MONTGOMERY COLLEGE

Germantown Campus

Utilities Master Plan Update

Final Report

Wiley|Wilson Commission #211130.02

February 13, 2013

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This report was prepared solely for the use of the Montgomery College for this project. It is a statement of professional opinion based on information available at the time of preparation. It represents conditions at a specific time which is identified in the report and these conditions may change. To develop this report, the standard of care applicable to professional services was used.

EXECUTIVE SUMMARY

INTRODUCTION

Wiley|Wilson was commissioned by Montgomery College to provide Utility Master Plans for all three campuses in 2006. These were based upon buildings included in the 2004 Facilities Master Plan. After completion of the 2006-2016 Facilities Master Plan, Montgomery College engaged Cho Benn Holback + Associates and Wiley|Wilson to update the 2006 UMP to reflect the latest FMP. The 2006 UMP should be consulted for additional background information such as modeling of utilities which was not part of this update and which contains information which is in most cases still valid for all three campuses.

The Appendices contain charts and drawings developed as part of this plan.

The Bioscience Education Center is under construction with a scheduled completion in 2014. Child Care Center #1 was completed in 2012. Changes in proposed buildings contained in the 2006-2016 FMP which are addressed in this UMP update are:

Building	Previous Plan	Current Plan
Humanities and Social S.	Renovate	Possible program space addition, size not determined
Physical Education Addition	18,700 GSF	Addition 41,732 GSF
Child Care #1[1]	5,400 GSF	5,535 GSF
Bioscience Education Center	127,100 GSF	126,900 GSF
Goldenrod Building	0 GSF	12,775 NASF
Physics, Engineering & Math[2]	Renovate	86,140
Student Services	0 GSF	120,400 GSF
Social Science and Art	0 GSF	65,000 GSF
Child Care #2 and #3	10,800 GSF	0 GSF

The previous Facilities Master Plan included four future academic buildings, each 80,000 GSF in size to be constructed in the 2027 timeframe. These buildings are not shown in the 2006-2016 Facilities Master Plan; however, several possible future building sites are indicated. The utility allowances in the 2006 UMP for these future buildings have been retained in this update.

This UMP update covers changes in the projected requirements for domestic/fire water, sanitary sewer, storm drainage, heating, cooling, natural gas, compressed air, building automation, and electrical distribution systems. In addition, sections have been added to document existing building fire alarm systems and exterior emergency phones.

[1] Completed in 2012.
[2] This is the existing Science and Applied Studies (SA) which will be renovated plus an addition of 20,994 GSF.

Table 1-3 Utilities Summary for future buildings is located in Appendix A and shows the existing buildings and future building projects which are envisioned in the 2006-2016 FMP. The planned dates for several of these buildings have extended; while dates are yet to be determined for some planned projects.

EXECUTIVE SUMMARY

This UMP update follows the same format as the 2006 UMP. It is in six sections with Section 1 containing the Executive Summary and detailed discussions of each major utility being provided in following sections. The Appendices include reference materials developed as part of the UMP update. Again, much of the data in this UMP update is based upon information developed during the 2006 UMP and remains accurate. The 2006 UMP contains background information such as computer modeling which was not repeated as part of this update. Montgomery College has not constructed or renovated any buildings on campus except for Child Care Center #1 and the Bioscience Education Building which is under construction, since 2006. The most significant changes to the facilities are completion of the first Child Care Center and that the College now utilizes the second floor of the Goldenrod Building for College functions.

A number of recommendations from the 2006 UMP have yet to be implemented and remain valid.

An overview of the most significant findings and recommendations for each utility studied are discussed below. More detailed information is contained in each main report section. Opinions of Probable Cost for recommendations were not in the scope of this Master Plan.

A summary of the building square footages and utility requirements for buildings existing in 2012, and for the future campus are shown in Tables 1-1 and 1-2 in Appendix Section A. Drawing C-1 located in Appendix Section A shows all underground utilities on Campus. This drawing includes a 34-inch water main which branches into two 24-inch branch mains that are part of the WSSC system. The lines pass through the Campus from the water tank above the parking lot but do not serve any Campus buildings. These lines are not shown on the water system drawings in Appendix Section B since they are for a lower pressure service area and do not supply water to the Campus.

WATER SYSTEM

A combined domestic/fire water system is supplied from the Washington Suburban Sanitary Commission (WSSC) to the Campus through a single line and meter. All buildings on Campus are fully sprinklered. The WSSC system is capable of providing the existing and future volumes of water required for domestic uses and for fire flow requirements. A section of 24-inch diameter water main, part of the WSSC system which passes through but is not connected with the Campus, will be relocated as part of the new Bioscience Education Center construction. Refer to Drawing C-1 in Appendix Section A and related drawings in Appendix Section B. Recommendations to serve the future campus include completing the south Campus loop and providing necessary connections to new buildings.

SANITARY SEWER SYSTEM

Campus buildings discharge into the Washington Suburban Sanitary Commission (WSSC) sewer system through collector lines on Campus. New collector lines will be installed from the building to the sewer when new buildings are constructed. Otherwise, the existing sanitary sewer system has adequate capacity to serve existing and proposed future buildings. The line leaving MH 7 and running to the south, which connects to the WSSC system near Middlebrook Road and Exploration Lane, could not be located during the 2006 UMP, and the recommendation made at that time that Montgomery College locate this line and manholes and have these added to the drawings remains valid.

STORMWATER DRAINAGE SYSTEM

The Campus site is approximately 230 acres, and consists of grass, woods, and impervious area, with a total of 7 percent of the site being impervious. A system of inlets and pipes from three drainage areas on Campus drain into a stormwater pond, while a fourth drainage area discharges into a small tributary on the East side of Campus. Approximately 192 acres of the Campus discharges runoff to various tributaries that do not drain into the storm pond on site. The Campus area draining into the pond is approximately 38 acres, with approximately 16 acres of impervious area.

Modeling of the stormwater system in 2006 indicated that surcharging was expected in certain sections of the stormwater system. The surcharging indications are due to existing conditions and are not impacted by future expansions. Since no actual surcharging or flooding issues have been identified it is likely that the model was providing somewhat conservative results. No changes are recommended unless flooding problems are observed. The stormwater section of this report indicates the sections of pipe which should be replaced with smooth wall pipe or larger diameters should flooding issues develop.

The existing pond is adequate for stormwater quality and quantity requirements for existing conditions and future expansions identified in this master plan. Recommendations are limited to re-routing lines, should interferences occur, and extending the piping and inlets to new construction areas. However, runoff from any area with new construction that does not drain to the existing pond will require stormwater quantity and quality treatment measures.

HEATING SYSTEM

Most Campus buildings are heated by modular, gas-fired, hot water boilers located in individual buildings. The Physical Education Building is heated by boilers located in Humanities & Social Sciences through an underground hot water distribution system. The proposed and recently constructed Child Care Centers (CG) will be heated by boilers located in the Sciences and Applied Studies Building and underground hot water distribution system lines installed in 2005. A satellite hot water and chilled water plant will be provided in the new BE building currently under construction.

The building hot water boilers produce 200 degrees F water for building heating. The modular boilers used for building heating are approximately 15 years old and are generally in good condition. The building boilers should continue to provide reliable service for the near future; however, these boilers are no longer supported by the manufacturer and will need to be phased out as buildings are renovated and as failures occur.

The HS and SA Buildings have solar hot water collectors located on the roof designed to supplement the building heating hot water system. They have been removed from service and partially replaced with photovoltaic panels.

Significant campus expansion is anticipated which will increase heating system demands. The satellite heating plant in the BE building will utilize high efficiency, condensing gas boilers to provide heating hot water to a new distribution system designed to serve southern parts of the future campus. Recommendations to heat the future campus include installing high efficiency, condensing gas boilers in a new central heating plant in the new Student Services Building and connecting the distribution system from the BE satellite plant to the Student Services Center central plant to provide a campus hot water loop. Existing modular boilers located in individual buildings and in the HS central plant should be decommissioned as part of building renovations and connections should be made to the distribution from the central plants. Estimated loads and equipment requirements are detailed in the Heating Water Systems section of this UMP.

Due to the size of the Campus and the individual electrical service feeders to buildings, micro-turbines and cogeneration do not appear feasible for the Germantown Campus. Consideration should be given to incorporation of solar heating and possibly to photovoltaic cells on new buildings depending on costs of the equipment relative to electrical energy pricing at the time buildings are built. Additional natural gas driven chillers with heat recovery should also be considered, particularly given current and forecast low gas pricing.

COOLING SYSTEM

The central chilled water plant located in the basement of the High Technology Instructional Center was constructed in 1995 to serve the High Technology & Science Center (HT) and later the remainder of the Campus. Underground distribution piping extends from the central plant to serve cooling demands in Humanities & Social Sciences (HS) Building, the Physical Education Complex (PG), and Science & Applied Studies (SA) Building. Distribution lines were installed in 2005 to serve the future Child Care Center.

The central chiller plant consists of two ammonia electric drive chillers, two ice storage tanks, one cooling tower, and one plate/frame heat exchanger. One chiller serves as a standby unit. The present condenser water system cannot support simultaneous operation of both chillers.

The new BE building will include a satellite chiller plant with capacity to supplement and provide some redundancy to the central plant in HT.

Recommendations are to add capacity and auxiliary equipment in the HT central plant to include a cooling tower, a glycol to chilled water heat exchanger, ice modules, and other modifications needed to allow simultaneous operation of both existing chillers. This will provide redundant capacity to cool existing loads and the new Bioscience Education Center and the "proposed" Student Services Center. An option to the central plant upgrade could include a satellite chiller plant in the new Student Services Building. However, because of the existing infrastructure it is recommended that the HT central plant be expanded to provide additional capacity to accommodate anticipated future campus requirements.

Connecting satellite chillers to the central loop will provide redundancy with a minimum capital investment and will maintain other advantages of the central plant concept including allowing use of ice modules to shift electrical loads to off peak, lower price periods; providing backup capability; and more energy efficient chilled water system operation. It is anticipated that future electrical rates will provide increased incentives to shift power consumption away from peak periods making ice storage even more attractive.

NATURAL GAS

The campus is served by a 4-inch (60 psig) line from Washington Gas. The existing line will be relocated as part of the BE building construction but the 4 inch primary and 2 inch branch line will provide adequate supply for the BE building and existing campus. A new 4-inch gas line from Washington Gas will be required when the Student Services Building and the new central hot water plant are constructed. The only other recommendations are to provide connections to new buildings as they are constructed and to relocate sections of line when there are interferences.

COMPRESSED AIR

Small air compressors and dryers are currently provided in individual buildings to supply the small quantities of control air required. Demands for compressed air will decrease for new and renovated buildings as HVAC and building control systems increasingly change from pneumatic operation to electronic. It would not be economically justified to install a central compressed air system and distribute air from the central system to Campus buildings. Recommendations are to install small compressors and dryers in new buildings as they are constructed to serve any compressed air requirements.

BUILDING AUTOMATION

The present Siemens BAC system is networked through a LAN and is monitored at a central workstation. The system is working well, in general, but upgrades to provide improved BACNET compatibility and to add energy monitoring and reporting features should be included in renovation and new building projects. Adding energy monitoring capabilities for electrical, chilled water, and boiler fuel for the central plants and for individual buildings would enable Montgomery College to better track and control energy usage. Enhanced energy monitoring capabilities would improve the ability to maximize operating efficiency of Campus electrical, heating, and cooling systems, and to compare energy costs between buildings and between campuses.

ELECTRICAL SYSTEM

The Campus is served by the Potomac Electric Power Company (Pepco) from looped underground distribution lines which enter the Campus near the intersection of Route 118 and Goldenrod Lane. Most buildings are individually metered by Pepco. The Physical Education Building is sub-fed from the Humanities and Social Sciences Building, and all of the outbuildings receive power from an adjacent building.

The Pepco system appears capable of providing service to meet requirements for planned expansion of the Campus.

The College has significantly reduced the electrical loads in the buildings since they were first constructed and consequently transformers for most of the buildings are rated above required capacities. Pepco has been requested to downsize the existing transformers since their policy is to calculate line loading based on transformer sizing.

Most of the existing service equipment is in good condition and will continue to be serviceable for existing buildings. The following are recommendations for upgrading and expanding the electrical distribution system to serve existing buildings and future building expansions planned for the Campus.

1. Replacement of GS & HS Switchboards in SA Building
2. Improve/Extend 13.2 kV Electrical Distribution System
3. Install Metering in all Campus Buildings

DOMESTIC/FIRE WATER SYSTEM

INTRODUCTION

This Utilities Master Plan was prepared to update previous master plans based on the colleges 2006-2016 Facilities Master Plan. The Germantown Campus water system is supplied by the Washington Suburban Sanitary Commission (WSSC) through a single connection located at the property line beside Route 118 and shown on Drawing C-2. This system provides water for both domestic and fire protection needs.

PREVIOUS MASTER PLAN

An extensive evaluation of the Germantown water system was completed as part of the 2006 Utilities Master Plan. The 2006 plan included evaluation of the performance of the existing water system, modifications needed to serve future building projects, and providing recommendations to improve the performance of the distribution system. Utilizing current models and incorporating data from the 1991 Utilities Master Plan, the 2006 plan offered the following summary and recommendations.

Fireflow requirements exceed domestic water demands and, therefore set the capacity needed for the distribution system. The existing distribution system can adequately meet the domestic demands and fireflow requirements. The 2006 plan further recommended connection lines be installed to serve future buildings and that main line loops be created as needed. These loops will be created through installation of new lines in conjunction with future building construction.

WSSC WATER SUPPLY

Storage for the Germantown Campus water system is provided by WSSC facilities. The nearest storage tank within the same pressure zone is the Brink Road Elevated Tank located at the intersection of Brink and Ridge Roads, within 2 miles of the Campus. This tank supplies the Campus water system and has a capacity of 1 million gallons and an operating range between elevations 760 and 744 feet. The WSSC storage tank located on Campus provides storage for a different pressure zone and is not connected to the Campus system. A second WSSC tank of similar capacity is proposed by WSSC in the Brink Road Elevated Tank pressure zone. This proposed tank would be located a couple of miles further away than Brink Road and be less available. The main WSSC line between the Campus and Brink Road Elevated Tank is a 24- and 20-inch main, which feeds directly into the WSSC meter noted earlier at the Campus property line. The pressure zone tank volumes are considered adequate to meet the existing and future storage requirements of Germantown Campus.

Due to the high elevation of the Brink Road Elevated Tank Campus pressures are normally high, ranging from 75 to 95 psi.

EXISTING DOMESTIC/FIRE WATER SYSTEM

The Campus water distribution system consists of about 1,600 feet of 12-inch pipe, 3,800 feet of 8-inch pipe, and 300 feet of 6-inch pipe. The water system was constructed between 1978 and 1983. The central part of the system contains loops of 8-inch piping, which were constructed towards the end of this period. An additional line was built to the High Technology and Science Center in 1995. The existing system is shown on Drawing C-2.

Routings for new waterlines must be adjusted to accommodate planned building additions with the updated Facilities Master Plan. These improvements will be discussed in subsequent sections of this report.

FUTURE DOMESTIC/FIRE WATER SYSTEM

The WATERCAD model generated for the 2006 Master plan was calibrated using 2004 hydrant test data. Following calibration, the WATERCAD model was used to evaluate the capacity of the system to meet Campus peak domestic and fire demands. The model evaluated the adequacy of the existing system to meet the peak instantaneous domestic demand. As noted earlier, domestic water demands obtained using fixture counts were used in the models and can be considered conservative. The results of the computer model indicate that the system has the capacity to meet these conservative domestic water demand requirements. Fireflows were assumed to occur with the system demand at the maximum day demand. The model showed that the existing Campus mains and fire hydrants have the ability to supply the 2,500 GPM fireflow for any of the existing buildings. Consistent with ISO guidelines, the simulations allowed a maximum fire hydrant credit of 1,000 GPM at fire hydrants within 300 feet and 675 GPM at fire hydrants within 600 feet.

Drawing C-3 shows the relocation of existing waterlines and proposed extensions to accommodate future Campus improvements.

SUMMARY AND RECOMMENDATIONS

Summary and recommendations from the 2006 Master Plan that the existing distribution system can adequately meet the domestic demands and fireflow requirements are confirmed. Future line additions are provided as indicated on Drawings C-3 to accommodate proposed and future Campus expansion projects.

SANITARY SEWER SYSTEM

INTRODUCTION

This Master Plan provides an evaluation of the existing and future sanitary sewer system at the Germantown Campus based on the colleges 2006-2016 Facilities Master Plan. The College owns and maintains its own sanitary sewer collection system as shown on Drawing C-4. Most of the collection lines at the Campus Core were relocated in 1995 with the construction of the High Technology and Science Center. The Grounds Storage Building has an independent septic system, and the Greenhouse a similar system designed for anticipated lower capacities, therefore, they are not included in the existing system considerations.

PREVIOUS MASTER PLAN

The 1991 Utilities Master Plan for the Germantown Campus, prepared by Wiley|Wilson, incorporated three existing buildings: Humanities and Social Sciences, Physical Education Complex, and Sciences and Applied Studies, plus four proposed buildings. Recommendations provided in the 1991 plan were incorporated and installed with the construction of the High Technology Center in 1995. An extensive evaluation of the Germantown Campus sanitary sewer system was performed for the 2006 Utilities Master Plan. This study utilized fixture counts and sewer modeling software to evaluate the adequacy of the sanitary system for existing and future conditions. The 2006 plan concluded that the existing Campus lines were adequate for existing and future Campus flows and that the existing line downstream of MH 7 should be located and evaluated for adequacy.

EXISTING SANITARY SEWER SYSTEM

The system consists of building collection lines, an 8-inch collector, and, according to the 1991 Utility Master Plan, a long 8-inch transmission line running south-easterly approximately 3,000 feet into the 12-inch WSSC sewer collection line that runs south down the Campus eastern property boundary, connecting between Middlebrook Road and Exploration Lane. This line could not be located downstream of MH 7 during the 2006 Utilities Master Plan. The existing system is shown on Drawing C-4.

FUTURE SANITARY SEWER SYSTEM

Future building service lines have been adjusted to coincide with the updated facilities master plan. The addition of the Student Services Center and Social Science & Art buildings requires a significant portion of the existing line located on the west side of Campus be relocated. Relocated sanitary sewer system alignments and building service lines are shown on Drawing C-5.

SUMMARY AND RECOMMENDATIONS

The existing Campus lines provided for the existing and future Campus connections are adequate for Campus flows. It was assumed during the 2006 master plan update that the WSSC lines have adequate capacity within their system to handle Campus flow without surcharging Campus lines. Proposed and future lines required for the new buildings have been adjusted to coincide with planned improvements in the 2006-2016 facilities master plan. We also continue to recommend that Montgomery College locate the line leaving MH7 connecting to the WSSC system near Middlebrook Road and Exploration Lane so that the actual alignment can be added to the utility drawings.

STORM DRAINAGE SYSTEM

INTRODUCTION

The existing storm drainage system consists of inlets, pipes, and a stormwater pond. The 2006 study modeled the storm drain pipe system and pond for the current and future site conditions. The existing and proposed model results were analyzed and compared with acceptable results. System deficiencies were identified along with corrective measures. The purpose of the storm drainage system study is to update the 2006 Utilities Master Plan based on the 2006-2016 Facilities Master Plan prepared for the Germantown Campus of Montgomery College.

PREVIOUS STUDY

A comprehensive analysis of the existing storm drainage system was performed for the 2006 Utilities Master Plan prepared by Wiley|Wilson. The 2006 Utilities Master Plan's summary and recommendations are listed below.

1. The existing storm pond is adequately sized for stormwater quantity to accommodate current and proposed runoff, based on the proposed site layout for the period 2004 to 2012; however, runoff from any area with new construction that does not drain into the existing storm pond will require new stormwater quantity treatment measures.
2. The storm model indicates some deficiencies in the existing storm system. The model has been simplified to include major inlets and pipes. It is acknowledged that no flooding issues have been identified on site; and therefore, the portions of the storm pipe system indicated as being surcharged, could be the result of model simplification or an overestimation of runoff rates. Generally speaking, stormwater runoff modeling is an inexact science; and therefore, the stormwater flow rates resulting from actual storm events may not coincide with the mathematical modeling. Additionally, proposed construction has no impact on any storm system deficiency. The portions of the storm drainage system model that have surcharged are identified here with comments.
    a. DI-21 and DI-22 surcharges (inlets southeast of the Humanities & Social Sciences Building). This deficiency can be corrected by resizing sewer lines: P-20 from an 18-inch CMP to an 18-inch diameter RCP, and P-21 from 12-inch CMP to a 15-inch diameter RCP. The flows in this area could have been overestimated, and since there is no known flooding or surcharging on site, there is no imminent need to replace these pipes.
    b. DI-24 and DI-25 surcharges (inlets north of the Sciences & Applied Studies Building). This deficiency can be corrected by resizing sewer lines P-22, P-23 and P-24 from a 12-inch CMP to a 15-inch diameter RCP. The flows in this area could have been overestimated, and since there is no known flooding or surcharging on site, there is no imminent need to replace these pipes.

c. DI-53, CI-55, DI-56, and DI-57 surcharges (inlets west of the Humanities & Social Sciences Building). This deficiency can be corrected by resizing sewer lines P-53, P-55, P-56, and P-57 from a 12-inch CMP to an 18-inch diameter RCP. The flows in this area could have been overestimated, and since there is no known flooding or surcharging on site, there is no imminent need to replace these pipes.
d. CI-38 and CI-39 surcharges (inlets far west of the Humanities & Social Sciences Building). This deficiency can be corrected by resizing sewer lines: P-37 from a 24-inch CMP to a 21-inch diameter RCP, P-38 from an 18-inch CMP to a 21-inch diameter RCP, and P-39 from an 18-inch CMP to an 18-inch diameter RCP. The flows in this area could have been overestimated, and since there is no known flooding or surcharging on site, there is no imminent need to replace these pipes.
e. CI-46 surcharges (inlet east of the Grounds Storage Building). This deficiency can be corrected by resizing sewer line P-45 from a 12-inch CMP to a 15-inch diameter RCP. The flow in this area could have been overestimated, and since there is no known flooding or surcharging on site, there is no imminent need to replace these pipes.

