Demand by Year

[SC (217) - ELEC_PLANT]

Active (kW)	PEPCO	51 Mannakee Street Rockville, MD, US 20850
Status	Vendor	Address



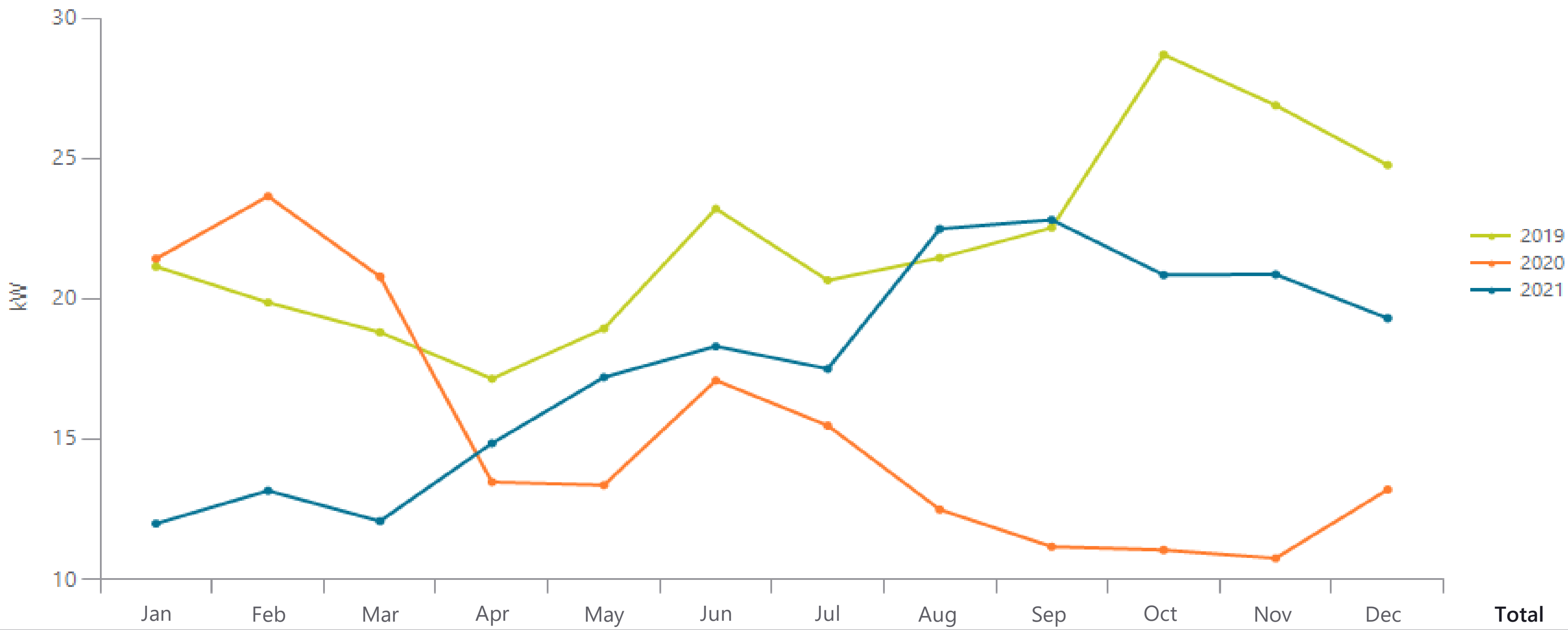
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	453	621	504	702	834	846	918	807	980	977	730	506	8,876
2020	468	440	604	422	635	744	753	781	683	615	493	408	7,047
2021	284	292	547	504	642	700	768	812	827	800	630	390	7,195

Monthly Electric Demand by Year

[CB (205) - ELEC]

Active (kW)	PEPCO	ROCKVILLE CAMPUS US 20850
Status	Vendor	Address

Monthly Electric Demand by Year



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	21	20	19	17	19	23	21	21	23	29	27	25	264
2020	21	24	21	13	13	17	16	13	11	11	11	13	184
2021	12	13	12	15	17	18	18	23	23	21	21	19	212