DRAINAGE AREA CHARACTERISTICS

The Campus site is approximately 230 acres, and consists of grass, woods, and impervious area, with a total of 7 percent of the site being impervious. Approximately 192 acres of the Campus discharges runoff to various tributaries that do not drain into the storm pond on site. The Campus area draining into the pond is approximately 38 acres, with approximately 16 acres of impervious area. The required water quality treatment volume for this impervious area, based on Maryland Regulations, is 2.2 acre-feet. The wet pool volume provided in the pond is 4.4 acre feet; and therefore, the existing pond meets the water quality treatment needs of the area draining into the pond.

EXISTING STORM DRAINAGE SYSTEM

The existing storm drainage system, as shown on Drawings C-6 consists of a series of inlets, pipes, and a stormwater pond. There are four storm drainage subareas, with three storm pipes discharging runoff into the stormwater pond, and one storm drainage outfall discharging runoff to a tributary located on the east side of the property.

PROPOSED AND FUTURE STORM SEWER SYSTEM

The routings for existing storm lines need to be adjusted and new systems installed to accommodate planned building additions with the updated 2006-2016 Facilities Master Plan. The proposed and future storm sewer alignments, shown on drawing C-7, are based on removing existing storm drain pipes that conflict with planned building additions on Campus and rerouting new storm lines around these improvements. Stormwater runoff from the proposed and future site discharges into the existing stormwater pond. The existing pond was evaluated as part of the 2006 master plan and determined to be appropriately sized, based on Maryland

Regulations, to treat both stormwater quantity and quality measures. However, runoff from any area with new construction that does not drain to the existing pond will require stormwater quantity and quality treatment measures.

SUMMARY AND RECOMMENDATIONS

The recommendations from the 2006 master plan remain valid for the updated 2006-2016 facilities master plan. In summary, the existing storm pond was adequately sized to accommodate planned Campus improvements for storm water quantity and quality. However, areas of new construction that do not drain to the pond must be treated for storm water quantity and quality. In addition the 2006 storm sewer model identified possible surcharging within several sections of the storm sewer system. See previous study recommendations above.

MECHANICAL SYSTEMS SCOPE

This portion of the Montgomery College, Germantown Campus - Utility Master Plan addresses the following Campus mechanical systems:

- Heating Water Systems
- Chilled Water System
- Natural Gas System
- Compressed Air/Instrument Air Systems
- Building Automation System

This Mechanical Systems Master Plan meets the following objectives:

1. Updates additions and modifications to the existing mechanical systems for the existing Campus.
2. Documents the current configuration and capacity of the existing heating and cooling systems for the existing Campus.
3. Provides recommendations to improve the performance of the existing central plant and distribution systems to meet heating hot water, chilled water-cooling, natural gas, compressed air demands, and new building automation.
4. Identifies modifications needed to the existing central plant and mechanical distribution systems to serve future building projects including renovations and/or additions to existing buildings and new building construction.

HEATING WATER SYSTEMS (HWS/R)

INTRODUCTION

This section of the Utility Master Plan (UMP) describes the existing heating systems for the Germantown Campus and reviews the available heating data related to the major structures on the Campus. The current mechanical systems are updated from the previous 2006 Utility Master Plan, reviewed for distribution system impacts, and recommendations developed for modifications to accommodate planned future Campus requirements.

Based on the existing system conditions, present Campus loads, and the anticipated construction projects outlined in the Cho Benn Holback + Associates (CBH+A) – 2006 Facility Master Plan, improvements and/or new construction items are determined for the 2006-2016 timeframe to correct deficiencies and provide for sufficient system capacity for pending Campus expansion. Future Campus expansion requirements are provided from the CHB+A Facilities Master Plan document and suggested mechanical system construction projects are outlined to address the Campus expansion that could occur in the 2006-2016 timeframe.

Wiley|Wilson provided the 2006 Utility Master Plan for the Germantown Campus as an update from the 1991 document. As of 2012, all buildings except the recently acquired GB are heated with modular, gas-fired, hot water boilers located in the individual building, with the exception of PG which is served by boilers in HS. Also, chilled water from the HT central plant provides cooling for all Campus buildings. The chilled water distribution system is through high performance underground piping.

In 2008, the GB was renovated and added to the campus. The first floor is used by the college and the second floor is sub-leased to Montgomery County. The building is heated and cooled by a stand-alone water source heat pump system.

PREVIOUS STUDY

When the 2006 Utility Master Plan (UMP) was performed by Wiley|Wilson, Inc. for Montgomery College, there were four major structures on site. Three of the structures, the SA Building, the HS Building, and the PG Building were all constructed in the late 1970's. The fourth building, HT, was built in the mid-1990's. The recommendation of the 2006 UMP called for the installation of a satellite chiller in the new "Bioscience Education Center" (BE) and continued upgrades to the BAS in renovated and new buildings. Since the 2006 UMP was issued, Montgomery College has not completed any renovations or new buildings. However, a satellite hot water and chilled water plant is currently in the design phase for the new BE.

EXISTING HEATING SYSTEMS

Presently, the SA Building is heated by four, natural gas-fired, 300 (nominal) MBH, Hydro-Therm “multi-pulse” boilers. The units provide heat to the interior space air handlers and the perimeter water-source heat pump loop. The domestic hot-water heating load is handled by a separate unit located in an adjacent space to the main mechanical room. Hot water lines were run to a vault to meet the needs of the “Child Care Center” (CG). The CG was completed in November 2012. The solar water heating system has basically been replaced by a photovoltaic installation.

Presently, the HS Building is heated by seven, natural gas-fired, 300 (nominal) MBH, Hydro-Therm “multi-pulse” boilers. The units provide heat to the interior space air handlers and the perimeter water-source heat pump loop. The units also serve the PG Building, which houses a heated pool and gymnasium, by feeding HWS/R via 3-inch underground pipes to the facility.

The domestic hot-water heating loads for these two buildings are handled by two, “CemLine” DHW heaters that are connected to the heating boilers.

The newest of the main buildings is the HT. This facility became operational in 1995 and was not installed with any type of solar recovery system. Its heating system consists of ten, natural gas-fired, 300 (nominal) MBH, Hydro-Therm "multi-pulse" boilers. The units are installed on the first level in the "Chilled Water - Central Plant". The units provide 180 degrees F heating water to the roof-mounted, space air handlers, re-heat coils on VAV boxes within the building, and the domestic hot-water needs.

The following is a summary of the "Existing Building Heating Loads" for the Germantown Campus. The information contained in the chart is based partly on gathered field data, SF factor estimates, and on the original 1991 Utility Master Plan estimates. The information does not include some of the smaller structures such as the Tennis and Baseball storage facilities.

TABLE 1

Montgomery College - Germantown Campus

Bldg. No.	Bldg. Code	Building Name	Building Function	Year Built	Building Size (GSF)*	Heating Load Factor (Btu/GSF)**	Design Heating Load (MBH)
101	SA	Science and Applied Studies	Administrative, Labs, Classrooms, Security	1978	65,146	30	1,954
102	HS	Humanities & Social Sciences	Classrooms, Offices, Library, Bookstore, Cafeteri	1978	75,700	44	3,331
TBD	GS	Ground Storage Building	Grounds Equipment repair, Carpentry, Storage	1980	6,055	-	-
103	PG	Physical Education	Gym, Pool, Classrooms, Offices	1983	36,770	36	1,324
TBD	TS	Tennis Storage Shed	Storage	1991	450	-	-
TBD	GN	Greenhouse	Greenhouse	1993	2,397	-	-
104	HT	High Technology and Science Center	Tech labs, Classrooms, Offices, Auditorium	1995	75,542	38	2,871
104	---	Central Plant	Central Cooling Plant, Building Heating	1995	---		
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, Etc.	1999	1,004	-	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenanc	1985	33,684	N/A	
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985	35,142	N/A	
107	CG	Child Care	Child Care	2012	5,535	30	166
			Total Connected Building Load		258,693		**9,646**
			Campus Block Loads (75% Diversity)				**7,234**

* Gross Square Foot data for buildings taken from CBH+A "Facility Master Plan" dated: 2009

** Design Htg. Load Factor is based on building characteristics such as Envelope Design, Materials of Construction, Internal Activities, Outside Air Ventilation, etc. , where known

It should be noted that a campus-wide hot water distribution system, originating from the central plant, does not exist. The boilers located within the individual buildings provide the required water for building heating. However, as stated previously, CG and PG are served by other buildings.

DISTRIBUTION SYSTEM EQUIPMENT AND CONDITION

The heating hot water distribution system is limited to the underground piping extending from the HS Building to the PG Building. The PG Building receives its heating hot water from the boilers in the HS Building. The hot water supply and return piping is direct buried and is properly sized for the heating load it serves. The piping is CPVC material and was replaced in 2005.

The Hydro-Therm “multi-pulse” boilers are in generally good condition. However, they are no longer supported by the manufacturer and will need phased replacement as buildings are renovated.

PRESENT CAMPUS HEATING LOAD AND CAPABILITY

The various building heating systems are designed for hot water to be supplied to the building HVAC components at 195 degrees F and returned to the boilers at 155 degrees F. In 2006, the systems were observed to operate closer to 30 degrees F temperature difference (180 to 150 degrees F) between the supply and return. The lower delta T requires more hot water to be circulated throughout the system, thus increasing pump horsepower requirements and decreasing system efficiency. Every effort should be made to try to increase the temperature differential across the boiler systems. The greater the difference between the EWT and LWT on the boilers, the more efficient they become. An optimum condition would be to have a 50 or 60 degree F delta T across the units.

FUTURE HEATING DEMANDS

Based on the “Facility Master Plan” prepared by CBH + A in 2010, the campus is expected to grow significantly in future years. Four new structures and major “renovated” facilities will increase the campus gross square footage (GSF) to 580,000 GSF. The first structure listed in the FMP is the BE which is under way and scheduled for completion in 2014. Other planned construction efforts include a “Student Services Center”, the renovation of and addition to the SA building, a new “Social Sciences and Art” building, a major addition to the “Physical Education” building, and renovation of HT and HS buildings. At the end of this period, the campus heating demands will have grown to approximately 18,600 MBH. The expected campus growth over this timeframe is as depicted in Table 2 below.

TABLE 2
Montgomery College - Germantown Campus
2012 "Future" Building Heating Loads / Factors

Bldg. No.	Bldg. Code	Building Name	Building Function	Year Built	Building Size (GSF)*	Heating Load Factor (Btu/GSF)**	Design Heating Load (MBH)
104	**HT**	**High Technology & Science Center**	**Tech Labs, Classrooms, Offices, Auditorium**	**1995**	**75,542**	**38**	2,871
104	HT	Central Plant	Central Heating and Cooling Plant	1995		-	-
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	450	-	-
102	**HS**	**Humanities & Social Sciences Building**	**Classrooms, Offices, Library, Bookst, Cafeteria**	**1978**	**75,700**	**44**	3,331
103	**PG**	**Physical Education Center**	**Gym, Pool, Classrooms, Offices**	**1983**	**73,270**	**36**	2,638
TBD	**GN**	**Greenhouse, Demolished**	---	---	-	-	-
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	**TBD**	-	-
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	6,055	-	-
101	**SA**	**Physics, Engineering & Math**	**Administrative, Labs, Classrooms, Security**	**1978**	**86,140**	**30**	2,584
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	1,004	-	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	Leased	33,684	-	-
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985	35,142	-	-
107	CG	Child Care	Child Care	2012	5,535	30	166
106	**BE**	**Bioscience Education Center**	**Labs, Classrooms, Offices**	**2014**	**126,900**	**30**	3,807
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	**12,600**	-	-
TBD	**---**	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	**120,400**	**30**	3,612
TBD	**---**	**Social Science and Art Building**	**Classrooms**	**TBD**	**65,600**	**30**	1,968
			Total Connected Building Load		718,022		**20,977**
			Campus Block Loads (75% Diversity)				**15,733**

* Gross Square Foot data for buildings taken from CBH+A "Facility Master Plan" dated: 2009
** Design Htg. Load Factor is based on building characteristics such as Envelope Design, Materials of Construction, Internal Activities, Outside Air Ventilation, etc. , where known

The CG will initially be supplied with heating hot water from SA's existing boiler plant. The distribution system for this heating water is a new direct buried, high performance, fiber reinforced piping system that is already installed and only needs short connecting piping to the building from the valve vault. After the completion of the new BE satellite heating plant, the CG will be supplied from this facility.

The BE satellite heating plant will consist of three, 3,000 MBH, high efficiency, condensing hot water boilers. The new distribution system will run along the south side of the BE building and tie-in to existing piping at the SA building valve vault. A new utility vault will be provided south of this tie-in point and provide future connections to the renovated SA and the Student Services central plant.

During the SA renovation, the existing modular pulse boilers will be removed and the building connected to the BE satellite heating plant. This construction will also provide an opportunity to install direct buried, high performance piping to connect the BE satellite heating plant to the future central plant in Student Services.

The Student Services central heating plant will serve the renovated HT and HS, PG and the PG addition, and the new Social Science and Art building. The distribution piping from the Student Services will run to the north of HS and connect to the piping from BE satellite plant. The existing piping from HS to PG is too small and will be removed and replaced by this new heating hot water main header. Large domestic hot water heaters in HS currently supply domestic hot water to HS and PG. This system should be evaluated during the HS renovation and PG addition to determine the best method of supplying domestic hot water to the PG.

Solar thermal collectors and storage systems will need to be evaluated at the time of each building renovation or new building construction to determine the feasibility at that time.

SUMMARY AND RECOMMENDATIONS

In summary, Montgomery College is in the beginning stages of increasing the size of the Germantown Campus. In order to meet the heating needs of the future proposed facilities and the "renovated" existing structures, the College will need to install two new heating hot water capacities in selected new buildings. Our specific recommendations are as follows:

1. A satellite heating plant is already designed for the BE building and will provide heating hot water for the southern portion of the campus. Utility vaults are planned to provide connections points for future tie-ins to a new central heating plant on the northern end of the campus.
2. For all additional new construction and renovations, the College should continue to remove the modular pulse boilers and connect building to the central distribution system.
3. Provide a new central heating plant in the Student Services building and remove the boilers in the HS. Provide new distribution piping to the northern sided of the campus and tie-in to BE satellite plant.

CHILLED WATER SYSTEM

PREVIOUS STUDY

When the 2006 UMP was performed for Montgomery College, there were four major structures on site. The construction of HT was completed in 1995. HT was built with a central chilled water plant which was extended to all buildings.

EXISTING SYSTEM

The central chilled water plant, located on the first floor level of the HT, was constructed to provide chilled water for HT and the remainder of the Campus. The plant has been in service since the HT building was constructed in 1995. Underground distribution piping extends from the central plant to serve cooling demands in HS Building and SA Building. The HS building diverts a portion of its chilled water flow and feeds the PG Building via 4-inch CHW supply and return underground piping. A future chilled water connection is located in a vault outside the PG and terminated to the east of SA for future expansion to the south. From this connection at SA, chilled water lines were also extended west and south to a vault adjacent to the CG. The CG was completed in November 2012 and chilled water lines were extended from the vault.

CENTRAL CHILLER PLANT EQUIPMENT

The Germantown Campus central chiller plant consists of two ammonia (NH_3), electric-drive chillers, two 1,220–ton-hour thermal storage, ice tanks, one 750-ton induced draft, cooling tower, one plate and frame heat exchanger, and associated condenser water, glycol, and chilled water distribution pumps. Currently, only one chiller can operate at a time. The second unit acts as a standby. The existing condenser water system (piping and equipment) will not support the simultaneous operation of both chiller units. Noise generated by the chiller operation is a significant issue impacting any decision to upgrade the system to allow two chillers to operate at the same time. A solution to the noise issue would need to be developed prior to this change. The chillers have the following capacities:

Existing Central Plant Chillers

Chiller No.	Type Chiller	Tons Capacity	Glycol Flow	Leaving Temp.
No. 1	Electric-Driven "Frick Screw Compressor" Ammonia (NH3)	222 tons (Ice-Build) 266 tons (Chilled Wtr)	805 GPM 805 GPM	20 deg. F 39 deg. F
No. 2	Electric-Driven "Frick Screw Compressor" Ammonia (NH3)	222 tons (Ice-Build) 266 tons (Chilled Wtr)	805 GPM 805 GPM	20 deg. F 39 deg. F

The operating chiller cools a 25 to 30 percent mixture of ethylene glycol and water to approximately 20 degrees F and this glycol solution is used to make ice in the two ice storage modules. Each module has a capacity of 1,220 ton-hours of "latent" thermal storage for a total installed capacity of 2,440 ton-hours. When the chiller is operating in the "cooling mode", the unit produces glycol at 39 degrees F, which cools chilled water (CHWS) for campus distribution via a plate and frame heat exchanger.

The original design intent and "Sequence of Operations" was supposed to provide for the following operating "modes":

"Ice-Build": This mode is normally used at night to produce 20 degrees F glycol which is circulated through the ice storage modules (tanks) to generate ice.

"Ice-Melt": As the cooling load of the Campus begins to increase on the following day, the ice in the "thermal storage" ice modules can be melted and the 36 to 38-degrees F glycol generated by the ice melting process can be passed through the existing plate and frame heat exchanger to produce 40 degrees F chilled water for the Campus chilled water distribution loop.

"Chillers Only Mode": Glycol can be cooled to 36 degrees F by the ammonia chillers and used to cool chilled water (CHWS) for campus distribution in the plate and frame heat exchanger. This mode is typically used when ice is not available or there is a need to conserve ice.

"Chiller and Ice Mode": One ammonia chiller can work in series with the ice modules. Glycol enters the ammonia chiller at 54 degrees F and is cooled to approximately 46 degrees F. Then, the majority of the glycol is transported on to the ice modules where it is further cooled to 36 and can be blended to produce 38 degrees F glycol to be sent to the plate and frame heat

exchanger. This operational scenario is supposed to occur during the peak-cooling season and, as the overall Campus load reaches its maximum, the ammonia chiller must work harder and pick up the load not covered by the ice modules.

The concept of the chiller and thermal storage combination is designed to: minimize the required sizes of the costly items such as the chillers; give the plant the capability to meet the Campus cooling load goals; and primarily to shift electric loads needed for cooling from "On-peak" power times to "Off-peak" times, thus reducing energy costs.

CENTRAL CHILLER PLANT EQUIPMENT CONDITION

Chillers:

Chiller No. 1 (Installed in 1995): This ammonia chiller has a "Frick RWB-II-134" compressor/oil separator and 400 HP motor combination. The heat transfer devices are shell and tube heat exchangers as opposed to the more efficient plate and frame heat exchangers that are used on Chiller No. 2. Because of the less efficient heat exchangers and age of the controls on the chiller, it is considered to be in fair condition. The economic useful life of these units is generally considered to be roughly 25 to 30 years; so, with good preventative maintenance practices, the unit should reasonably be expected to perform until 2020 or beyond.

Chiller No. 2 (Installed in 1999): This ammonia unit has a nearly identical mechanical set up, consisting of a "Frick RWB-II-134" compressor/oil separator and 400 HP motor combination. The difference between this unit and Chiller No. 1 is the heat transfer devices. Chiller No. 2 has welded, stainless steel "plate and frame (P-n-F)" heat exchangers for the glycol "evaporator/cooler" and the system heat rejection "condenser" as opposed to Chiller No. 1's shell and tube arrangement. Due to the more efficient heat exchangers and age of the controls on this chiller, it is considered to be in good condition and should be expected to perform until 2030 or beyond.

Cooling Tower:

The existing "induced-draft" cooling tower is installed above grade level outside the HT near the central plant. Cooling Tower No. 1, which was installed in 1995, has a capacity of 750 GPM (with a heat rejection capability 4,087.5 MBH; 340 tons or 272 refrigeration tons) and has a variable frequency drive electric motor. The tower capacity is sufficient to operate one chiller, but is insufficient to handle both chillers presently in the plant. A second cooling tower and a third (back-up) condenser water pump are needed to allow the operation of both chillers in the "ice-build" and "chillers/ice tanks" modes to significantly increase the chilled water production capability of the plant.

Ice Storage Modules:

The two ice storage tanks are installed at grade level outside of the HT. The units were installed when the plant was originally constructed in 1995. The existing tanks are in good condition and should provide good service for the foreseeable future. Space is available for two additional ice storage modules. Installation of two more ice modules, plus a second cooling tower and glycol to chilled water heat exchanger may maximize the plant capacity.

Heat Exchanger:

The existing plate and frame heat exchanger within the central plant was installed in 1996 and is used to cool returning chilled water (CHWR) from the campus back down to its design leaving condition (LWT) of 38 to 40 degrees F. It is our understanding that the unit is properly sized for the operation of one chiller. A second heat exchanger will be required to transfer the total cooling capacity of both chillers and the ice modules operating simultaneously.

Pumping Systems:

The central plant has the following pumps related to the glycol, chilled water, and condenser water systems:

- Glycol Pump No. 1: 500 GPM, installed in 1995
- Glycol Pump No. 2: 500 GPM, installed in 1995
- Glycol Pump No. 3: 1150 GPM, VFD, installed in 1996.
- Chilled Water Pump No. 1: 1500 GPM, VFD, installed in 1996.
- Chilled Water Pump No. 2: 1500 GPM, VFD, installed in 1996.
- Condenser Water Pump No. 1: 750 GPM, installed in 1995.
- Condenser Water Pump No. 2: 750 GPM, installed in 1995.

The condenser water and glycol flow rates need to be increased to fully utilize the installed chiller capacity.

Central Plant Piping:

There are significant piping arrangement issues associated with the glycol system that will deter the plant from reaching its full capability. The two areas of greatest concern are: 1) The convoluted nature of the "ice tanks/chiller swapping scheme" and the ability of the "paired" swapping valves to work properly; and 2) The short circuiting of chilled glycol through the HT ahead of and around the main heat exchanger. Even if a new cooling tower is installed to support both chillers in "HVAC cooling" operations, the piping arrangement that presently exists will not allow the glycol chillers and ice tanks combination to reach its maximum capability to convert glycol cooling (GLYS) to chilled water supply (CHWS) for campus distribution. The main piping systems within the central plant are Schedule 40 steel pipe having welded and Victaulic ends, should be properly sized for the cooling demands of the Campus, and are considered to be in reasonably good condition. Thermal insulation is adequate and of the proper materials.

DISTRIBUTION SYSTEM EQUIPMENT AND CONDITION

The existing chilled water distribution system is comprised of supply and return mains that were installed in phases. Phase 1 extended from the chiller plant in HT to the HS Building. Phase 2 piping extended from the loop near HT to the SA Building. A sub-loop was installed between the HS Building and PE Building to feed chilled water to the PG Building.

Chilled water distribution piping is direct buried, fiber reinforced plastic (FRP) with cellular glass insulation. The chilled water distribution piping system is sized correctly for the existing Campus loads and for substantial future loads.

EXISTING CAMPUS COOLING LOAD AND CAPABILITY

At present, there are five Campus buildings connected to the chilled water distribution system with a combined "connected load" calculated to be 720 tons. There has been some discussion that this connected load may be slightly higher due to HVAC piping irregularities in the SA and HS Buildings. The thought is that the “water-source heat pump” compressor systems in the buildings may be rejecting their heat to the Campus chilled water network. Based on this premise, the connected cooling load to the central plant may be as high as 750 tons. Regular Campus operating hours are between 7:00 a.m. and 11:00 p.m. (16-hour day). Based on the "time of day" building usage, building orientation, and building construction, not all of the building areas require "maximum" cooling at the same time, so typically the "maximum" cooling load that the central plant must meet is significantly lower than the overall connected Campus load. In this case, we have calculated the Campus “Peak Block Load" to be approximately 540 tons. When the ice modules are fully charged, and are storing the designed 2,440 ton-hours of "latent" cooling, they are capable of providing 305 tons of “latent” cooling over the 8-hour PEPCO electrical "on-peak" operating period (12:00 noon to 8:00 p.m.). This 305 tons supplemented by Chiller No. 1 operating in series at a 45-degree F “leaving glycol temperature (LGT)” set point provides a total "peak" plant capacity of 571 tons of cooling.

TABLE 3
Montgomery College - Germantown Campus
2012 "Existing" Building Cooling Loads / Factors

Bldg. No.	Bldg. Code	Building Name	Building Function	Year Built	Building Size (GSF)*	Cooling Load Factor (Btu/GSF)**	Design Cooling Load (Tons R)
101	SA	Science and Applied Studies	Administrative, Labs, Classrooms, Security	1978	65,146	30	165
102	HS	Humanities & Social Sciences	Classrooms, Offices, Library, Bookstore, Cafeteri	1978	75,700	44	275
TBD	GS	Ground Storage Building	Grounds Equipment repair, Carpentry, Storage	1980	4,295	-	-
103	PG	Physical Education (Not on CP)	Gym, Pool, Classrooms, Offices (6,000 SF Cond)	1983	36,027	36	18
TBD	TS	Tennis Storage Shed	Storage	1991	370	-	-
TBD	GN	Greenhouse	Greenhouse	1993	2,075	-	-
104	HT	High Technology and Science Center	Tech labs, Classrooms, Offices, Auditorium	1995	75,542	45	280
104	---	Central Heating and Cooling Plant	Central Heating and Cooling Plant	1995	---		
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, Etc.	1999	1,004	-	-
105	GB	Goldenrod Building 1st Floor (Not on CP)	Classrooms, Offices, Administrative, Maintenanc	1985	TBD	TBD	TBD
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985	N/A	N/A	N/A
107	CG	Child Care	Child Care	2012	5,535	37	17
			Total Connected Building Load		252,415		**737**
			Campus Block Loads (75% Diversity)				**553**

* Gross Square Foot data for buildings taken from CBH+A "Facility Master Plan" dated: 2009
** Design Cooling Load Factor is based on building characteristics such as Envelope Design, Materials of Construction, Internal Activities, Outside Air Ventilation, etc.

CENTRAL PLANT CAPACITY

The HT Central plant design deficiencies and operational issues still exist at the facility which currently reduces the overall plant capacity and effectiveness.

The purpose of the “ice-build/ice-storage” system is to allow the ammonia “ice-building” chillers to run at night and use electrical energy during PEPCO’s MGT "off-peak" schedule hours. During daytime hours, the campus could elect to “burn or melt” the “stored cooling” ice during the day to either eliminate the need for the chillers altogether, or greatly reduce the chiller electrical demand loads on the PEPCO system, thus reducing overall energy costs.

Based on previous 2006 review of the original design documents and the field investigations associated with the "Germantown Central Plant; As-Built Documentation" project, the existing central plant system is not constructed to operate as it was originally intended and needs to be re-configured in order to get the maximum capability out of the plant. Listed below are the major system deficiencies that we have observed over the past year as part of the "As-Built" project.

First is the lack of heat rejection capacity from the condenser water system. Presently, there is only one cooling tower associated with the system. Each chiller inside the plant requires a nominal 270 tons (3,240 MBH) of heat rejection to meet its design "cooling mode" capacity, plus a "minimum" of 645 MBH heat rejection for the chiller compressor and auxiliary items on the unit. This is approximately equal to 3,885 MBH and within the limit of the existing tower. As evidenced above, there is sufficient cooling capacity to take care of one chiller. This means that at night only one chiller can work in the "ice-build" mode. Also, the maximum "ice-building" capability of either unit is approximately 222 tons. With only one chiller available to build ice during the 8-hour period, the maximum amount of "latent cooling" that can be "stored" during the off-peak period is 1,776 ton-hrs. This is 74 percent of the storage capacity available in the ice tanks for one chiller. This does not include the second set of ice modules which also have a capacity of 2,440 ton-hours. The addition of auxiliary equipment would more than double the ice storage capacity of the central chiller plant.

The second major issue associated with the chiller plant is the original glycol piping arrangement. When the central plant was first constructed in 1995, the original designers of the plant required that the ice modules be installed "ahead" of the chillers in the glycol loop. The arrangement is highly complex, difficult to follow, and is overly susceptible to valve problems. Should a valve fail in the incorrect position, move to a "mixing" position or simply leak, there is no way to determine the exact glycol flow path, and thus very difficult to control. Finally, from the previous 2006 investigations, it was determined that a portion of the chilled glycol from the operating chiller is diverted to the HTSC building as opposed to being routed to the "GLYS to CHWS" heat exchanger. With the piping arrangement as it exists now, it is possible that the glycol returning from the HTSC building could

be mixing with the glycol headed to the Campus heat exchanger, thus increasing the entering glycol temperature and reducing the capability of the heat exchanger to cool the campus.

FUTURE COOLING REQUIREMENTS

Based on the completed 2006-2016 "Facilities Master Plan" prepared by CBH + A in 2010, there is one major building project started, the BE. Future building projects include a new Student Services Center, a major addition to the Physical Education Building, and renovations to existing buildings. Wiley|Wilson has calculated the “new” building loads and “renovated” building loads based on gross square foot energy requirements. The calculated cooling loads to be added to the campus system in the future are summarized in the table on the following page. With the addition of the BE satellite heating and chiller plant, the campus HVAC loads will be adequately satisfied until additional new construction and renovation occurs.

There are a couple of options that are available to the College to meet the future increases in HVAC utility growth. The first option is already in progress and will result in a satellite chiller plant in the new BE. By doing so, the campus will have some redundant chilled water capability and the south side of the campus will eventually be connected to the central plant. The proposed installed units include two ammonia chillers for ice thermal storage and one electrical driven unit.

A second option for future growth would be an expansion and renovation project within the existing central plant to remediate the current deficiencies in the facility and to get the maximum amount of chilled water production out of the plant and minimize energy consumption. Based on our preliminary calculations, we think that the central plant can be modified with piping and equipment changes to allow both glycol chillers to operate simultaneously to get approximately 1,050 tons of “peak cooling” capacity during summer months.

A third option would be to provide a satellite chiller plant in the new Student Services building. This would be displaced the HT central chiller plant and be sized to serve the Student Services, proposed Social Science and Art building, renovated HS, as well as additional capacity back into the campus distribution system.

TABLE 4
Montgomery College - Germantown Campus
2012 "Future" Building Cooling Loads / Factors

Bldg. No.	Bldg. Code	Building Name	Building Function	Year Built	Building Size (GSF)*	Cooling Load Factor (Btu/GSF)**	Design Cooling Load (Tons R)
104	**HT**	**High Technology & Science Center**	**Tech Labs, Classrooms, Offices, Auditorium**	**1995**	**75,542**	**38**	**283**
104	HT	Central Plant	Central Heating and Cooling Plant	1995		-	
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	450	-	-
102	**HS**	**Humanities & Social Sciences Building**	**Classrooms, Offices, Library, Bookst, Cafeteria**	**1978**	**75,700**	**44**	271
103	**PG**	**Physical Education Center**	**Gym, Pool, Classrooms, Offices**	**1983**	**73,270**	**40**	141
TBD	**GN**	**Greenhouse, Demolished**	---	---	-	-	-
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	**TBD**	-	-
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	6,055	-	-
101	**SA**	**Physics, Engineering & Math**	**Administrative, Labs, Classrooms, Security**	**1978**	**86,140**	**33**	237
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	1,004	-	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	Leased	33,684	-	-
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985	35,142	-	-
107	CG	Child Care	Child Care	2012	5,535	37	17
106	**BE**	**Bioscience Education Center**	**Labs, Classrooms, Offices**	**2014**	**126,900**	**40**	381
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	**12,600**		-
TBD	---	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	**120,400**	**40**	401
TBD	---	**Social Science and Art Building**	**Classrooms**	**TBD**	**65,600**	**37**	202
			Total Connected Building Load		718,022		**1,933**
			Campus Block Loads (75% Diversity)				**1,450**

* Gross Square Foot data for buildings taken from CBH+A "Facility Master Plan" dated: 2009
** Design Cooling Load Factor is based on building characteristics such as Envelope Design, Materials of Construction, Internal Activities, Outside Air Ventilation, etc. , where known

SUMMARY AND RECOMMENDATIONS

In summary, Montgomery College is beginning the expansion of the Germantown Campus. In order to meet the chilled water supply needs of the future proposed facilities and the "renovated" existing structures, the College will need to either invest in its existing chilled water plant system to maximize its capabilities or provide additional chiller capacity in future buildings. Our specific recommendations are as follows:

1. As currently in progress, provide the proposed utility redundancy in the "new" BE. The building will have its own chilled water systems set up to operate as a satellite plant and eventually be tied-in to the central chilled water distribution loop.
2. Since the space and infrastructure is already available, as future chilled water requirements become necessary, renovate and expand the existing central plant. This will remedy the current physical and operational issues that hinder its effectiveness, increase its chilled water production capability to the greatest extent possible, and have that capacity ready as the proposed "new" buildings come on-line.

NATURAL GAS SYSTEM

LOCAL NATURAL GAS INFRASTRUCTURE

The existing natural gas system begins with a Washington Gas & Light (WG&L) "4-inch PLA" (plastic) pipe that travels Southwest down Middlebrook Road. The 4-inch line turns Northwest along an abbreviated section of Observation Drive at the far south end of the Germantown Campus and then turns Southwest again toward Hughes Satellite Systems. At the location where the 4-inch plastic line turns SW back toward Hughes, there is a 4-inch plastic pipe tap and valve that begins the Montgomery College – Germantown Campus natural gas service. The 4-inch service line runs North-West and up-hill for approximately 1 mile to the south side of the SA building. The route is through a generally wooded area owned by Montgomery College and is within a 10-foot WG&L "right-of-way" from lower Observation Drive to the back-side of the SA Building and current campus. In 2008, a 4-inch branch line was connected to the 4-inch service line that feeds the SA building. This branch line runs to the west around the southwest side of the WSSC water tower and to the north to initially feed the GB. A further extension was run in 2012 that connected this 4-inch line to the northwest corner of the HS building. A tie-in to the 4-inch main feeding the HS was also made which completed the loop and made the new branch line capable of feeding the SA building.

Based on the natural gas piping map and information provided by WG&L the existing natural gas main owned by WG&L typically provides natural gas at a pressure of 55 psig. Wiley|Wilson reviewed the existing pipe sizes and the stipulated available pressure to determine the maximum available capacity that WG&L can/could provide based on existing conditions and "Near-Term/Long-Term" anticipated loads. Table 5 below presents the current natural gas demands placed on the existing piping system.

TABLE 5
Montgomery College - Germantown Campus
2012 "Existing" Building Natural Gas

Bldg. No.	Bldg. Code	Building Name	Building Function	Year Built	Building Size (GSF)*	Heating Load Factor (Btu/GSF)	Equivalent Natural Gas Requirement (cu.ft/hr)**
101	SA	Science and Applied Studies	Administrative, Labs, Classrooms, Security	1978	65,146	30	1,916
102	HS	Humanities & Social Sciences	Classrooms, Offices, Library, Bookstore, Cafeteria	1978	75,700	44	3,266
TBD	GS	Ground Storage Building	Grounds Equipment repair, Carpentry, Storage	1980	4,295	-	-
103	PG	Physical Education	Gym, Pool, Classrooms, Offices	1983	36,027	36	1,272
TBD	TS	Tennis Storage Shed	Storage	1991	370	-	-
TBD	GN	Greenhouse	Greenhouse	1993	2,075	-	-
104	HT	High Technology and Science Center	Tech labs, Classrooms, Offices, Auditorium	1995	75,542	38	2,815
104	---	Central Heating and Cooling Plant	Central Heating and Cooling Plant	1995	---		
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, Etc.	1999	1,004	-	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	1985	TBD	TBD	TBD
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985	N/A	N/A	N/A
107	CG	Child Care	Child Care	2012	5,535	30	163
			Total Connected Building Load		252,415		**9,432**
			Campus Block Loads (80% Diversity)				**7,546**

* Gross Square Foot data for buildings taken from CBH+A "Facility Master Plan" dated: 2009
** Natural Gas requirements calculated based on 1,020 But/cu. Ft. (HHV)

EXISTING NATURAL GAS SYSTEM AND CONDITION

At the indicated "End Location" of the WG&L system (2-inch PLA pipe near the SA Mechanical Room), the piping system becomes a part of the College infrastructure and converts to a 4-inch, Schedule 40, black steel pipe. It is not known, exactly, but it is anticipated that the campus steel pipe is either plastic coated or protected in some other fashion from galvanic corrosion. The 4-inch line runs generally alongside the CHWS/R pipes down the middle of the main courtyard area and distributes gas to the SA Building, the HT, and the HS Building. The 4-inch line is also now connected to the 4-inch line that runs around the west side of the campus.

The maximum and minimum gas pressure requirements needed by the individual boilers within the existing campus buildings ranges between 14-inches water column (w.c.) and 4-inches (w.c.) respectively. Based on our review of the WG&L mapping provided, the existing pipe route

and the existing heating demands, it appears that there are no major concerns with regard to line capacity at this time. The average annual natural gas usage for the Germantown Campus buildings is presently about 90,000 Therms per year, but will fluctuate with weather conditions. The old location of the incoming natural gas "main service" line presented a problem for the proposed building projects. The BE footprint landed squarely on top of the original location of the WG&L gas main line. The lines has been relocated to remove it from the BE footprint.

SUMMARY AND RECOMMENDATIONS

In summary, Montgomery College is in the process of expanding its Germantown Campus. In order to meet the natural gas requirements for the future facilities and the "renovations" of existing structures, the College will need to invest in its existing natural gas infrastructure to alleviate anticipated construction coordination issues and to maximize the natural gas system and capabilities for future construction projects. Our specific recommendations are as follows:

1. The site work phase for the BE has been completed which relocated the east side of the loop for the Washington Gas & Light 4-inch gas line and "right-of-way". The current 4-inch loop system should provide adequate supply for future expansion.
2. When the Student Services building construction occurs, a new 4-inch gas line will be required for the proposed central hot water plant. This line can be tied in to the existing 4-inch loop at the northwest corner of HS.

COMPRESSED AIR/INSTRUMENT AIR SYSTEMS

EXISTING CONDITIONS

At present, the Germantown Campus has building air compressors in the SA Building, HS Building, and in the central chiller plant on the first floor level of the HT. Compressed air is used in these buildings for controlling pneumatic valve actuators and damper controls.

The air compressor units are generally in good condition and should continue to provide adequate service over the next 10 to 15 years.

SUMMARY AND RECOMMENDATIONS

New HVAC controls are predominately electronic and compressed air usage is typically lower than in the past. Recommendations are to continue to maintain the individual air compressors until buildings are renovated or replaced. Generally, the only new buildings that will require any significant amount of compressed air will be the central and satellite heating and chiller plants and these should have building based air compressors installed.

BUILDING AUTOMATION SYSTEMS (BAS)

INTRODUCTION

The building automation system(s) presently in service at the Germantown Campus are "relatively" new technology (1990's vintage) and are capable of providing a reasonable level of reliability, functionality and network capability needed to provide appropriate comfort levels.

PREVIOUS MASTER PLAN

The 2006 Utility Master Plan did not address major issues related to systems control or computerized energy management systems. The HS, PG, and SA Buildings automation controls consist of electric/pneumatic systems with time clocks responding to occupancy schedules. The majority of these controls are still in service but supplemented by a legacy DDC system. GB has BACnet controls which provide a hybrid network with the existing legacy control system. With the growth in speed and capabilities of local and wide area networks (LAN/WAN) and the Internet, it is now possible to monitor, control, and optimize major Campus systems and support energy conservation efforts on a Campus-wide basis.

BAS SYSTEM

The major drawback to the existing building automation system(s) on the Germantown Campus is that all of the major components and software are provided by a single-source vendor. The main building digital control units and associated control algorithms are provided by Siemens, Inc. (formerly Landis & Gyr Powers, Inc.). Though Siemens, Inc. is a very reputable controls company and understands building systems and operations, the company, as with many other controls groups, is resisting the need of clients for "interoperability" between disparate pieces of equipment and instrumentation. In order to get different equipment components to work together, or "talk" to each other, it is required that Siemens be contacted and they be involved in the integration of the equipment into the existing network. The lack of interoperability gives Siemens an advantage over competitors and little reason to compete on price. New and renovated buildings will be competitively bid and comply with ASHRAE Standard 135 with open protocol BACnet.

SUMMARY AND RECOMMENDATIONS

The existing individual building systems should be replaced with state-of-the-art systems networked to provide an integrated Campus control and monitoring system when buildings are renovated, replaced, or new construction. Energy monitoring and automatic reporting features should allow staff to see natural gas, fuel oil, and electrical energy usage in the central plant and in individual buildings, as well as energy delivered by the central plant through the Campus chilled water and heating hot water systems. The BAS systems should provide output to a server with the capability of storing data and easily formatting and generating on demand and scheduled reports tailored to user needs. The system should directly control equipment or provide information to allow operators to make timely decisions to minimize energy consumption and cost.

ELECTRICAL SYSTEMS

INTRODUCTION

The Germantown Campus is located in Pepco's service territory and is served by a looped 13.2-kV underground distribution feeder which enters the Campus near the intersection of MD Route 118 and Goldenrod Lane, adjacent to the Grounds Storage Building. This looped feeder originates at Pepco overhead line feeder 14880; the underground feeder is looped through the Campus in order to provide some operational flexibility and additional reliability. Further, along MD Route 118, there is another Pepco feeder 14889 which interconnects with the feeder 14880, which serves the Germantown Campus. Having an additional feeder in the area should provide Pepco with the ability to switch loads between feeders and restore service more quickly when outages occur. Further, this feeder may allow Pepco to more easily serve future Germantown Campus growth. As load growth occurs, Pepco may be able to easily extend this feeder to provide additional capacity.

PREVIOUS STUDY

The 2006 Utility Master Plan addressed the fact that two recommendations in the 1991 Utility Master Plan had been implemented. These recommendations were to construct a central chilled water plant for the Campus, and to convert electric-powered heating water boilers to natural gas-powered units. Both reduce electricity consumption.

The 2006 Utility Master Plan also referred to the 1991 Utility Master Plan recommendation to convert from multi-point metering to single-point metering of utility company electrical energy. Such a conversion would result in the College owning and maintaining the 13.2-kV Campus distribution system. The 1991 Utility Master Plan made the case that the conversion would result in significant annual electrical energy cost savings to the College. The 2006 Utility Master Plan concluded that the annual electrical energy cost savings would be less due to the addition of the chilled water plant and the conversion of electric-powered heating water boilers to natural gas-powered boilers. Although the energy savings would have been less than calculated in the 1991 Utility Master Plan, the 2006 Utility Master Plan still recommended making the change from multi-point metering to single-point metering.

There have been no significant changes that would justify reconsideration of the conversion from multi-point to single-point metering at this time, and therefore, such an analysis is not addressed in this update.

However, if multi-point versus single-point metering is reviewed again in the future, one option to consider, as addressed in the previous master plan, is to create a "virtual" single-point metering system in lieu of a physical single-point metering system. Essentially, this concept would involve the addition of College-owned metering to each Campus building. This metering should be capable of measuring electrical demand (kW) and energy use (kWh), at a minimum, with utility grade accuracy and have the ability to communicate with a central monitoring system which would record and store data. This data might be analyzed from a

historical perspective, or perhaps transmitted real-time to an energy broker who could make recommendations to the College regarding system operation. Possible recommendations might include a change to the central plant operations schedule, or perhaps the utilization of on-site generation to minimize energy purchases during times of high utility demand in order to gain price incentives. This is a concept that will certainly require further study and more detailed information. Nevertheless, the plan to begin the installation of building metering should be developed and implemented immediately. This will allow the College to begin collecting historical data for later use.