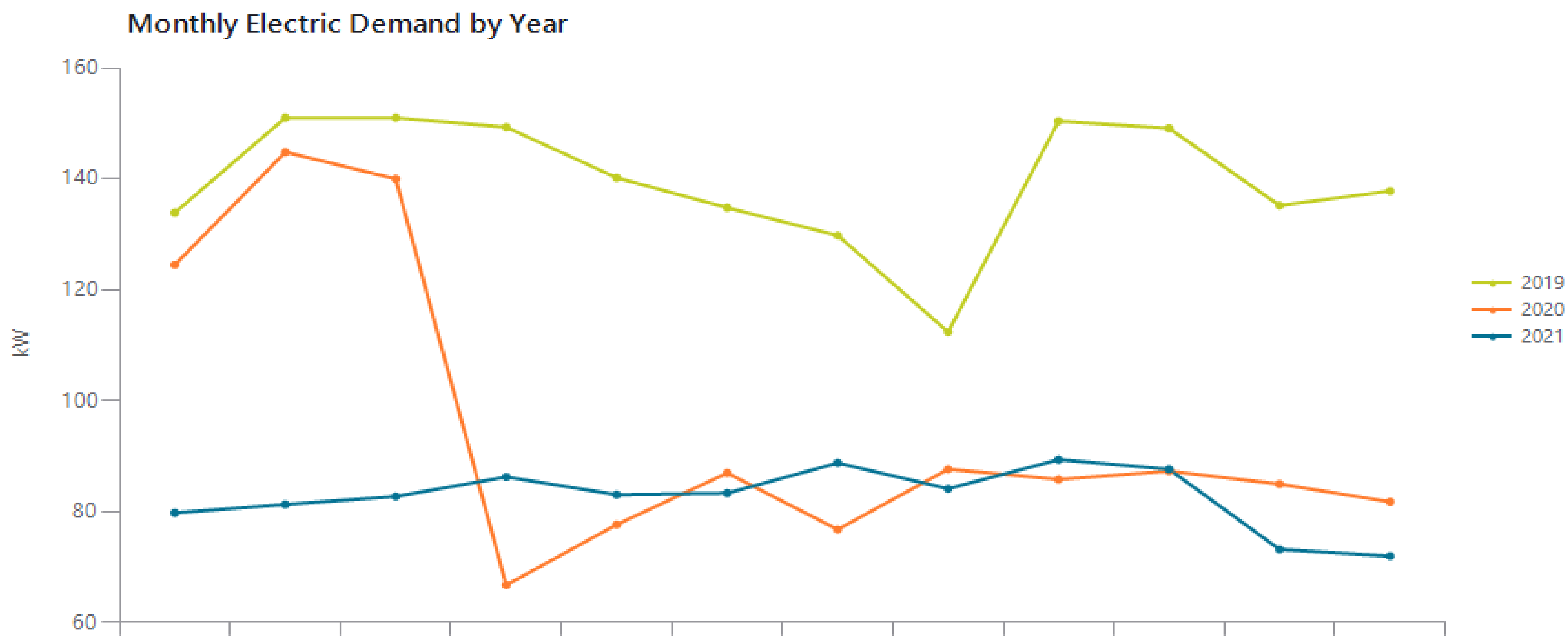
Monthly Electric Demand by Year

[HU (208) - ELEC_BUILDING]

Active (kW)
Status

PEPCO
Vendor

Rockville, MD, US 20850
Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	134	151	151	149	140	135	130	112	150	149	135	138	1,675
2020	125	145	140	67	78	87	77	88	86	87	85	82	1,145
2021	80	81	83	86	83	83	89	84	89	88	73	72	992