EXISTING CONDITIONS

All buildings are presently served by pad-mounted transformers, which are fed by the 13.2-kV underground distribution loop. All College loads are presently three phase loads, except the Child Care Center which has a single phase service. Additionally, at the far end of Observation Drive, there are three single phase services which receive power from the Campus loop feeder. These consist of the WSSC Campus Ground Tank, Montgomery County, and at least one other user. The water tank is not a College facility even though it does receive power from the Campus loop feeder. See the single line diagram on Drawing E-1 in Appendix D for a representation of the present arrangement.

The College has recently requested that Pepco downsize the existing building transformers. The College made this request because it is Pepco's policy to calculate line loading based on the sizes of the transformers connected to the line rather than the actual load served. There has been a significant reduction in the electrical loads in the buildings since they were first constructed and the transformers selected and installed. The reduction in transformer sizes will result in an increase in line capacity, as calculated by Pepco, and hence less potential for the need to make changes to Pepco's primary lines as the Campus grows in the near future.

Most buildings are individually metered by Pepco. The Physical Education Complex is sub-fed from the Humanities and Social Sciences Building, and all of the outbuildings receive power from an adjacent building.

SYSTEM IMPROVEMENTS

As part of the 2006 Utility Master Plan, a field inspection of each building's service entrance equipment was performed. Most of the equipment was in good, serviceable condition. However, there were several conditions observed which cause concern. The following issue identified in the 2006 Utility Master Plan has not been corrected and remains valid:

Priority 3: "Long Term Concerns (3-5 years): Should be corrected in the more distant future to maintain the integrity of the building, including systems that have exceeded their expected useful life, but are still functioning."

1. The Sciences & Applied Studies Buildings has older service entrance equipment that is separated into General Service (GS) and Heating Service (HS) equipment. This equipment is serviceable and functional, but for simpler operation should be unified into a single service entrance switchboard when this building undergoes substantial renovation. Unifying this service equipment will prove to be more cost-effective than replacement in kind.

FUTURE ELECTRICAL SYSTEM

Based on the Germantown Campus Facilities Master Plan, there is a good deal of growth expected to occur in the near future. This growth will certainly have an impact on the Campus electrical system, and will therefore need to be considered in planning and budgeting. Based on the determination that the conversion to single-point metering will not take place in the near future, the following summary of system improvements is based on the assumption of the electrical distribution system remaining a part of the Pepco grid.

Expected electrical growth will certainly require improvements to the Pepco electrical distribution system, and it will be important to provide load data to Pepco as it becomes available for each project. These data will allow system improvements to be made so that Pepco can ensure that system capacity exists for each new load that the College adds to the system. In addition, since Pepco will remain the owner and operator of the system, any desired modifications to the electrical distribution system on Campus will need to be designed or approved by Pepco.

Estimated loads have been calculated to determine if existing equipment has sufficient capacity to accept additional loading or if new equipment will be required. Service transformers have also been addressed, even though they will remain the responsibility of Pepco. They have been included since changes to the system, based on College construction, will likely result in construction costs that the College will need to reimburse to Pepco. These costs will also need to be budgeted for, so that specific building projects can be planned appropriately.

The projected electrical load increases have been calculated based on gross square foot values of new construction plus the addition of mechanical loads as shown in the mechanical portion of this Plan. The specific value of electrical load per square foot varies depending on the building function. Tabulating mechanical loads separately is required where indicated because this load represents new central plants to be constructed within the buildings. The new central plants will require separate electrical services from the building services. Where no mechanical load is indicated the new or renovated buildings are expected to be provided with cooling by existing central plants. Heating will be provided by individual natural gas-powered boilers in the buildings.

Table 1 below includes a list of projects scheduled to be completed in this period and the expected electrical load growth.

Table 1
Future Electrical Load Increases

Building	Gross Square Footage Increase (GSF)	Total Future Electrical Load (kVA)	Mechanical (kVA)	Total Electrical Load Increase (kVA)
High Technology & Science Center Alteration	0	177	N/A	0
Humanities & Social Sciences Building Renovation	0	301	N/A	301
Physical Education Complex Renovation and Addition	36,500	220	N/A	220
New Greenhouse	TBD	TBD	TBD	TBD
Physics, Engineering & Math (Renovated SAS Building)	20994	431	N/A	112
Child Care[1]	5,535	22	N/A	22
Bioscience Education Center	114,300	686	N/A	686
Bioscience Education Center Central Plant	12,600	189	860	1049
Student Services	120,400	482	N/A	482
Social Science and Art Building	65,600	394	N/A	394

Based on the load calculations above, following is a summary of transformer size requirements. For a complete listing of electrical demand data and transformer sizes for the entire Campus, please refer to Table 6-1 in Appendix D.

[1] The Child Care Center was completed in late 2012.

High Technology & Science Center Alteration: The building will undergo an alteration, but the existing demand of 177 kVA isn't expected to change significantly. An existing 1000-kVA transformer serves the building. This transformer has sufficient capacity to continue serving the building. Replacement of the electrical service equipment and service transformer with equipment more closely matched to the electrical load should be addressed as part of the alteration design.

Humanities and Social Sciences Building: The existing building will be renovated. Program space changes will be made to repurpose the space vacated by the Library, Cafeteria, and Childcare Center. The Facilities Master Plan states that an expansion of this building is possible. The load shown for this building is the existing maximum demand recorded for the previous 12-month period. The load has not been increased for the possible expansion of the building in the future. The building is served by a 1500-kVA transformer that also serves the Physical Education Complex. It's recommended that the two buildings be separated and have separate service transformers when the Physical Education Complex is expanded. It's likely that the service transformer for the Humanities and Social Sciences Building can be reduced in size at that time; contingent on, if and to what magnitude, the building size and function are changed.

Physical Education Complex: The existing building will be renovated and expanded in size. The building is presently served by the same service transformer as the Humanities and Social Sciences Building. It's recommended that the two buildings be separated and have separate service transformers when the Physical Education Complex is expanded. The expanded Physical Education Complex is expected to have a demand of 220 kVA. This new expanded building will require a new 300-kVA transformer.

New Greenhouse: This will be a new building. The building's gross square footage has not been determined at this time. It's not expected that this building will have a high electrical demand. The building will likely be connected to the electrical service of the closest other building.

Physics, Engineering & Math Building (Renovated SA Building Plus Third Floor Addition): This renovation of an existing building, plus the addition of a third floor will result in a new function for the building. The renovation and addition will change the gross square footage of the building and is expected to result in a significant change in the electrical demand. The existing building is served by a 1000-kVA transformer, and the demand on the building is currently 319 kVA. The expanded building is expected to have a demand of 431 kVA. The existing transformer has sufficient capacity to continue to serve the building after the renovation and addition. The existing GS and HS service equipment will be replaced by a single set of service entrance equipment to receive power from the transformer.

Child Care: This new building was completed in 2012 with an expected demand of 22 kVA.

Bioscience Education Center: This will be a new building with an expected demand of 686 kVA. This building will require a new 1000-kVA transformer. A new central plant will also be located in this building.

Bioscience Education Center Central Plant: A new central plant will be located in the new Bioscience Education center. This area will have an expected building demand of 189 kVA and a mechanical demand of 860 kVA for a total demand of 1,049 kVA. This area will require a new separate service transformer rated 1500-kVA.

Student Services: This will be a new building with an expected demand of 482 kVA. This building will require a new 500-kVA transformer.

Social Science and Art Building: This will be a new building with an expected demand of 394 kVA. This building will require a new 500-kVA transformer.

THIN CLIENT COMPUTING IMPACTS ON ELECTRICAL DEMAND

Use of personal laptop computers and wireless systems is a growing trend on campuses. For computer labs with installed workstations, other trends such as thin client computing are emerging trends. While an analysis of potential impacts of changes in computing systems was not within the scope of the Utility Master Plan, it should be noted that significant reductions in electrical consumption might be achieved by emerging technologies such as thin client computing where very low power computer workstations utilize servers instead of internal hard drives and software. In modern classrooms with multiple computer terminals, thin client computing may reduce power consumption used significantly. As Montgomery College plans new building projects the impacts of the quantities and types of computing systems to be installed needs to be carefully considered in sizing electrical components.

ON-SITE ELECTRICAL GENERATION

The Germantown Campus has three diesel generators designed to provide emergency power for life safety functions (i.e., emergency egress lighting, fire alarm, etc.) in the event of a utility power failure; a 75-kW unit supplies power to the Humanities & Social Sciences (HS) Building (with a sub-feed to the PG Building); a 400-kW unit supplies power to the High Technology & Science Center (HT) and the Central Plant; and a 100-kW unit supplies power to the Goldenrod Building.

The College has invested in solar electricity generation at Germantown. There are solar photovoltaic systems on the roofs of the Sciences & Applied Studies (SA) Building and the HS Building, totaling 50 kW capacity. Further, on the HS Building, there is a 63 kW solar thermal collector system. All totaled, the College has the ability to offset approximately 280,000 kWh

of purchased energy usage by the production from these solar systems. Both the diesel generators and solar energy systems are tabulated on Table 6-1 in Appendix D.

The Germantown Campus is not presently well suited to utilize combined heat and power (CHP) generation applications due to the lack of a central heating plant. Heating occurs principally via gas boilers in individual buildings and the only central function is for cooling of the Campus.

INFORMATION TECHNOLOGY (IT) SYSTEM

The Germantown Campus has a network of communications infrastructure which links most of the buildings. As expected, the importance of this infrastructure is increasing rapidly and systems demands are growing. A thorough analysis of this system is not within the scope of this Plan, but a drawing of the complete IT system has been compiled and included as Drawing E-5 in Appendix D.

FIRE ALARM SYSTEMS

New fire alarm and emergency notification systems are currently under construction in all buildings. New fire alarm systems will be in accordance with College design standards and will be addressable, connected to a remote UL/NFPA monitoring facility, be capable of emergency notification, have a BACnet interface, and be capable of integrating with other networked Campus fire alarm devices.

EMERGENCY PHONES

Emergency phone stations with visual beacon lights attached to the tops are presently distributed around the Campus. A thorough discussion of this system is not within the scope of this Plan. We will review existing College records when they are available and a drawing will be compiled showing the exterior emergency phone stations. We have included Drawing E-6 in Appendix D of this report as a place holder for this future drawing. Several proposed emergency phone stations, as indicated on design documents, have been located on Drawing E-6 in anticipation that they will be constructed at the indicated locations.

SUMMARY AND RECOMMENDATIONS

Replacement of GS & HS Switchboards in SA Building.

Extend 13.2 kV Electrical Distribution System as required for new buildings. As new buildings are constructed and major renovations take place, the underground 13.2 kV distribution system should be upgraded to provide loops throughout Campus. This will allow buildings to be fed from either end of a loop, which will minimize the duration of outages should part of a loop fail. Install Metering in the Campus Buildings not presently metered.

Montgomery College - Germantown Campus Utility Master Plan Existing Facilities Data

Table 1-1 UTILITY SUMMARY SHEETS

Wiley|Wilson Commission No.: 211130.02

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Revised: 10/31/2011

Note: In year built/renovated columns, the construction/renovation dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built	Year Renovated	Building Size (GSF)	Domestic Water Load (GPM)	Fire Water Flow (GPM)	Sanitary Sewer Load (GPM)	Cooling Load (Tons)	Heating Load (MBH)	Electrical Demand (kW)	Natural Gas Load Cu. Ft/hr
Existing Utility Conditions (2011)													
104	HT	High Technology & Science Center	Tech Labs, classrooms, offices, auditorium	1995	-	75,542	211	500	88	280	2,871	177.3	2,720
104	HT	Central Plant	Central Heating and Cooling Plant	1995	-		-	500	-	-	-	445.6	-
102	HS	Humanities & Social Science	Classrooms, offices, Library, Bookstore, cafeteria	1978	-	75,700	208	500	88	275	3,343	411.0	3,280
103	PG	Physical Education Center	Gym, pool, classrooms, offices	1983	-	36,770	103	500	65	20	1,298		1,275
TBD	GN	Greenhouse	Greenhouse	1993	-	2,397	30	-	27	-	-	UNK	-
TBD	GS	Storage/Grounds	Grounds equipment repair, carpentry, storage	1980	-	6,055	41	500	31	-	-	* N/A	-
101	SA	Sciences & Applied Studies	Administrative, Labs, Classrooms, Security	1978	Partial,1999	65,146	127	500	82	165	1,940	319.1	1,905
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	-	450	10	-	10	-	-	N/A	-
TBD	-	Baseball (all structures)	Fields, storage, dugouts, etc.	1999	-	1,004	10	-	10	-	-	N/A	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	leased 1985	2007	33,684	0	500	0	-	-	148.8	-
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, business incubator			35,142	0	500	0	-	-	TBD	-
107	CG	Child Care	Child Care	2012		5,535	84					22.1	
			Total Bldg Loads			337,425	823		401	740	9,452	1,524	9,180
			Campus Block Loads				576		281	555	7,089		

Montgomery College - Germantown Campus Utility Master Plan Future Facilities Data

Table 1-2 UTILITY SUMMARY SHEETS

Wiley|Wilson Commission No.: 211130.02

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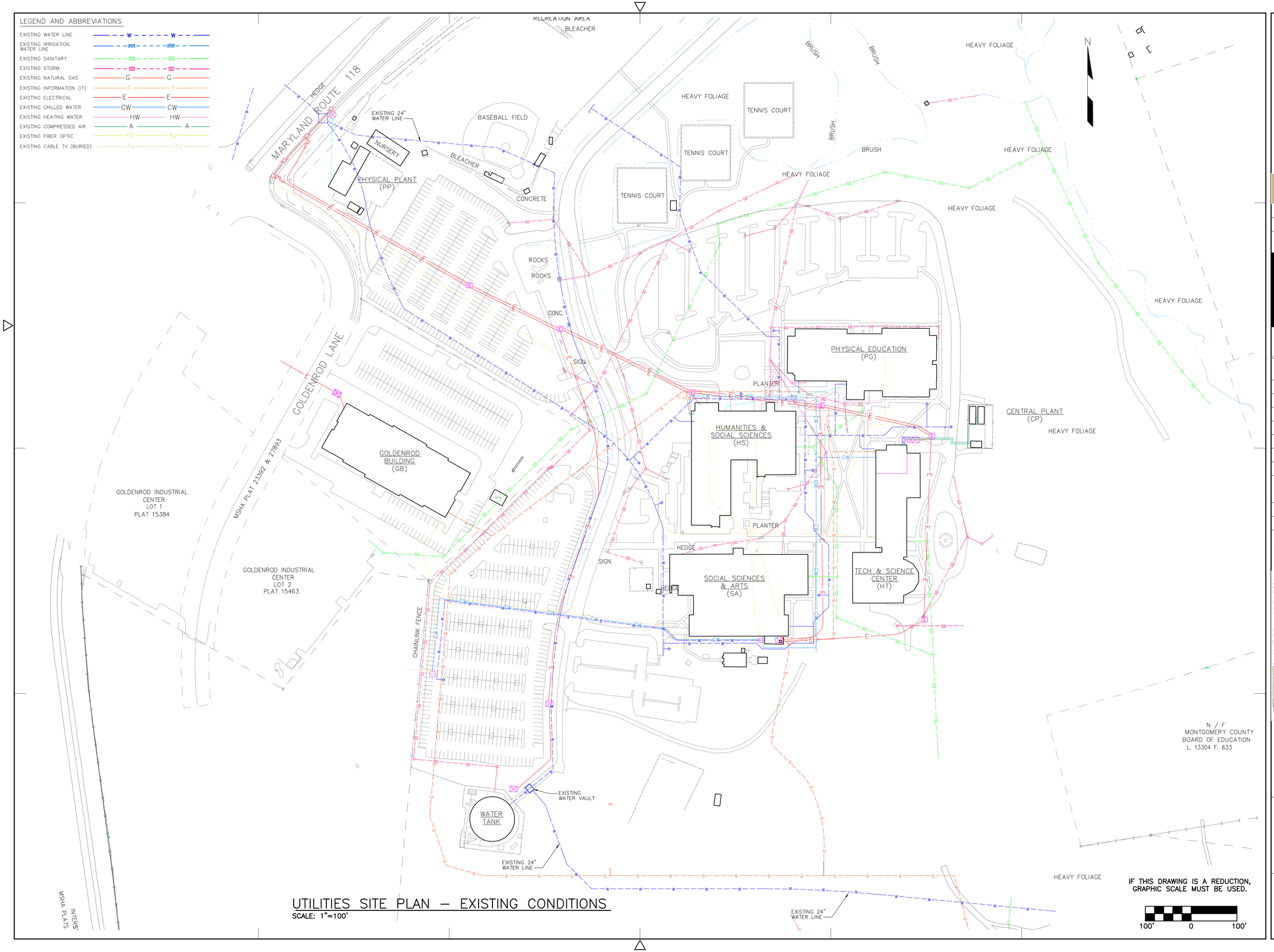
Revised: 2/13/2013

Note: In year built column, the new construction/demolition dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built/ Proposed Build	Year Renovated/ Demolished	Building Size (GSF)	Domestic Water Load (GPM)	Fire Water Flow (GPM)	Sanitary Sewer Load (GPM)	Cooling Load (Tons) R	Heating Load (MBH)	Electrical Demand (kW)	Natural Gas Load Cu. Ft/hr
Future Utility Conditions (Reference 2006 - 2016 Facilities Master Plan Proposed Facilities)													
104	HT	High Technology & Science Center, Alteration	Tech Labs, Classrooms, Offices, Auditorium	1995	---	75,542	211	500	88	283	2,871	177.3	-
104	HT	Central Plant	Central Heating and Cooling Plant	1995	---		-	500	-	-	-	445.6	-
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	---	450	-	-	-	-	-	minimal	-
102	**HS**	**Humanities & Social Sciences Building, Renovation**	**Classrooms, Offices, Library, Bookstore, Cafeteria**	**1978**	**---**	**75,700**	**208**	**500**	**88**	**271**	3,331	**301.0**	**-**
103	**PG**	**Physical Education Center, Renovation and Addition**	**Gym, Pool, Classrooms, Offices**	**1983**	**---**	**73,270**	**185**	**500**	**65**	**141**	2,638	**220.0**	**-**
TBD	**GN**	**Greenhouse, Demolished**	**---**	**---**	**---**	**-**	**-**	**-**	**-**	**-**	-	**-**	**-**
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	**---**	**TBD**	**-**	**0**	**TBD**	**-**	-	**TBD**	**-**
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	---	6,055	41	500	31	-	-	UNK	-
101	**SA**	**Physics, Engineering & Math (Renovated & Addition SA Building)**	**Administrative, Labs, Classrooms, Security**	**1978**	**---**	**86,140**	**160**	**500**	**109**	**237**	2,584	**430.7**	**-**
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	---	1,004	10		82	-	-	N/A	-
105	GB	Goldenrod Building 1st Floor[1]	Classrooms, Offices, Administrative, Maintenance	Leased	2007	33,684	0		0	-	-	148.8	-
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985		35,142	10		10	-	-	TBD	-
107	CG	Child Care	Child Care	2012	---	5,535	84	500	0	17	166	22.1	-
106	**BE**	**Bioscience Education Center**	**Labs, Classrooms, Offices**	**2014**	**---**	**114,300**	165	**500**	**67**	381	3,807	**686.0**	**-**
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	**---**	**12,600**	47	0	**110**			**1049.0**	**9,000**
TBD	**---**	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	**---**	**120,400**	158	**500**	**107**	**401**	**3,612**	**482.0**	**9,000**
TBD	**---**	**Social Science and Art Building**	**Classrooms**	**TBD**	**---**	**65,600**	117	**500**	**82**	**202**	**1,968**	**394.0**	**-**
						705,422							
		Notes:		Total Bldg Loads			1,396		839	1,934	20,976	4356.5	18,000
		1. GB has a stand alone water source heat pump system		Campus Block Loads			977		587	1,450	15,732		

Abbreviations:

GSF	gross square feet
GPM	gallons per minute
Block load	load after reducing peak load to account for diversity (non-coincident peak usages)
Btu	British Thermal Unit
Btu/SF*Hr	British Thermal Units per square foot per hour
LTHW	Low temperature hot water
HW	Hot water
CW	Chilled water
Hp	Horsepower
SCFM	standard cubic foot per minute
kW	kilowatts
kVA	kilovolt-amperes



UTILITIES SITE PLAN – EXISTING CONDITIONS

SCALE: 1"=100'

Montgomery College

Central Administration
Office of Facilities
900 Hungerford Drive
Rockville, Md 20850
Telephone: (301)–251–7363

Montgomery College endless possibilities

Drawn By: JLW	Ckd By: ETH
Designed By: ETH	Approved By: SMT

Notes

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COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

UTILITIES SITE PLAN
EXISTING CONDITIONS

Scale: 1" = 100'

Project No.

Date 01–25–13

Drawing Number C–1

MC Facilities No.

Montgomery College - Germantown Campus Utility Master Plan Existing Facilities Data

Table 2-1A Domestic Water

Wiley|Wilson Commission No.: 211130.02

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Revised: 2/13/2013

Note: In year built/renovated columns, the construction/renovation dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built	Year Renovated	Building Size (GSF)	Fixture Units (Number)	Fixture Units (GPM)	Hose Bib & Wall Hydrant (GPM)	Cooling Tower (GPM)	Boilers (GPM)	Total Domestic Water Load (GPM)	Building Peak System Load @ 70% (GPM)
Existing Utility Conditions (2011)													
104	HT	High Technology & Science Center	Tech Labs, classrooms, offices, auditorium	1995	-	75,542	436.5	131.2	40	24.3	15	210.5	147.4
104	HT	Central Plant	Central Heating and Cooling Plant	1995	-		-	-	-	-	-	-	-
102	HS	Humanities & Social Science	Classrooms, offices, Library, Bookstore, cafeteria	1978	-	75,700	416.0	128.8	30	49.5	-	208.3	145.8
103	PG	Physical Education Center	Gym, pool, classrooms, offices	1983	-	36,770	167.0	82.6	20	-	-	102.6	71.8
TBD	GN	Greenhouse	Greenhouse	1993	-	2,397	-	-	30	-	-	30.0	21.0
TBD	GS	Storage/Grounds	Grounds equipment repair, carpentry, storage	1980	-	6,055	23	36.0	5	-	-	41.0	28.7
101	SA	Sciences & Applied Studies	Administrative, Labs, Classrooms, Security	1978	Partial,1999	65,146	257	102.0	10	-	15	127.0	88.9
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	-	450	-	-	10	-	-	10.0	7.0
TBD	-	Baseball (all structures)	Fields, storage, dugouts, etc.	1999	-	1,004	-	-	10	-	-	10.0	7.0
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	leased 1985	2007	33,684							
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, business incubator			35,142							
107	CG	Child Care	Child Care	2012		5,535	151	79.0	5			84.0	58.8
									Total Connected Building Load (GPM)			**823.4**	576.4
									Campus Block Load (GPM)			**576.4**	

Montgomery College - Germantown Campus Utility Master Plan Existing Facilities Data

Table 2-1B Fire Water

Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 2:29 PM

Revised: 2/13/2013

Note: In year built/renovated columns, the construction/renovation dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built	Year Renovated	Building Size (GSF)	Fire Flow (GPM)
Existing Utility Conditions (2011)							
104	HT	High Technology & Science Center	Tech Labs, classrooms, offices, auditorium	1995	-	75,542	500
104	HT	Central Plant	Central Heating and Cooling Plant	1995	-		500
102	HS	Humanities & Social Science	Classrooms, offices, Library, Bookstore, cafeteria	1978	-	75,700	500
103	PG	Physical Education Center	Gym, pool, classrooms, offices	1983	-	36,770	500
TBD	GN	Greenhouse	Greenhouse	1993	-	2,397	-
TBD	GS	Storage/Grounds	Grounds equipment repair, carpentry, storage	1980	-	6,055	500
101	SA	Sciences & Applied Studies	Administrative, Labs, Classrooms, Security	1978	Partial,1999	65,146	500
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	-	450	-
TBD	-	Baseball (all structures)	Fields, storage, dugouts, etc.	1999	-	1,004	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	leased 1985	2007	33,684	500
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, business incubator			35,142	500
107	CG	Child Care	Child Care	2012	---	5,535	500

Montgomery College - Germantown Campus Utility Master Plan Existing Facilities Data

Table 3-1 Sanitary Sewer

Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 10:13 AM

Revised: 2/13/2013

Note: In year built/renovated columns, the construction/renovation dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built	Year Renovated	Building Size (GSF)	Fixture Units (Number)	Total Flow (GPM)	Building Peak System Load @ 70% (GPM)
Existing Utility Conditions (2011)									
104	HT	High Technology & Science Center	Tech Labs, classrooms, offices, auditorium	1995	-	75,542	184.0	88.0	61.6
104	HT	Central Plant	Central Heating and Cooling Plant	1995	-		-	-	
102	HS	Humanities & Social Science	Classrooms, offices, Library, Bookstore, cafeteria	1978	-	75,700	184.0	88.0	61.6
103	PG	Physical Education Center	Gym, pool, classrooms, offices	1983	-	36,770	94.0	65.0	45.5
TBD	GN	Greenhouse	Greenhouse	1993	-	2,397	9.0	27.0	18.9
TBD	GS	Storage/Grounds	Grounds equipment repair, carpentry, storage	1980	-	6,055	15.0	31.0	21.7
101	SA	Sciences & Applied Studies	Administrative, Labs, Classrooms, Security	1978	Partial,1999	65,146	165.0	82.0	57.4
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	-	450	3.0	10.0	7.0
TBD	-	Baseball (all structures)	Fields, storage, dugouts, etc.	1999	-	1,004	3.0	10.0	7.0
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	leased 1985	2007	33,684			
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, business incubator			35,142			
107	CG	Child Care	Child Care	2012	---	5535	98	67	46.9
					Total Connected Building Load (GPM)			**468.0**	327.6
						Campus Block Load (GPM)		**327.6**	

Montgomery College - Germantown Campus Utility Master Plan Future Facilities Data

Table 2-2A Domestic Water

Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 10:16 AM

Revised: 2/13/2013

Note: In year built column, the new construction/demolition dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built/ Proposed Build	Year Renovated/ Demolished	Building Size (GSF)	Fixture Units (Number)	Fixture Units (GPM)	Hose Bib & Wall Hydrant (GPM)	Cooling Tower (GPM)	Boilers (GPM)	Total Domestic Water Load (GPM)	Building Peak System Load @ 70% (GPM)
Future Utility Conditions (Reference 2006 - 2016 Facilities Master Plan Proposed Facilities)													
104	HT	**High Technology & Science Center, Alteration**	**Tech Labs, Classrooms, Offices, Auditorium**	**1995**	---	**75,542**	**436.5**	**131.2**	**40**	**24.3**	**15**	**210.5**	**147.4**
104	HT	Central Plant	Central Heating and Cooling Plant	1995	---		-	-	-	-	-	-	-
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991		450	-	-	-	-	-	-	-
102	**HS**	**Humanities & Social Sciences Building, Renovation**	**Classrooms, Offices, Library, Bookstore, Cafeteria**	**1978**	---	**75,700**	**416.0**	**128.8**	**30**	**49.5**	-	**208.3**	**145.8**
103	**PG**	**Physical Education Center, Renovation and Addition**	**Gym, Pool, Classrooms, Offices**	**1983**	---	**73,270**	**333.0**	**165.0**	**20**	-	-	**185.0**	**129.5**
TBD	**GN**	**Greenhouse, Demolished**	---	---	---	-	-	-	**30**	-	-	-	-
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	---	**TBD**	-	-	-	-	-	-	-
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	---	6,055	23	36.0	5	-	-	41.0	28.7
101	**SA**	**Physics, Engineering & Math (Renovated & Addition SA Building)**	**Administrative, Labs, Classrooms, Security**	**1978**	---	**86,140**	**340**	**135.0**	**10**	-	**15**	**160.0**	**112.0**
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	---	1,004	-	-	10	-	-	10.0	7.0
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	Leased 1985	2007	33,684							
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator			35,142	-	-	10	-	-	10.0	7.0
107	CG	Child Care	Child Care	2012	---	5,535	151	79.0	5			84.0	58.8
106	**BE**	**Bioscience Education center**	**Labs, Classrooms, Offices**	**2014**	---	**126,900**	**495**	**145.0**	**20**	-	-	**165.0**	**115.5**
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	---	**12,600**				**47.0**		**47.0**	**32.9**
TBD	**---**	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	---	**120,400**	**447**	**138.0**	**20**	-	-	**158.0**	**110.6**
TBD	---	**Social Science and Art Building**	**Classrooms**	**TBD**	---	**65,600**	**257**	**102.0**	**15**	-	-	**117.0**	**81.9**
											Total Connected Building Load (GPM)	**1,395.8**	977.1
											Campus Block Load (GPM)	**977.1**	

Montgomery College - Germantown Campus Utility Master Plan Future Facilities Data

Table 2-2B Fire Water

Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 2:32 PM

Revised: 2/13/2013

Note: In year built column, the new construction/demolition dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built/ Proposed Build	Year Renovated/ Demolished	Building Size (GSF)	Building sprinklered	Fire Flow (GPM)
Future Utility Conditions (Reference 2006 - 2016 Facilities Master Plan Proposed Facilities)								
104	**HT**	**High Technology & Science Center, Alteration**	**Tech Labs, Classrooms, Offices, Auditorium**	**1995**	---	**75,542**	**yes**	**500**
104	HT	Central Plant	Central Heating and Cooling Plant	1995	---		yes	500
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	---	450	no	-
102	**HS**	**Humanities & Social Sciences Building, Renovation**	**Classrooms, Offices, Library, Bookstore, Cafeteria**	**1978**	---	**75,700**	**yes**	**500**
103	**PG**	**Physical Education Center, Renovation and Addition**	**Gym, Pool, Classrooms, Offices**	**1983**	---	**73,270**	**yes**	**500**
TBD	**GN**	**Greenhouse, Demolished**	---	---	---	-	**no**	-
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	---	**TBD**		
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	---	**6,055**	yes	500
101	**SA**	**Physics, Engineering & Math (Renovated & Addition SA Building)**	**Administrative, Labs, Classrooms, Security**	**1978**	---	**86,140**	**yes**	**500**
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	---	1,004		
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	Leased 1985	2007	33,684		
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator			35,142	no	-
107	CG	Child Care	Child Care	2012	---	5,535	yes	500
106	**BE**	**Satellite Plant**	**Labs, Classrooms, Offices**	**2014**	---	**126,900**	**yes**	**500**
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	---	**12,600**	**yes**	
TBD	---	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	---	**120,400**	**yes**	**500**
TBD	---	**Social Science and Art Building**	**Classrooms**	**TBD**	---	**65,600**	**yes**	**500**

Montgomery College - Germantown Campus Utility Master Plan Future Facilities Data

Table 3-2 Sanitary Sewer

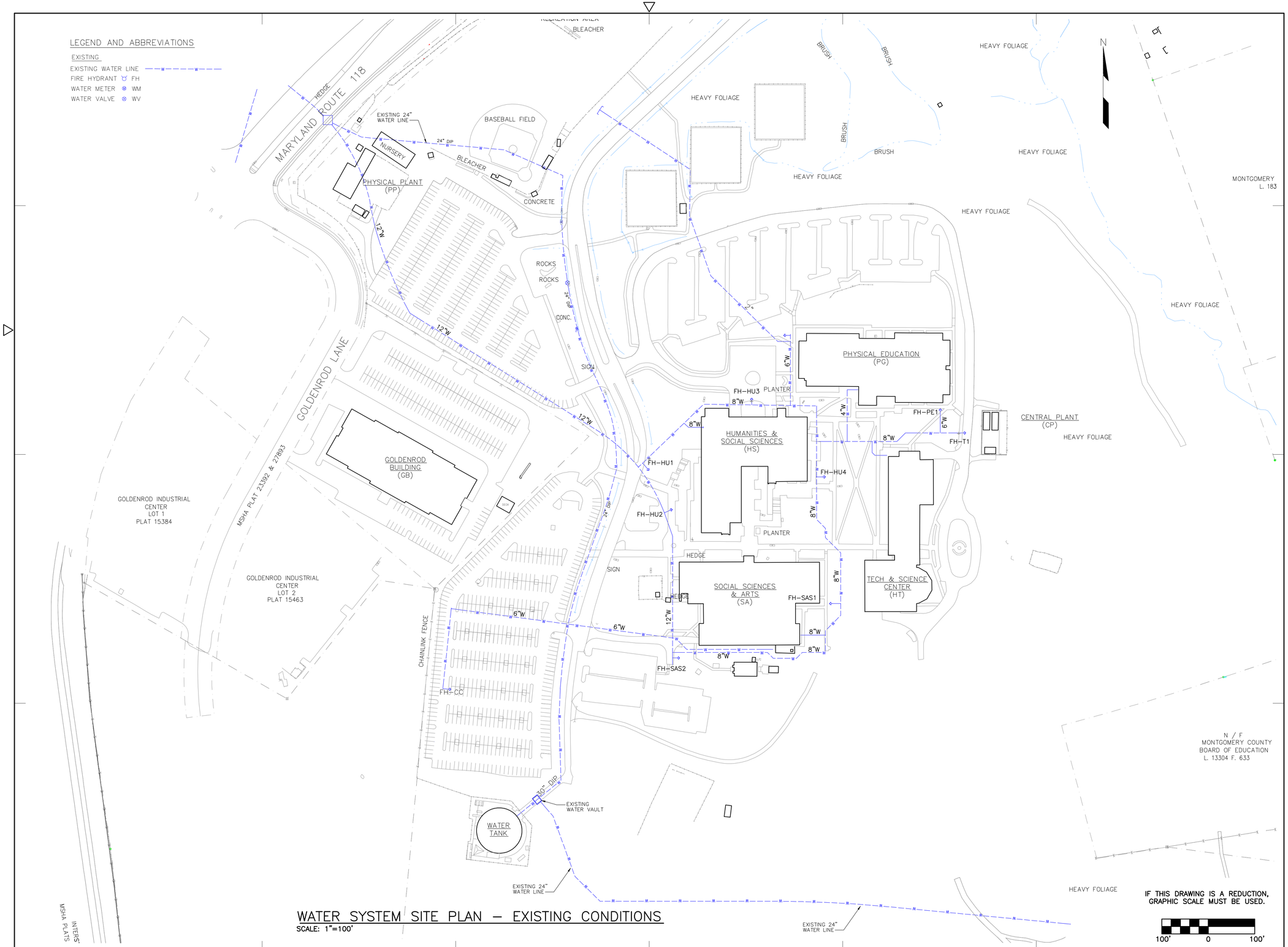
Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 10:18 AM

Revised: 2/2/2012

Note: In year built column, the new construction/demolition dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built/ Proposed Build	Year Renovated/ Demolished	Building Size (GSF)	Fixture Units (Number)	Total Flow (GPM)	Building Peak System Load @ 70% (GPM)
Future Utility Conditions (Reference 2006 - 2016 Facilities Master Plan Proposed Facilities)									
104	**HT**	**High Technology & Science Center, Alteration**	**Tech Labs, Classrooms, Offices, Auditorium**	**1995**	**---**	**75,542**	**184.0**	**88**	**62**
104	HT	Central Plant	Central Heating and Cooling Plant	1995	---		**-**	**-**	
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	---	450	**-**	**-**	
102	**HS**	**Humanities & Social Sciences Building, Renovation**	**Classrooms, Offices, Library, Bookstore, Cafeteria**	**1978**	**---**	**75,700**	**184.0**	**88**	**62**
103	**PG**	**Physical Education Center, Renovation and Addition**	**Gym, Pool, Classrooms, Offices**	**1983**	**---**	**73,270**	**94.0**	**65**	**46**
TBD	**GN**	**Greenhouse, Demolished**	**---**	**---**	**---**	**-**	**---**	**---**	**---**
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	---	**TBD**			**0**
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	---	6,055	15.0	31	**22**
101	**SA**	**Physics, Engineering & Math (Renovated & Addition SA Building)**	**Administrative, Labs, Classrooms, Security**	**1978**	**---**	**86,140**	**220.0**	**109**	**76**
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	---	1,004		82	**57**
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	Leased 1985	2007	33684	3	10	7
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator			35142			
107	**CG**	**Child Care**	**Child Care**	**2012**	**---**	**5535**	**98**	**67**	**47**
106	**BE**	**Biosciences Education Center**	**Labs, Classrooms, Offices**	**2014**	**---**	**126,900**	**316**	**110**	**77**
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	**---**	**12,600**			
TBD	**---**	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	**---**	**120,400**	**285.0**	**107**	**75**
TBD	---	**Social Science and Art Building**	**Classrooms**	**TBD**	---	**65,600**	**165.0**	**82**	**57**
					Total Connected Building Load (GPM)			**839**	587.3
						Campus Block Load (GPM)		**587**	



WATER SYSTEM SITE PLAN – EXISTING CONDITIONS

SCALE: 1"=100'

Montgomery College

Central Administration
Office of Facilities
900 Hungerford Drive
Rockville, Md 20850
Telephone: (301)–251–7363

Montgomery College endless possibilities

Drawn By: JLW	Ckd By: ETH
Designed By: ETH	Approved By: SMT

Notes

Wiley|Wilson™ Constant Progress

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phone 434.947.1901 | fax 434.947-1601 | web wileywilson.com

COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE GERMANTOWN CAMPUS UTILITY MASTER PLAN

Drawing Title

WATER SYSTEM SITE PLAN – EXISTING CONDITIONS

Scale: 1" = 100'

Project No.

Date 01–25–13

Drawing Number C–2

MC Facilities No.

LEGEND AND ABBREVIATIONS

EXISTING WATER LINE
FIRE HYDRANT FH
WATER METER WM
WATER VALVE WV
PROPOSED WATER LINE
PROPOSED WATER LINE (UNDER CONSTRUCTION)

MARYLAND ROUTE 118
GOLDENROD LANE
OBSERVATION DRIVE

PHYSICAL PLANT (PP)
GOLDENROD BUILDING (GB)
TENNIS COURT
TENNIS COURT
TENNIS COURT
PROPOSED STUDENT SERVICES CENTER 120,400 GSF
PROPOSED PG ADDITION 36,500 GSF
PHYSICAL EDUCATION (PG)
CENTRAL PLANT (CP)
HUMANITIES & SOCIAL SCIENCES (HS)
PROPOSED SOCIAL SCIENCE & ART 65,600 GSF
FUTURE BUILDING SITE
FUTURE BUILDING SITE
FUTURE BUILDING SITE
FUTURE BUILDING SITE
SOCIAL SCIENCES & ART (SA)
PROPOSED RENOVATION & ADDITION OF 64,504 GSF
TECH & SCIENCE CENTER (HT)
PROPOSD GREENHOUSE (GH)
PROPOSED CHILD CARE 5,535 GSF
PROPOSED BIOSCIENCE EDUCATION 126,900 GSF
WATER TANK

FH-HU1
FH-HU2
FH-HU3
FH-HU4
FH-PE1
FH-T1
FH-SAS1
FH-SAS2
FH-CC

24" DIP
20" DIP

GOLDENROD INDUSTRIAL CENTER LOT 1 PLAT 15384
GOLDENROD INDUSTRIAL CENTER LOT 2 PLAT 15463
N / F MONTGOMERY MOBILE VILLA L. 18365 F. 106
N / F BENJAMIN L. 5809
N / F MONTGOMERY COUNTY BOARD OF EDUCATION L. 13304 F. 633

N

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

100' 0 100'

WATER SYSTEM SITE PLAN – FUTURE CONDITIONS

SCALE: 1"=100'

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COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE GERMANTOWN CAMPUS UTILITY MASTER PLAN

Drawing Title

WATER SYSTEM SITE PLAN – FUTURE CONDITIONS

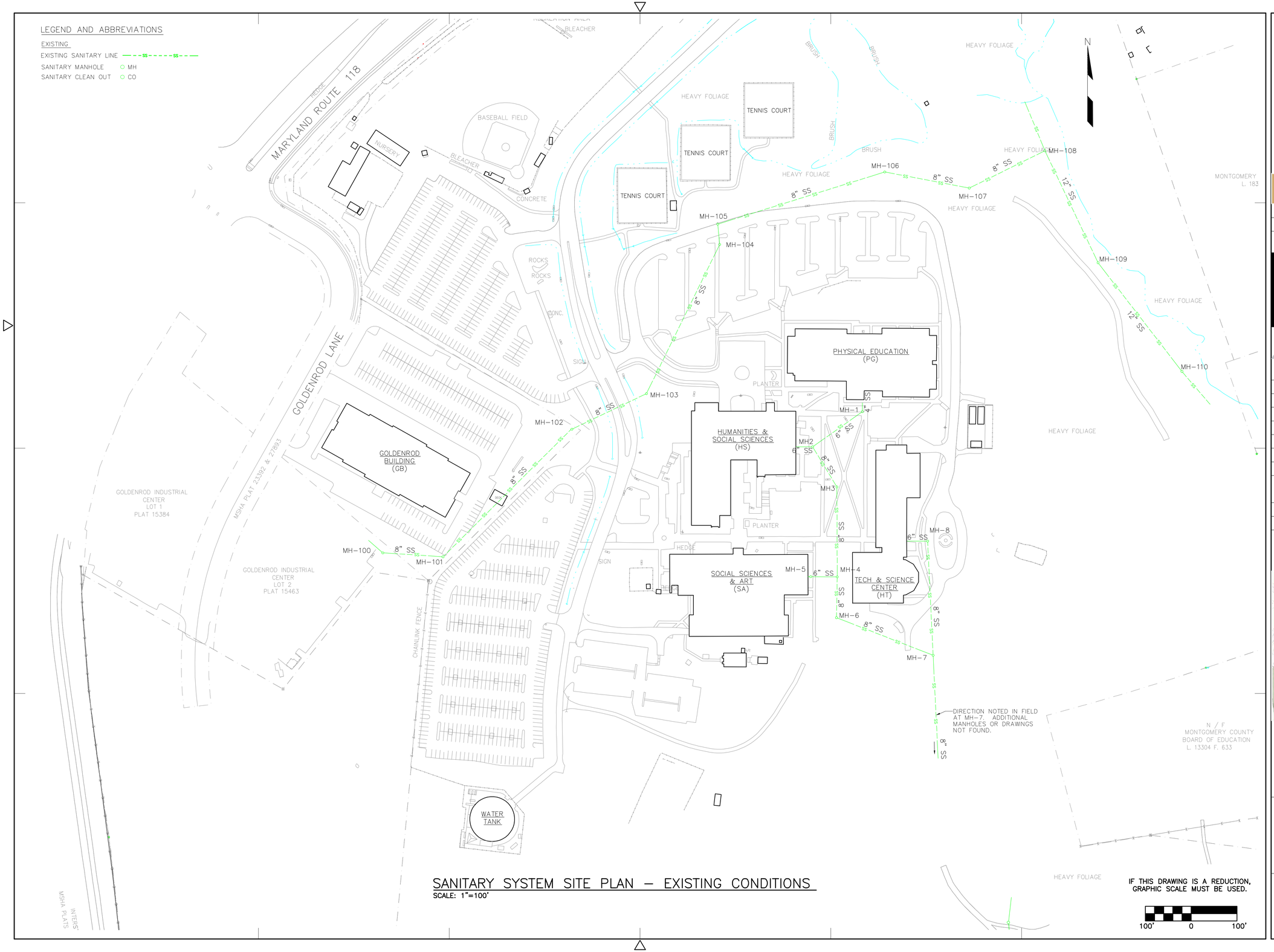
Scale: 1" = 100'

Project No.