Monthly Electric Demand by Year

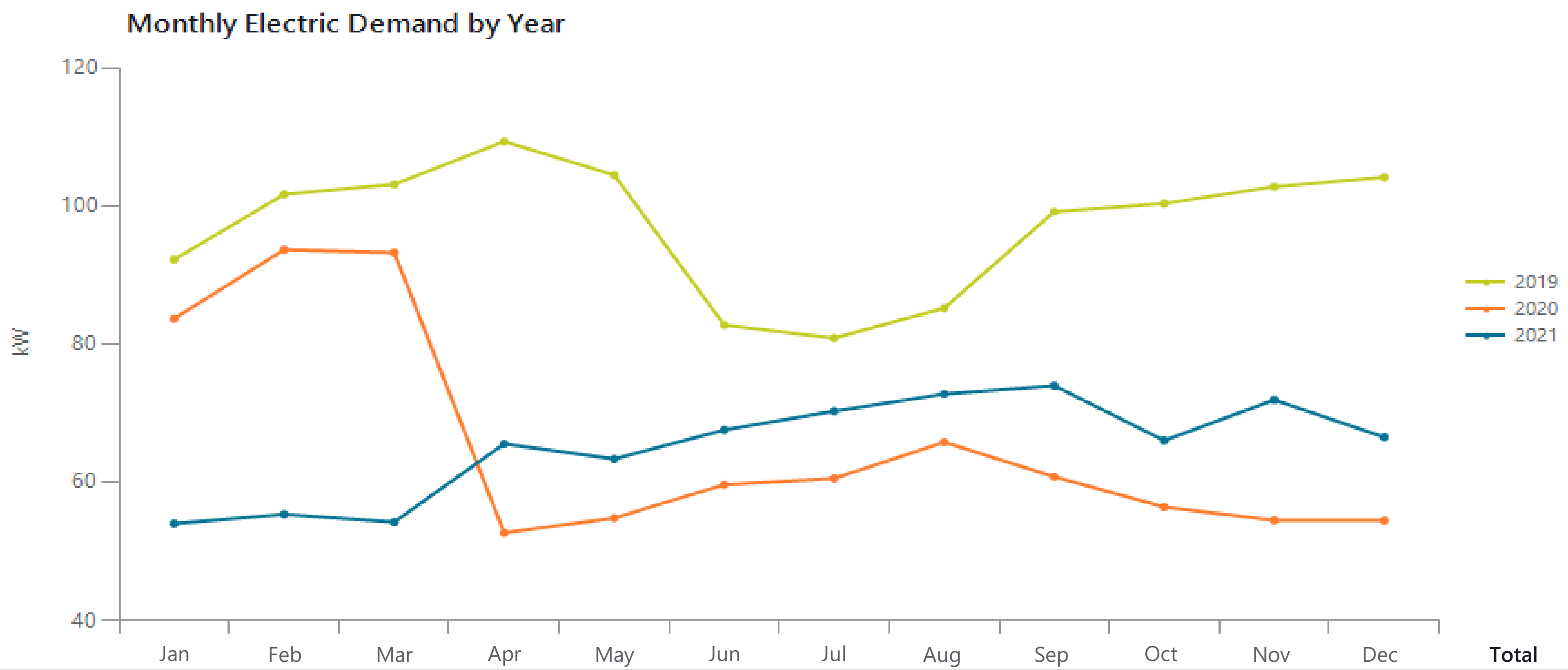
[TC (222) - ELEC]

Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS
Rockville, MD, US 20850

Address

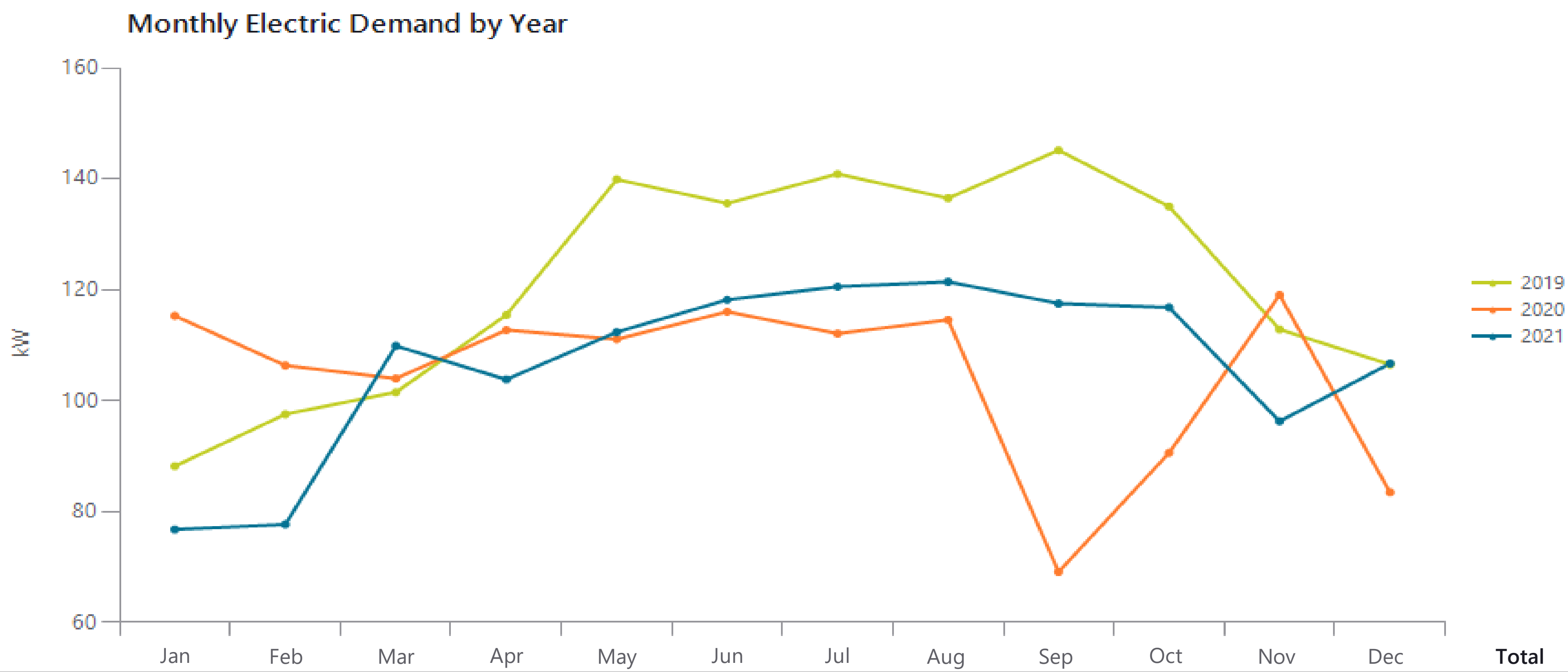


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	92	102	103	109	104	83	81	85	99	100	103	104	1,166
2020	84	94	93	53	55	60	61	66	61	56	55	55	791
2021	54	55	54	66	63	68	70	73	74	66	72	67	782

Monthly Electric Demand by Year

[CS (204) - ELEC]