Date 01–25–13

Drawing Number C–3

MC Facilities No.



SANITARY SYSTEM SITE PLAN – EXISTING CONDITIONS
SCALE: 1"=100'

Montgomery College

Central Administration
Office of Facilities
900 Hungerford Drive
Rockville, Md 20850
Telephone: (301)–251–7363

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Designed By: ETH	Approved By: SMT

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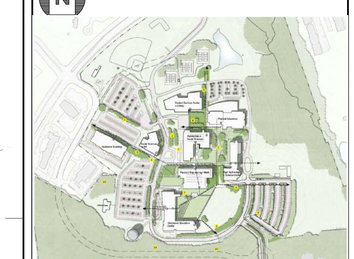
No.	Description	Date

Revisions

Location Map



Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

SANITARY SYSTEM
SITE PLAN –
EXISTING CONDITIONS

Scale: 1" = 100'

Project No.

Date
01–25–13

Drawing Number
C–4

MC Facilities No.

LEGEND AND ABBREVIATIONS

EXISTING

EXISTING SANITARY LINE — SS — SS —

SANITARY MANHOLE ○ MH

SANITARY CLEAN OUT ○ CO

PROPOSED

PROPOSED SANITARY SEWER

SANITARY MANHOLE ○ MH

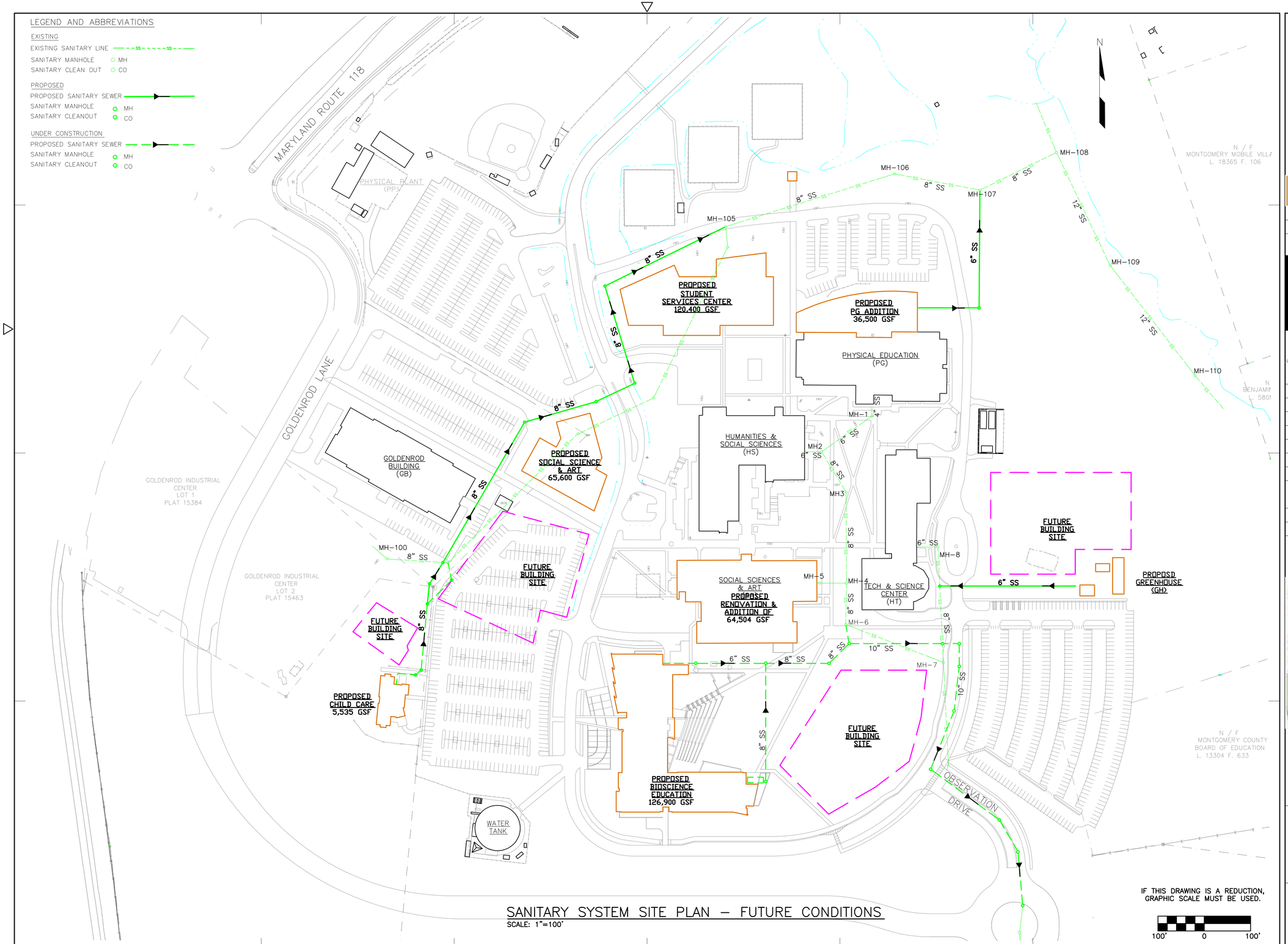
SANITARY CLEANOUT ○ CO

UNDER CONSTRUCTION

PROPOSED SANITARY SEWER

SANITARY MANHOLE ○ MH

SANITARY CLEANOUT ○ CO



SANITARY SYSTEM SITE PLAN – FUTURE CONDITIONS

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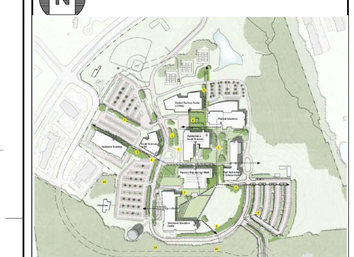
No.	Description	Date

Revisions

Location Map



Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

SANITARY SYSTEM
SITE PLAN –
FUTURE CONDITIONS

Scale: 1" = 100'

Project No.

Date 01–25–13

Drawing Number C–5

MC Facilities No.

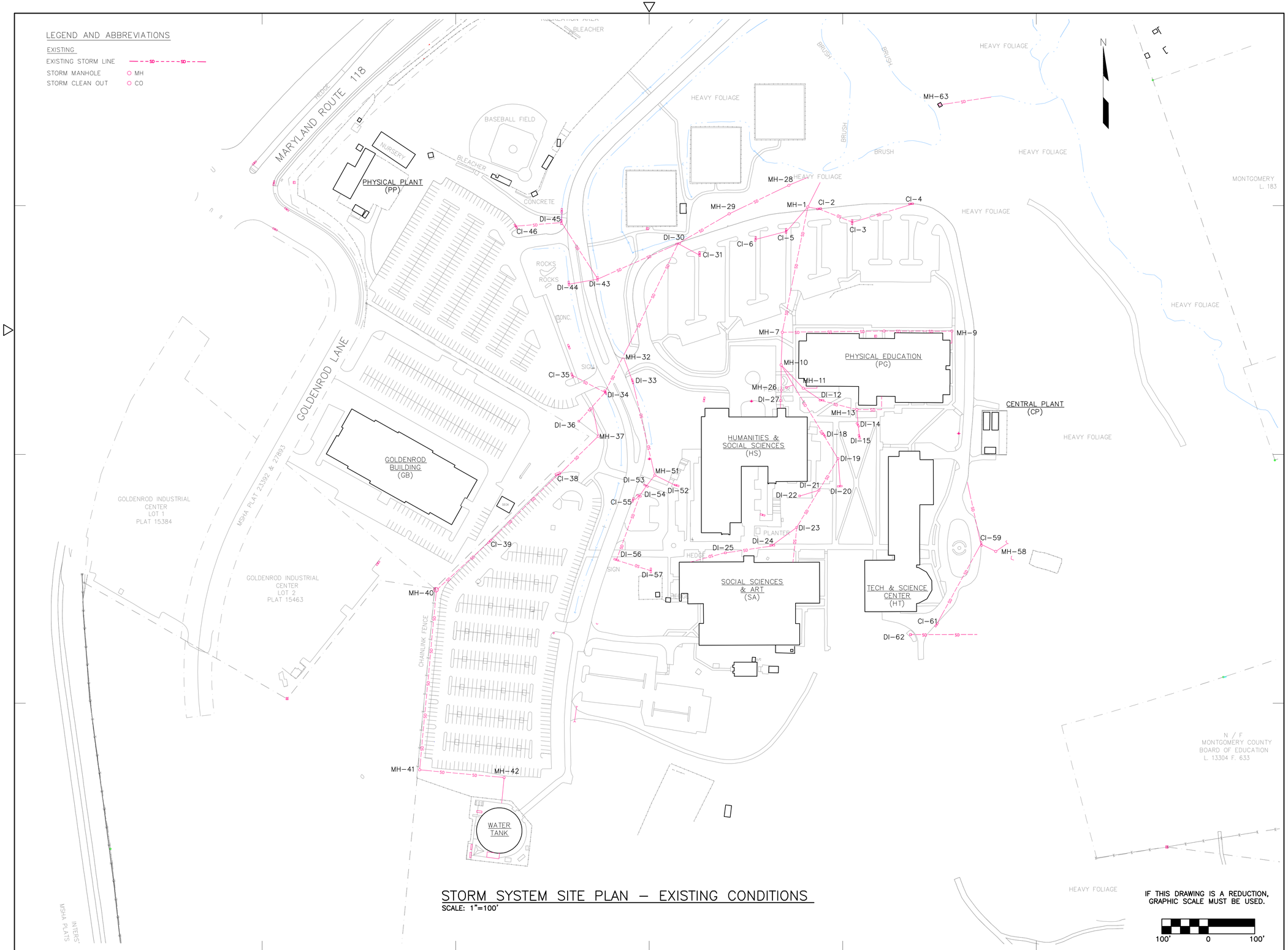
LEGEND AND ABBREVIATIONS

EXISTING

EXISTING STORM LINE — SD —

STORM MANHOLE MH

STORM CLEAN OUT CO



STORM SYSTEM SITE PLAN – EXISTING CONDITIONS

SCALE: 1"=100'

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Revisions

Location Map

Project Title

MONTGOMERY COLLEGE GERMANTOWN CAMPUS UTILITY MASTER PLAN

Drawing Title

STORM SYSTEM SITE PLAN – EXISTING CONDITIONS

Scale: 1" = 100'

Project No.

Date 01–25–13

Drawing Number C–6

MC Facilities No.

LEGEND AND ABBREVIATIONS

EXISTING

EXISTING STORM LINE — SD

STORM MANHOLE — MH

STORM CLEAN OUT — CO

PROPOSED

PROPOSED STORM SEWER

STORM MANHOLE — MH

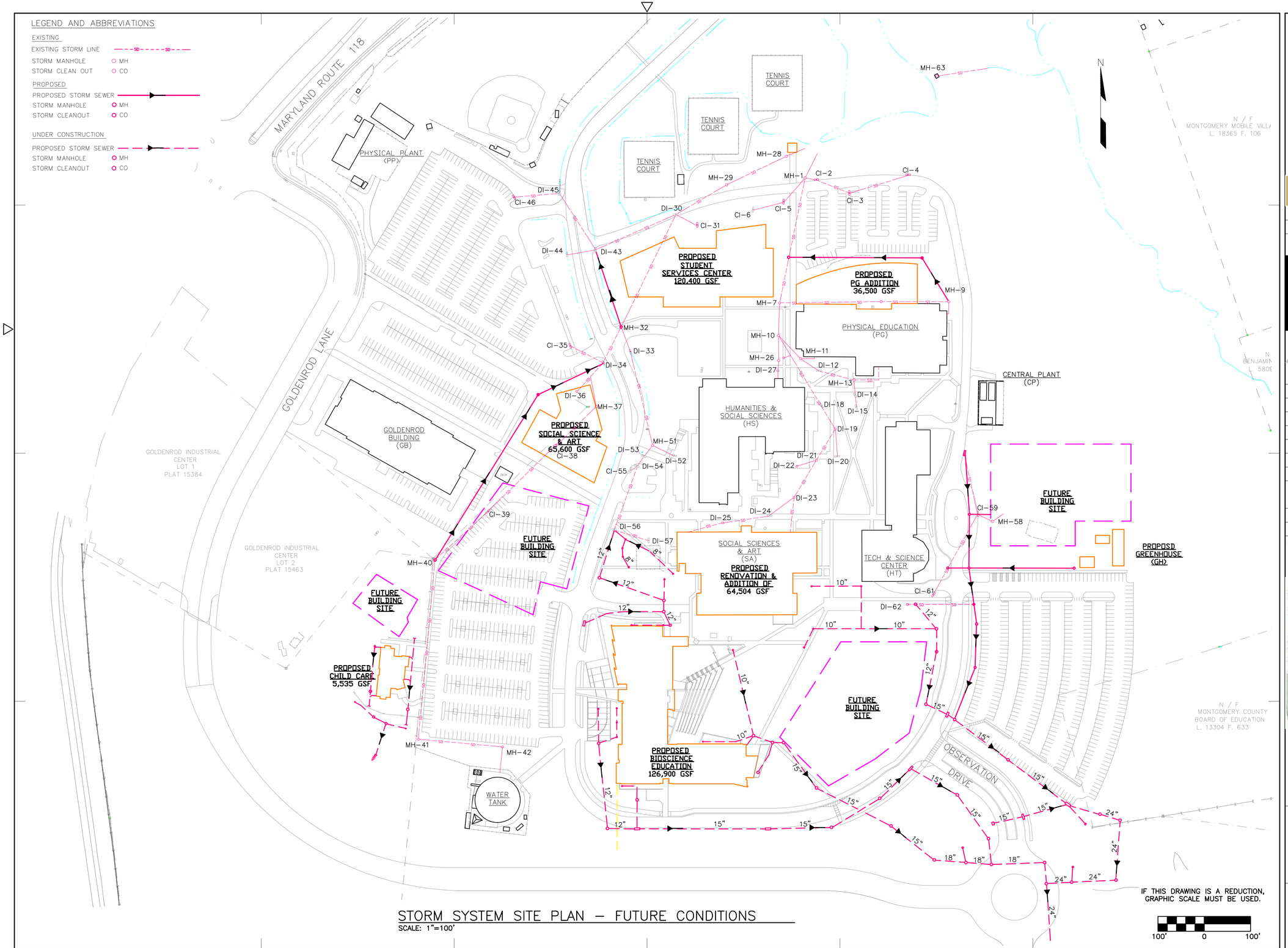
STORM CLEANOUT — CO

UNDER CONSTRUCTION

PROPOSED STORM SEWER

STORM MANHOLE — MH

STORM CLEANOUT — CO



STORM SYSTEM SITE PLAN – FUTURE CONDITIONS

SCALE: 1"=100'

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Drawn By: JLW	Ckd By: ETH
Designed By: ETH	Approved By: SMT

Notes

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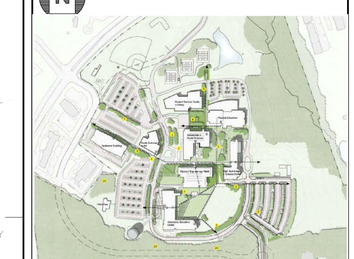
COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map



Project Title

MONTGOMERY COLLEGE GERMANTOWN CAMPUS UTILITY MASTER PLAN

Drawing Title

STORM SYSTEM SITE PLAN – FUTURE CONDITIONS

Scale: 1" = 100'

Project No.

Date 01–25–13

Drawing Number C–7

MC Facilities No.

C

Montgomery College - Germantown Campus Utility Master Plan Existing Facilities Data

TABLE 5-1 Cooling & Heating

Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 10:19 AM

Revised: 2/13/2013

Note: In year built/renovated columns, the construction/renovation dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built	Year Renovated	Building Size (GSF)	Air Cond. Area (GSF)	AC Design Load Factor (Btuh/GSF)	AC Design (GSF / Ton) Load Factor	Calculated Design Cooling (Tons)	CW Source	Heating Design Load Factor (Btuh/SF*Hr)	Heated Area (GSF)	LTHW Design Heating Load (Btu/Hr)	Heating HW Source
Existing Utility Conditions (2011)															
104	HT	High Technology & Science Center	Tech Labs, classrooms, offices, auditorium	1995	-	75,542	75,542	44.5	270	280	CP	38	75,542	2,870,596	Local
104	HT	Central Plant	Central Heating and Cooling Plant	1995	-		-	-	-	-	-		-		-
102	HS	Humanities & Social Science	Classrooms, offices, Library, Bookstore, cafeteria	1978	-	75,700	75,700	42.8	275	275	CP	44	75,700	3,330,800	Local
103	PG	Physical Education Center	Gym, pool, classrooms, offices	1983	-	36,770	6,000	40.0	333	20	CP	36	36,770	1,323,720	HS
TBD	GN	Greenhouse	Greenhouse	1993	-	2,397	-	-	-	-	-		-		SA
TBD	GS	Storage/Grounds	Grounds equipment repair, carpentry, storage	1980	-	6,055	-	-	-	-	-		-		-
101	SA	Sciences & Applied Studies	Administrative, Labs, Classrooms, Security	1978	Partial,1999	65,146	65,146	33.2	395	165	CP	30	65,146	1,954,380	Local
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	-	450	-	-	-	-	-		-		-
TBD	-	Baseball (all structures)	Fields, storage, dugouts, etc.	1999	-	1,004	-	-	-	-	-		-		-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	leased 1985	2007	33,684	-	-	-	-	Note 1		-		Note 1
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, business incubator			35,142	-	-	-	-			-		-
107	CG	Child Care[2]	Child Care	2012	---	5,535	5,535	37.0	324	17	BE Sat Plt	30	5,535	166,050	BE Sat Plt
			Total Bldg Loads			337,425	227,923	40	319	757				9,645,546	
			Campus Block Loads							606				7,234,160	
			Current "Calculated" Maximum Capacity of Central Plant =							**575**					

Notes: 1. GB has stand alone water source heat pump system

2: The Child Care Center was completed in 2012. It is shown as existing but as-built information was not available and estimated values used in this table.

Montgomery College - Germantown Campus Utility Master Plan Future Facilities Data

TABLE 5-2 Cooling & Heating

Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 10:23 AM

Revised: 2/13/13

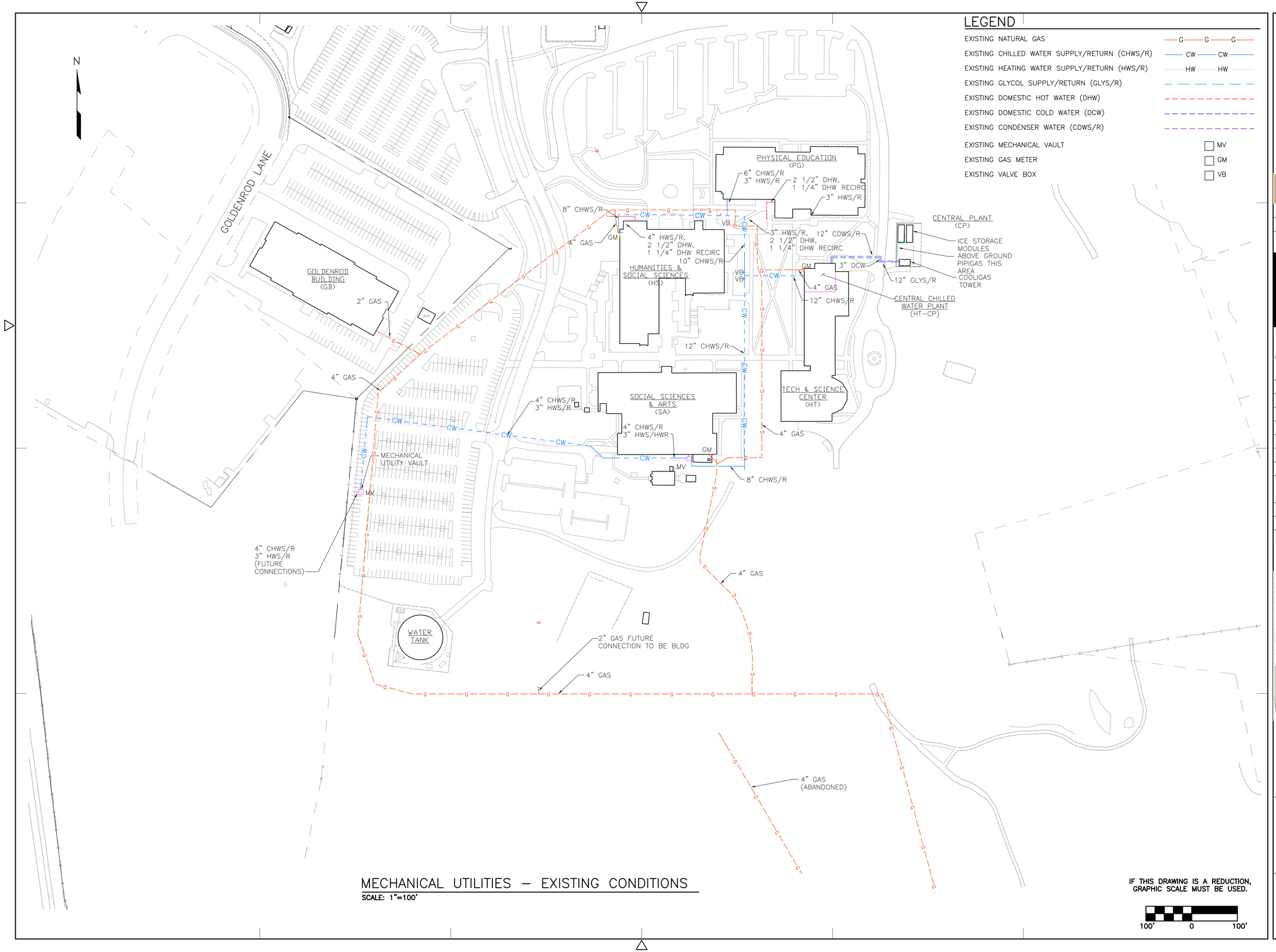
Note: In year built column, the new construction/demolition dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built/ Proposed Build	Year Renovated/ Demolished	Building Size (GSF)	Air Cond. Area (GSF)	Cooling Load Factor (Btuh/ GSF)	Calculated Design Cooling (Tons)	Actual Chiller (Tons) R	CW Source	Heating Design Load Factor (Btuh/ SF*Hr)	Heating Load (Btu/Hr)	Heating HW Source
Future Utility Conditions (Reference 2006 - 2016 Facilities Master Plan Proposed Facilities)														
104	**HT**	**High Technology & Science Center, Alteration**	**Tech Labs, Classrooms, Offices, Auditorium**	**1995**	---	**75,542**	**75,542**	**45**	**283**	-	**HT Cent Plt**	**38**	**2,870,596**	**SS Sat Plt**
104	HT	Central Plant	Central Heating and Cooling Plant		---		-	-	-	845	Note 2	-	-	-
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	---	450	-	-	-	-	-	-	-	-
102	**HS**	**Humanities & Social Sciences Building, Renovation**	**Classrooms, Offices, Library, Bookstore, Cafeteria**	**1978**	---	**75,700**	**75,700**	**43**	**271**	-	**Sat or Cen Plt**	**44**	**3,330,800**	**SS Sat Plt**
103	**PG**	**Physical Education Center, Renovation and Addition**	**Gym, Pool, Classrooms, Offices**	**1983**	---	**73,270**	**42,300**	**40**	**141**	-	**HT Cent Plt**	**36**	**2,637,720**	**SS Sat Plt**
TBD	**GN**	**Greenhouse, Demolished**	**---**	**---**	**---**	**-**	**-**	**-**	-	-	-	**-**	**-**	**-**
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	---	**TBD**	**-**	**-**	-	-	-	**-**	-	-
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	---	6,055	-	-	-	-	-	-	-	-
101	**SA**	**Physics, Engineering & Math (Renovated & Addition SA Building)**	**Administrative, Labs, Classrooms, Security**	**1978**	---	86,140	86,140	**33**	**237**	-	**BE Sat Plt**	**30**	**2,584,200**	**BE Sat Plt**
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	---	1,004	-	-	-	-	-	-	-	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	Leased	2007	33,684	-	-	-	-	Note 1	-	-	Note 1
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985		35,142	-	-	-	-	-	-	-	-
107	CG	Child Care	Child Care	2012	---	5,535	5,535	37	17	-	BE Sat Plt	30	166,050	BE Sat Plt
106	**BE**	**Bioscience Education Center**	**Labs, Classrooms, Offices**	**2014**	---	**126,900**	**114,300**	**40**	381	-	**BE Sat Plt**	**30**	3,807,000	**BE Sat Plt**
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	---	**12,600**			-	**1036**	**Note 3**	-	-	-
TBD	---	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	---	**120,400**	**120,400**	**40**	401	-	**HT Cent Plt**	**30**	3,612,000	**SS Sat Plt**
TBD	---	**Social Science and Art Building**	**Classrooms**	**TBD**	---	**65,600**	**65,600**	**37**	202	-	**HT Cent Plt**	**30**	**1,968,000**	**SS Sat Plt**
					Total Bldg Loads	718,022	585,517		1,934				20,976,366	
					Campus Block Loads				1,451				15,732,275	

Notes: 1. GB has a stand alone water source heat pump system

2. Includes 305 tons for 8 hours from ice modules

3. Includes 676 tons for 9 hours from ice modules



LEGEND

EXISTING NATURAL GAS	G — G — G
EXISTING CHILLED WATER SUPPLY/RETURN (CHWS/R)	CW — CW
EXISTING HEATING WATER SUPPLY/RETURN (HWS/R)	HW — HW
EXISTING GLYCOL SUPPLY/RETURN (GLYS/R)	
EXISTING DOMESTIC HOT WATER (DHW)	
EXISTING DOMESTIC COLD WATER (DCW)	
EXISTING CONDENSER WATER (CDWS/R)	
EXISTING MECHANICAL VAULT	MV
EXISTING GAS METER	GM
EXISTING VALVE BOX	VB

MECHANICAL UTILITIES – EXISTING CONDITIONS

SCALE: 1"=100'

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

100' 0 100'

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Designed By: MCR	Approved By: SMT

Notes

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COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

MECHANICAL UTILITIES
EXISTING CONDITIONS

Scale: 1"=100'

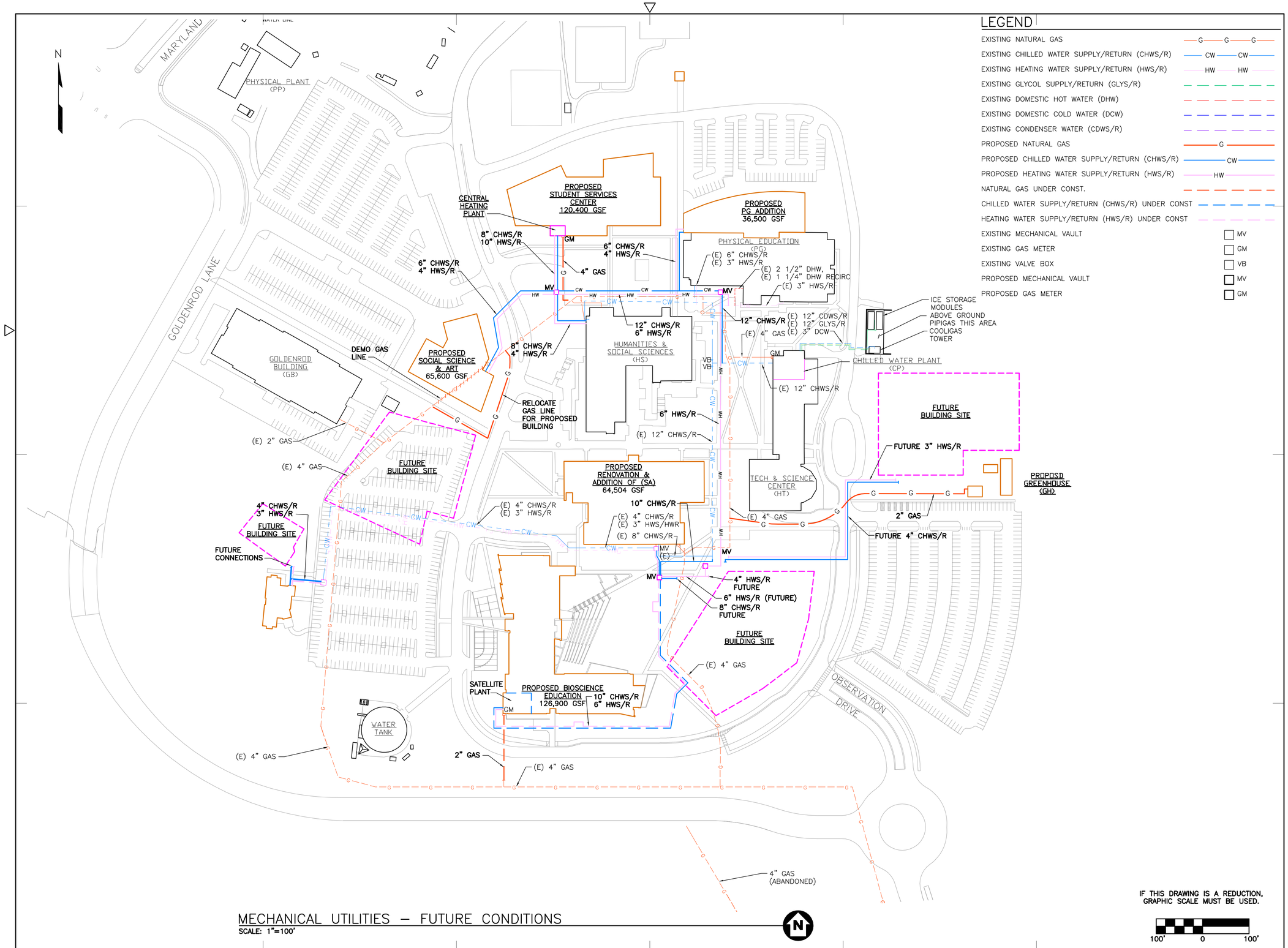
Project No.

Date
01–25–13

Drawing Number

M–1

MC Facilities No.



MECHANICAL UTILITIES – FUTURE CONDITIONS

SCALE: 1"=100'

LEGEND

EXISTING NATURAL GAS	G
EXISTING CHILLED WATER SUPPLY/RETURN (CHWS/R)	CW
EXISTING HEATING WATER SUPPLY/RETURN (HWS/R)	HW
EXISTING GLYCOL SUPPLY/RETURN (GLYS/R)	
EXISTING DOMESTIC HOT WATER (DHW)	
EXISTING DOMESTIC COLD WATER (DCW)	
EXISTING CONDENSER WATER (CDWS/R)	
PROPOSED NATURAL GAS	G
PROPOSED CHILLED WATER SUPPLY/RETURN (CHWS/R)	CW
PROPOSED HEATING WATER SUPPLY/RETURN (HWS/R)	HW
NATURAL GAS UNDER CONST.	
CHILLED WATER SUPPLY/RETURN (CHWS/R) UNDER CONST	
HEATING WATER SUPPLY/RETURN (HWS/R) UNDER CONST	
EXISTING MECHANICAL VAULT	MV
EXISTING GAS METER	GM
EXISTING VALVE BOX	VB
PROPOSED MECHANICAL VAULT	MV
PROPOSED GAS METER	GM

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

100' 0 100'

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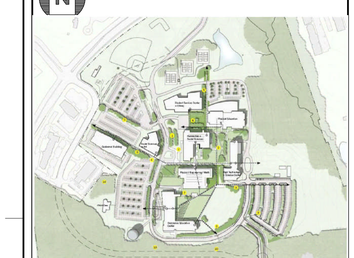
COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map



Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

MECHANICAL UTILITIES
FUTURE CONDITIONS

Scale: 1"=100'

Project No.

Date 01–25–13

Drawing Number

M–2

MC Facilities No.

D

Montgomery College - Germantown Campus Utility Master Plan Existing Facilities Data

Table 6-1 Electrical Service Data

Wiley|Wilson Commission No.: 211130.02

Printed 2/18/13 10:24 AM

Revise 2/13/2013

Note: In year built/renovated columns, the construct Note: In year built/renovated columns, the construction/renovation dates are completion year

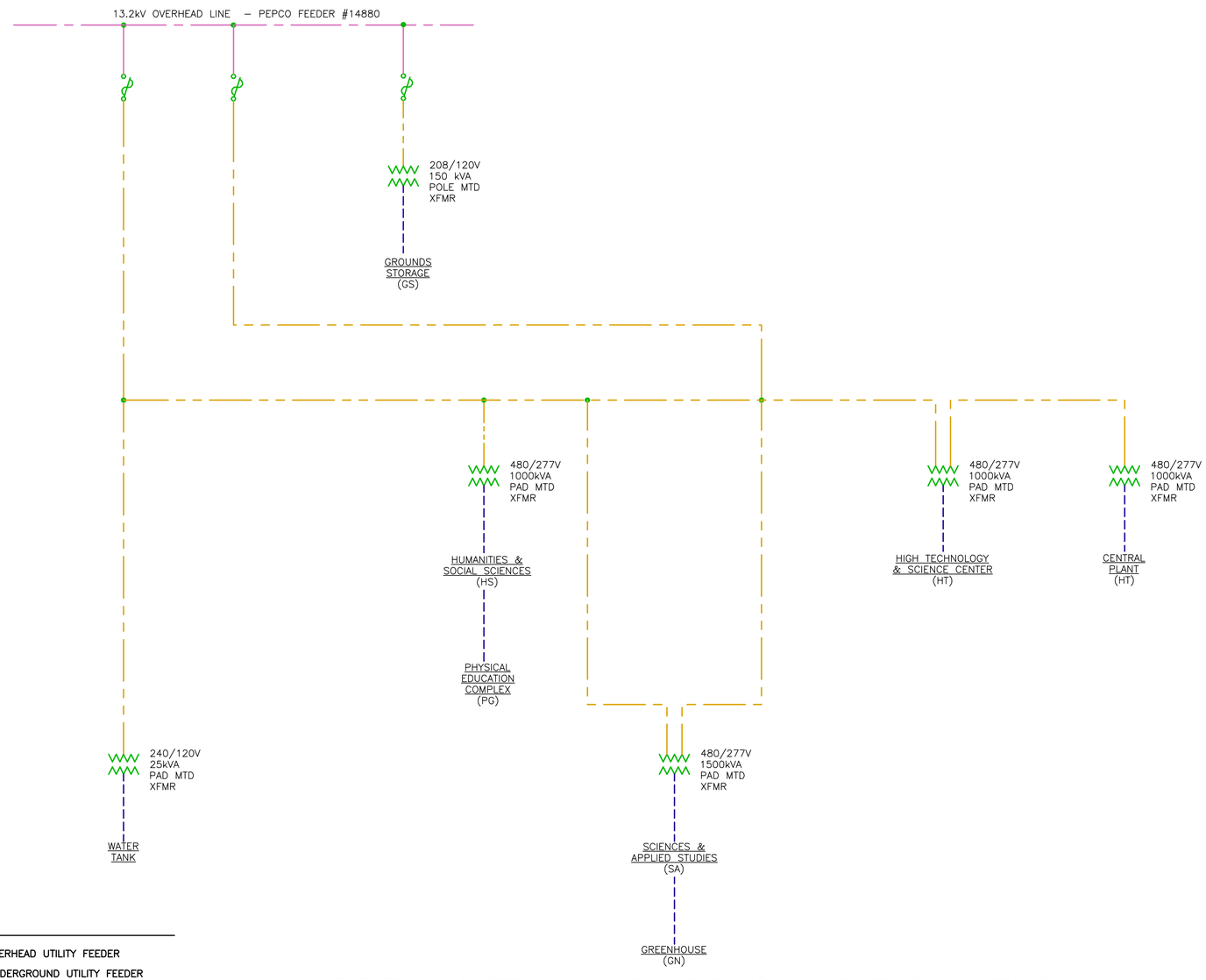
Building Number	Building Code	Building Name	Building Function	Year Built	Year Renovated	Size (GSF)	Pepco Account Number	Rate Schedule	Service Demand (kW)	Service Transformer (kVA)	Service Entrance Voltage	Service Entrance Ampacity	GS Service Entrance Equipment	HS Service Entrance Equipment	Service Entrance Equipment	Service Notes	Power Generation Notes
Existing Utility Conditions (2011)																	
104	HT	High Technology & Science Center	Tech Labs, classrooms, offices, auditorium	1995	-	75,542	2019317318	MGTLV / Daily2	177.3	1000	480/277	1600A			Switchboard	-	400kW diesel generator; shared by HTSC and Central Plant
104	HT	Central Plant	Central Heating and Cooling Plant	1995	-		2024960508	MGTLV / Month2	445.6	1000	480/277	2000A			Switchboard	-	
102	HS	Humanities & Social Science	Classrooms, offices, Library, Bookstore, cafeteria	1978	-	75,700	2034975306	MGTLV Type IIB	411.0	1500	480/277		2000A Swbd	1600A Swbd		PG Bldg fed from 2000A Swbd in Humanities	75kW diesel generator; 24kW solar photovoltaic; 63kW solar thermal
103	PG	Physical Education Center	Gym, pool, classrooms, offices	1983	-	36,770											
TBD	GN	Greenhouse	Greenhouse	1993	-	2,397	2097001917	MGTLV / MMGTL2A	UNK	N/A	N/A	N/A			N/A	Fed from Sciences & Applied Studies Bldg	-
TBD	GS	Storage/Grounds	Grounds equipment repair, carpentry, storage	1980	-	6,055	2002914501	GS / MDND	* N/A	150	208/120	UNK			Panelboard	* GS rate schedule; demand not metered	-
101	SA	Sciences & Applied Studies	Administrative, Labs, Classrooms, Security	1978	Partial,1999	65,146	2097001917	MGTLV / MMGTL2A	319.1	1000	480/277		1200A Swbd	1600A Swbd		-	26kW solar photovoltaic
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	-	450	2034975306	MGTLV Type IIB	N/A	N/A	N/A	N/A			N/A	-	-
TBD	-	Baseball (all structures)	Fields, storage, dugouts, etc.	1999	-	1,004			N/A	N/A	N/A	N/A			N/A	-	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	leased	2007	33,684	2010761977	MGTLV Type IIB	148.8	TBD	TBD	TBD	N/A	N/A	TBD	-	-
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, business incubator	1985		35,142			TBD	TBD	TBD	TBD	N/A	N/A	TBD	-	-
107	CG	Child Care	Child Care	2012	---	5,535	TBD	TBD	22.1	75	120/240	250A			Panelboard	Information on actual transformer and service entrance was not provided at the time of completion of this master plan, values are estimated	-

Montgomery College - Germantown Campus Utility Master Plan Future Facilities Data
Table 6-2 Electrical Service Data
Wiley|Wilson Commission No.: 211130.02

Printed: 2/18/13 10:27 AM
Revised: 2/13/2013

Note: In year built column, the new construction/demolition dates are completion year

Building Number	Building Code	Building Name	Building Function	Year Built/ Proposed Build	Year Renovated/ Demolished	Building Size (GSF)	Pepco Account Number	Rate Schedule	Service Demand (kW)	Service Transformer (kVA)	Service Entrance Voltage	Service Entrance Ampacity	GS Service Entrance Equipment	HS Service Entrance Equipment	Service Entrance Equipment	Service Notes	Power Generation Notes
Future Utility Conditions (Reference 2006 - 2016 Facilities Master Plan Proposed Facilities)																	
104	**HT**	**High Technology & Science Center, Alteration**	**Tech Labs, Classrooms, Offices, Auditorium**	1995	---	**75,542**	2019317318	MGTLV / Dailey2	**177.3**	**1000**	**480/277**	**1600A**			Switchboard	-	400kW Diesel Generator; shared by HTSC and Central Plant
104	HT	Central Plant	Central Heating and Cooling Plant		---		2024960508	MGTLV / Month2	445.6	1000	480/277	2000A			Switchboard	-	
TBD	TS	Tennis/Baseball Storage Sheds (3)	Storage	1991	---	450	2034975306	MGTLV Type IIB	**220.0**	**300**	**480/277**				N/A	**PE Bldg should be discon-nected from service in Humanities and provided with its own service**	75kW Diesel Generator; 24kW Solar Photovoltaic Installed 2000; 63kW Solar Thermal
103	**PG**	**Physical Education Center, Renovation and Addition**	**Gym, Pool Classrooms, Offices**	1978	**---**	**75,700**											
102	**HS**	**Humanities & Social Sciences Building, Renovation**	**Classrooms, Offices, Library, Bookstore, Cafeteria**	1983	**---**	**73,270**	**TBD**	**TBD**	**301.0**	**1500**	**480/277**				**Panelboard**		
TBD	**GN**	**Greenhouse, Demolished**	**-**	-	**---**	**-**	-	**-**	**-**	**-**	**-**	**-**			**-**	Presently fed from SA Bldg service	**-**
TBD	**GN**	**Greenhouse, New**	**Greenhouse**	**TBD**	---	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**	**TBD**			**TBD**	-	-
109	GS	Storage/Grounds	Grounds Equipment Repair, Carpentry, Storage	1980	**---**	6,055	2002914501	GS / MDND	UNK	150	208/120	UNK			Panelboard	Demand Not Metered	**-**
101	**SA**	**Physics, Engineering & Math (Renovated & Addition SA Building)**	**Administrative, Labs, Classrooms, Security**	1978	Partial, 1999	**86,140**	2097001917	MGTLV / MMGTL2A	**430.7**	**1000**	**480/277**				**Switchboard**	**-**	26kW Solar Photovoltaic Installed 1998
TBD	---	Baseball (all structures)	Fields, Storage, Dugouts, etc.	1999	---	1,004	N/A	MGTLV Type IIB	N/A	N/A	N/A	N/A			N/A	-	-
105	GB	Goldenrod Building 1st Floor	Classrooms, Offices, Administrative, Maintenance	Leased	2007	33,684	2010761977	MGTLV Type IIB	148.8	750 (?)	208/120	1600A			Bolted Pressure Switch	-	100kW Cummins Diesel Generator
108	GB	Goldenrod Building 2nd Floor	Subleased to Mont. County, Business Incubator	1985		35,142			TBD			1600A			Bolted Pressure Switch	-	
107	CG	Child Care	Child Care	2012	---	5,535	TBD	TBD	22.1	75	120/240	250A			Panelboard	As built information was not available, values are estimated	-
106	**BE**	**Bioscience Education Center**	**Labs, Classrooms, Offices**	**2014**	**---**	**114,300**	**TBD**	**TBD**	**686.0**	**1000**	**480/277**	**1600A**			**Switchboard**	**-**	30-35kW Solar Photvoltaic Planned
TBD	**BE**	**Satellite Plant**	**Satellite Heating and Cooling Plant**	**2014**	**---**	**12,600**	**TBD**	**TBD**	**1049.0**	**1500**	**480/277**	**2500A**			**Switchboard**	**-**	**-**
TBD	**---**	**Student Services Center**	**Cafeteria, Classrooms, Offices, Heating Plant**	**TBD**	**---**	**120,400**	**TBD**	**TBD**	**482.0**	**500**	**480/277**	**800A**			**Panelboard**	**-**	**-**
TBD	**---**	**Social Science and Art Building**	**Classrooms**	**TBD**	**---**	**65,600**	**TBD**	**TBD**	**394.0**	**500**	**480/277**	**800A**			**Panelboard**	**-**	**-**