Active (kW)	PEPCO	ROCKVILLE CAMPUS Rockville, MD, US 20850
Status	Vendor	Address

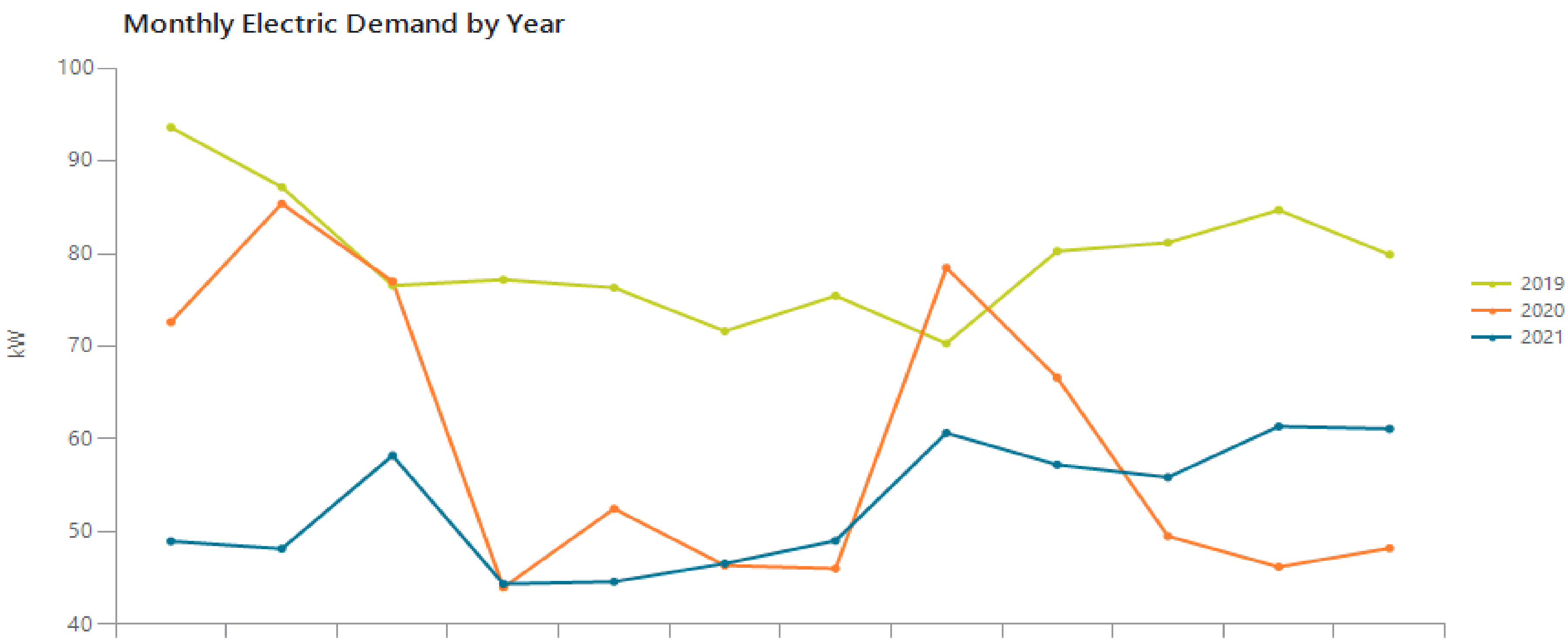


	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	88	98	102	115	140	136	141	137	145	135	113	107	1,455
2020	115	106	104	113	111	116	112	115	69	91	119	83	1,255
2021	77	78	110	104	112	118	121	121	118	117	96	107	1,278

Monthly Electric Demand by Year

[SE (218) - ELEC]

Status	Vendor	Address
Active (kW)	PEPCO	ROCKVILLE CAMPUS Rockville, MD, US 20850



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	94	87	77	77	76	72	75	70	80	81	85	80	954
2020	73	85	77	44	53	46	46	78	67	50	46	48	713
2021	49	48	58	44	45	47	49	61	57	56	61	61	636

Monthly Electric Demand by Year

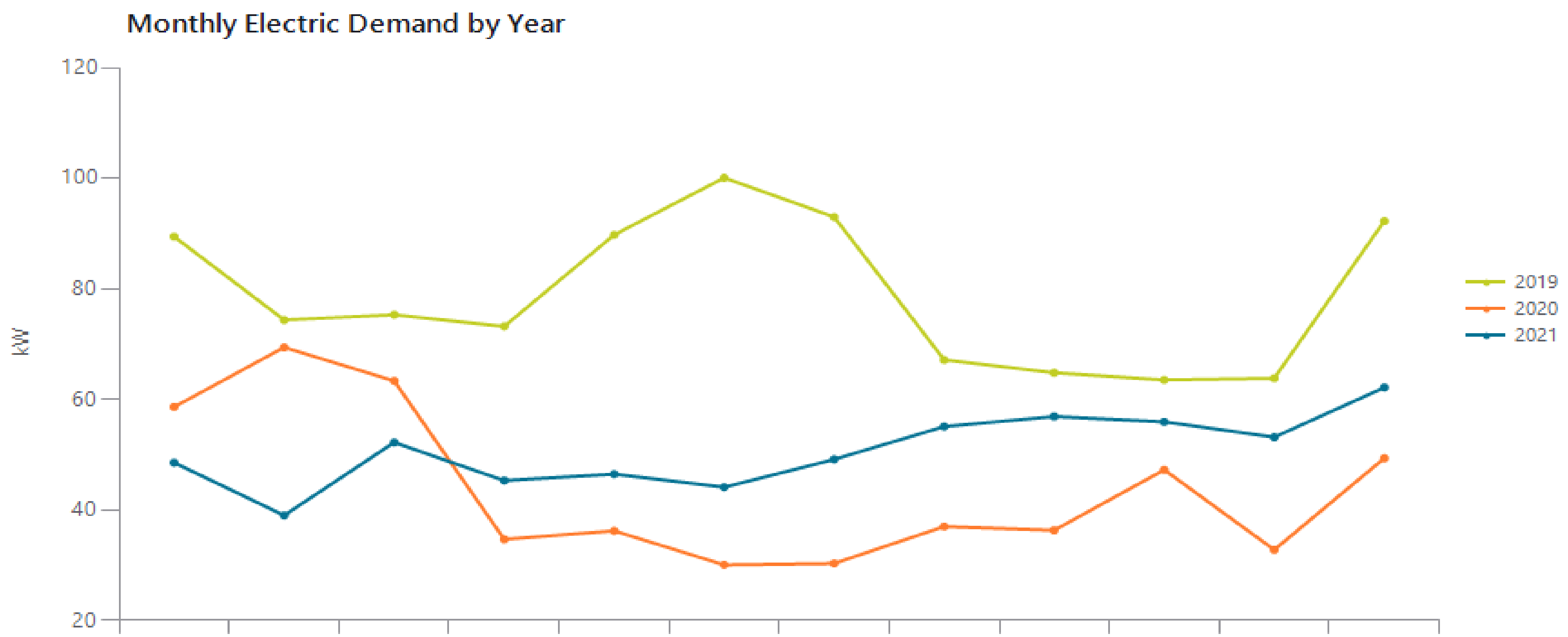
[TA (223) - ELEC]

Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS
US 20850

Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	89	74	75	73	90	100	93	67	65	64	64	92	947
2020	59	69	63	35	36	30	30	37	36	47	33	49	526
2021	49	39	52	45	47	44	49	55	57	56	53	62	608

Monthly Electric Demand by Year

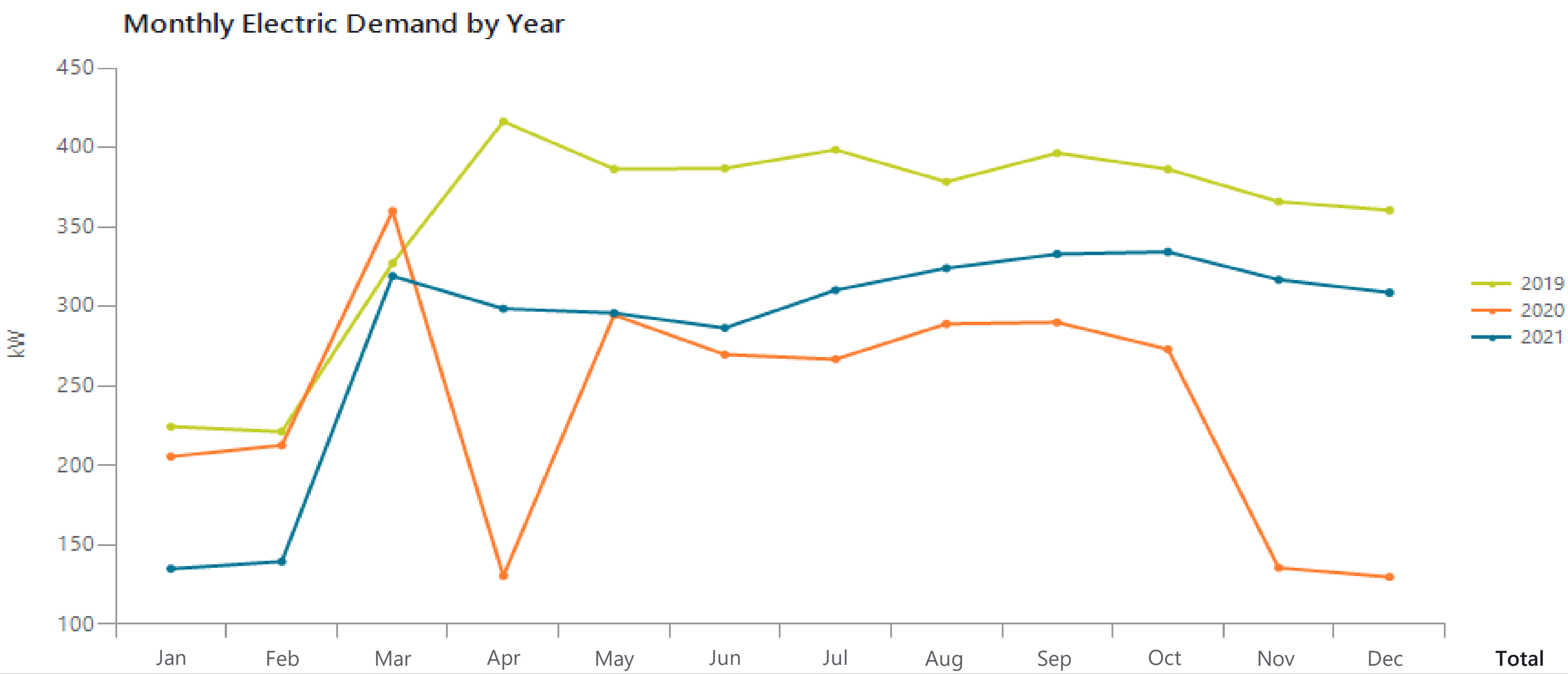
[CC (202) - ELEC]

Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS
Rockville, MD, US 20850

Address



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	224	221	327	416	386	387	399	378	397	386	366	361	4,249
2020	206	213	360	131	295	270	267	289	290	273	136	130	2,858
2021	135	140	319	299	296	287	310	324	333	334	317	309	3,403

Monthly Electric Demand by Year

[PE (215) - ELEC]

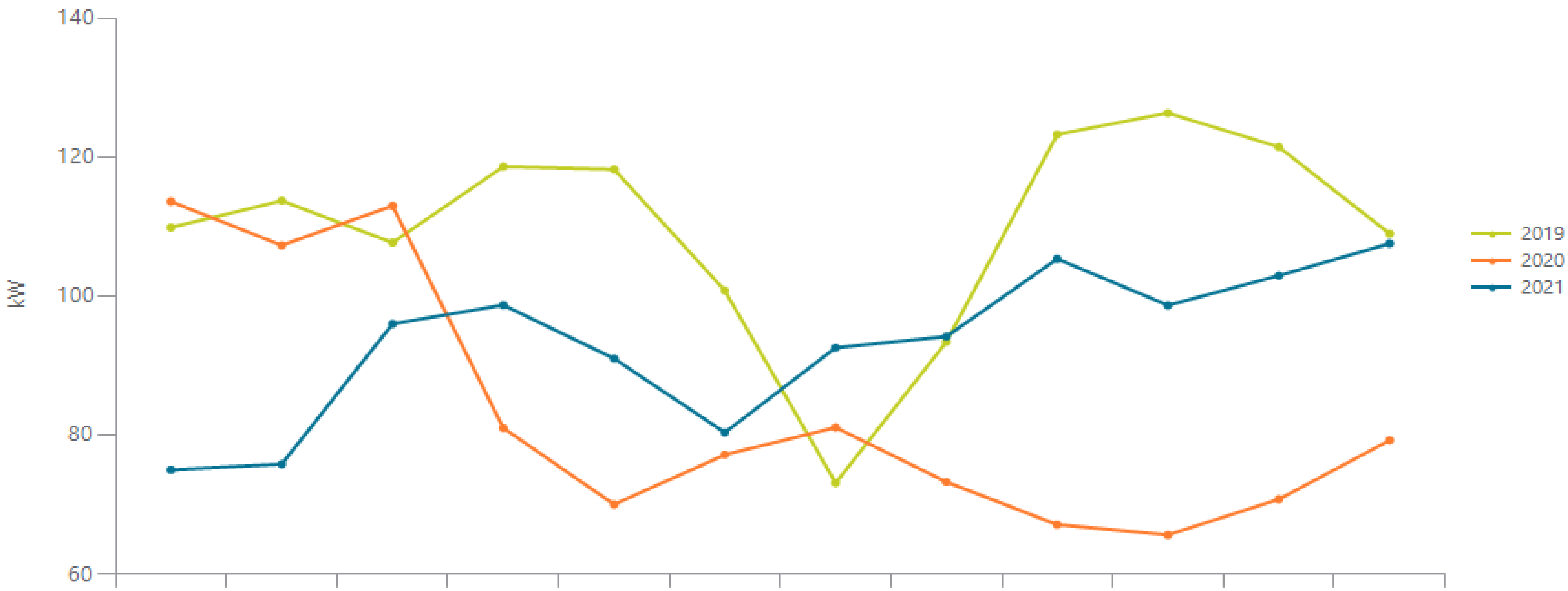
Active (kW)
Status

PEPCO
Vendor

ROCKVILLE CAMPUS
Rockville, MD, US 20850

Address

Monthly Electric Demand by Year



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
2019	110	114	108	119	118	101	73	93	123	126	121	109	1,316
2020	114	107	113	81	70	77	81	73	67	66	71	79	1,000
2021	75	76	96	99	91	80	93	94	105	99	103	108	1,119