LEGEND

- 13.2 kV OVERHEAD UTILITY FEEDER
- 13.2 kV UNDERGROUND UTILITY FEEDER
- 600V OR LOWER UNDERGROUND SERVICE
- 600V OR LOWER OVERHEAD SERVICE
- OVERHEAD OR UNDERGROUND UTILITY FEEDER SWITCH,
- UNDERGROUND UTILITY FEEDER OPEN POINT
- OVERHEAD OR UNDERGROUND UTILITY FEEDER FUSES
- UTILITY FEEDER TAP/CONNECTION POINT
- UTILITY TRANSFORMER (SINGLE LINE)
- UTILITY POLE (SITE PLAN)
- UTILITY PAD–MOUNTED TRANSFORMER, UNLESS OTHERWISE NOTED (SITE PLAN)
- UTILITY POLE–MOUNTED TRANSFORMER (SITE PLAN)
- MANHOLE (SITE PLAN)
- 13.2 KV SWITCHGEAR (SITE PLAN)

ELECTRICAL SYSTEM – SINGLE LINE DIAGRAM – EXISTING CONDITIONS

SCALE: NO SCALE

PEPCO ACCOUNT NUMBERS

BUILDING NUMBER	BUILDING BANNER	BUILDING NAME	PEPCO ACCOUNT NUMBER
101	SA	SCIENCES & APPLIED STUDIES BUILDING	2097001917
TBD	GN	GREENHOUSE	
102	HS	HUMANITIES & SOCIAL SCIENCES BUILDING	2034975306
TBD	TS	TENNIS STORAGE SHED	
TBD	TS	BASEBALL (ALL STRUCTURES)	
103	PG	PHYSICAL EDUCATION COMPLEX	
104	HT	HIGH TECHNOLOGY & SCIENCE CENTER	2019317318
104	HT	CENTRAL PLANT	2024960508
105	GB	GOLDENROD BUILDING 1st FLOOR	2010761977
108	GB	GOLDENROD BUILDING 2nd FLOOR	
109	GS	GROUNDS STORAGE BUILDING	2002914501
TBD	TBD	SOCIAL SCIENCE AND ARTS BUILDING	TBD
TBD	TBD	STUDENT SERVICES CENTER	TBD
TBD	BE	BIOSCIENCE EDUCATION CENTER	TBD
TBD	CG	CHILD CARE	TBD

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Montgomery College endless possibilities

Drawn By: DLS	Ckd By: JTO
Designed By: JTO	Approved By: JTO

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COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

ELECTRICAL SYSTEM
SINGLE LINE DIAGRAM
EXISTING CONDITIONS

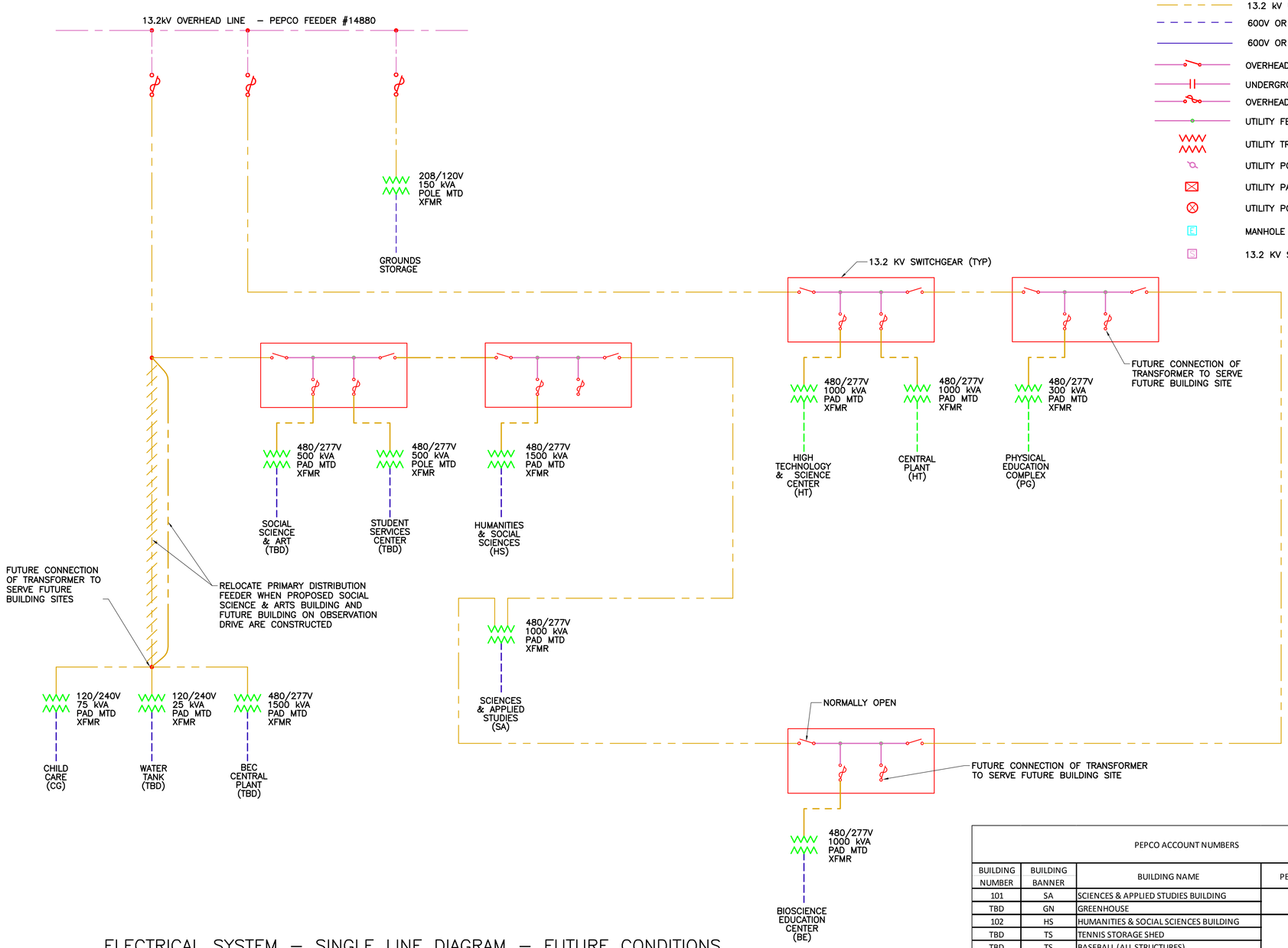
Scale: NO SCALE

Project No.

Date 01–25–13

Drawing Number E–1

MC Facilities No.



LEGEND

- 13.2 kV OVERHEAD UTILITY FEEDER
- 13.2 kV UNDERGROUND UTILITY FEEDER
- 600V OR LOWER UNDERGROUND SERVICE
- 600V OR LOWER OVERHEAD SERVICE
- OVERHEAD OR UNDERGROUND UTILITY FEEDER SWITCH,
- UNDERGROUND UTILITY FEEDER OPEN POINT
- OVERHEAD OR UNDERGROUND UTILITY FEEDER FUSES
- UTILITY FEEDER TAP/CONNECTION POINT
- UTILITY TRANSFORMER (SINGLE LINE)
- UTILITY POLE (SITE PLAN)
- UTILITY PAD–MOUNTED TRANSFORMER, UNLESS OTHERWISE NOTED
- UTILITY POLE–MOUNTED TRANSFORMER (SITE PLAN)
- MANHOLE (SITE PLAN)
- 13.2 KV SWITCHGEAR (SITE PLAN)

ELECTRICAL SYSTEM – SINGLE LINE DIAGRAM – FUTURE CONDITIONS

SCALE: NO SCALE

PEPCO ACCOUNT NUMBERS

BUILDING NUMBER	BUILDING BANNER	BUILDING NAME	PEPCO ACCOUNT NUMBER
101	SA	SCIENCES & APPLIED STUDIES BUILDING	2097001917
TBD	GN	GREENHOUSE	
102	HS	HUMANITIES & SOCIAL SCIENCES BUILDING	2034975306
TBD	TS	TENNIS STORAGE SHED	
TBD	TS	BASEBALL (ALL STRUCTURES)	
103	PG	PHYSICAL EDUCATION COMPLEX	
104	HT	HIGH TECHNOLOGY & SCIENCE CENTER	2019317318
104	HT	CENTRAL PLANT	2024960508
105	GB	GOLDENROD BUILDING 1st FLOOR	2010761977
108	GB	GOLDENROD BUILDING 2nd FLOOR	
109	GS	GROUNDS STORAGE BUILDING	2002914501
TBD	TBD	SOCIAL SCIENCE AND ARTS BUILDING	TBD
TBD	TBD	STUDENT SERVICES CENTER	TBD
TBD	BE	BIOSCIENCE EDUCATION CENTER	TBD
TBD	CG	CHILD CARE	TBD

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Designed By: JTO	Approved By: JTO

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COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

ELECTRICAL SYSTEM
SINGLE LINE DIAGRAM
FUTURE CONDITIONS

Scale: NO SCALE

Project No.

Date 01–25–13

Drawing Number E–2

MC Facilities No.

LEGEND AND ABBREVIATIONS

EXISTING BURIED ELECTRIC — E — E —

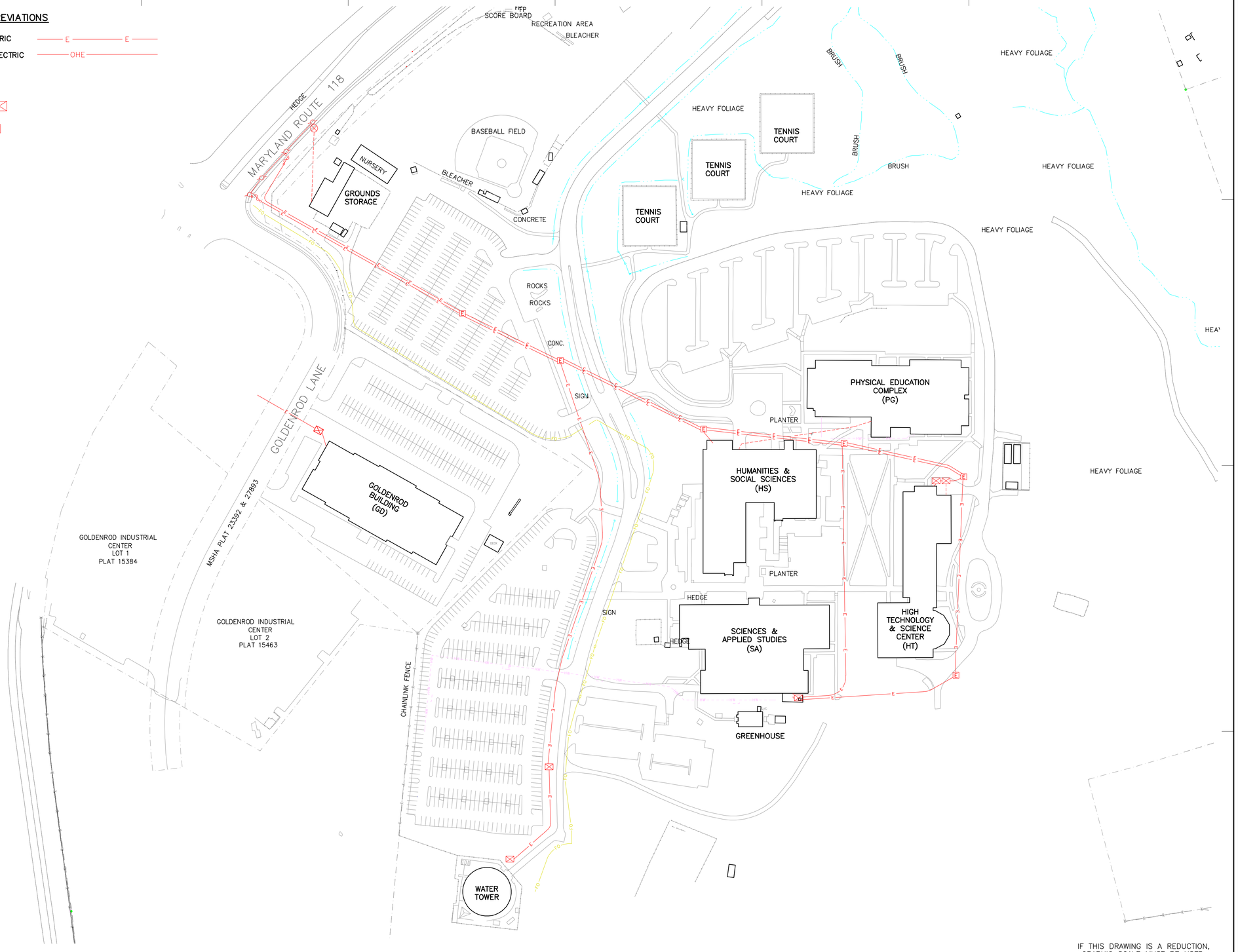
EXISTING OVERHEAD ELECTRIC — OHE —

POWER POLE

LIGHT POLE

UG TRANS. VAULT

ELEC MH OR HANDHOLE (E) [E]



ELECTRICAL SYSTEM – SITE PLAN – EXISTING CONDITIONS

SCALE: 1"=100'

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

100' 0 100'

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COMM. NO. 211130.02

No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title

ELECTRICAL SYSTEM
SITE PLAN
EXISTING CONDITIONS

Scale: 1" = 100'

Project No.

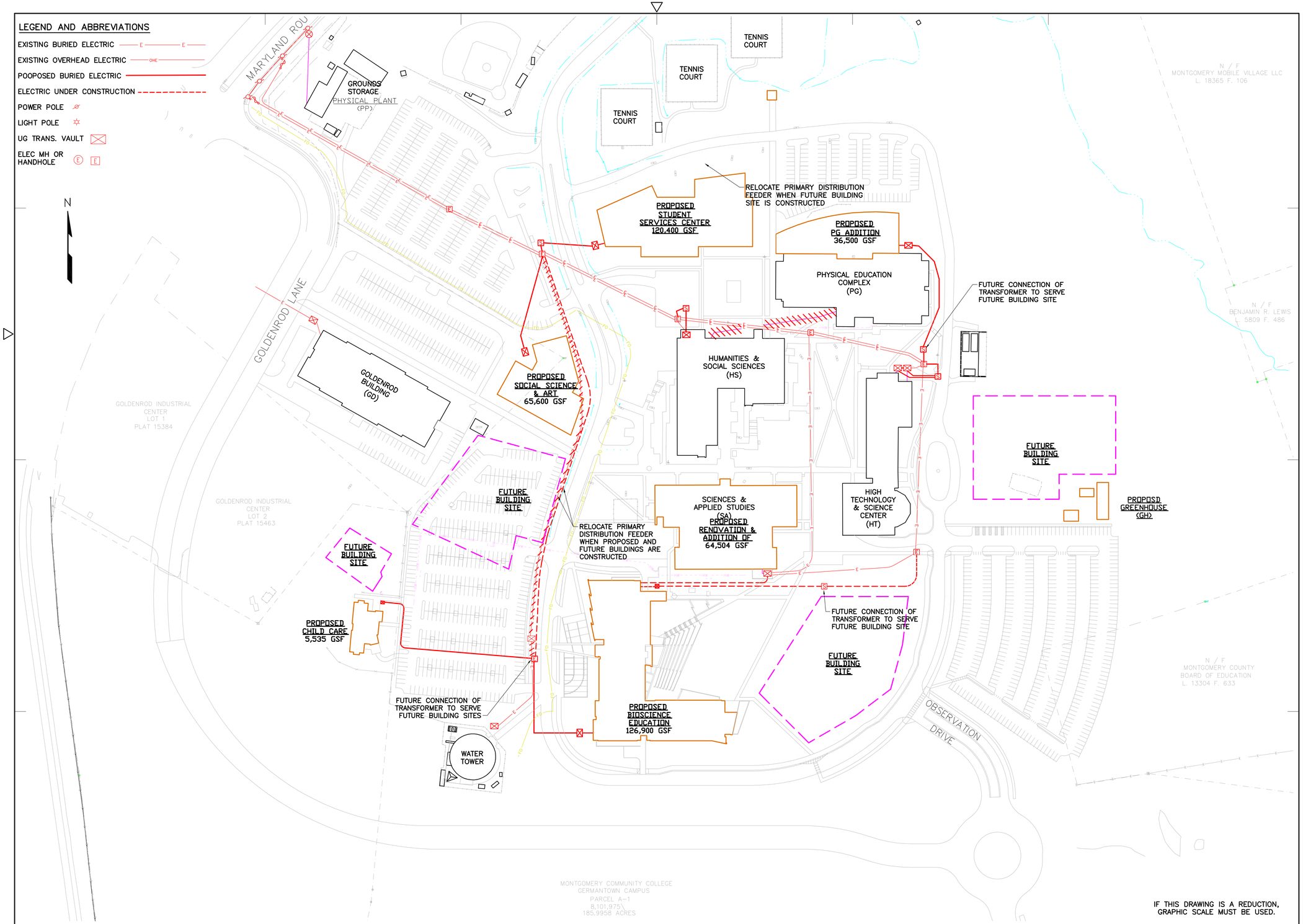
Date 01–25–13

Drawing Number E–3

MC Facilities No.

LEGEND AND ABBREVIATIONS

- EXISTING BURIED ELECTRIC
- EXISTING OVERHEAD ELECTRIC
- POOPOSED BURIED ELECTRIC
- ELECTRIC UNDER CONSTRUCTION
- POWER POLE
- LIGHT POLE
- UG TRANS. VAULT
- ELEC MH OR HANDHOLE



ELECTRICAL SYSTEM – SITE PLAN – FUTURE CONDITIONS

SCALE: 1"=100'

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100' 0 100'

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No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE GERMANTOWN CAMPUS UTILITY MASTER PLAN

Drawing Title

ELECTRICAL SYSTEM – SITE PLAN – FUTURE CONDITIONS

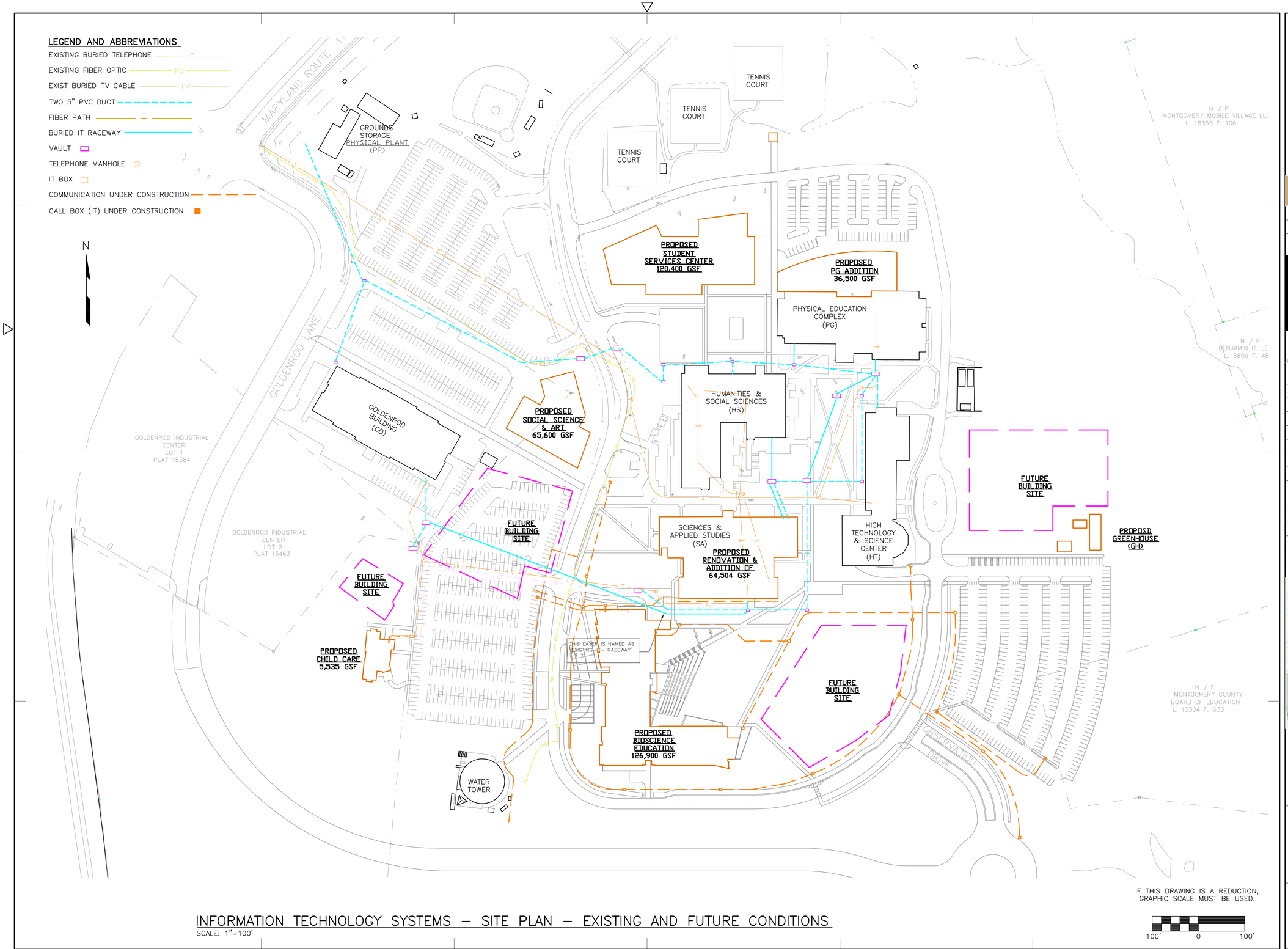
Scale: 1"=100'

Project No.

Date 01–25–13

Drawing Number E–4

MC Facilities No.



INFORMATION TECHNOLOGY SYSTEMS – SITE PLAN – EXISTING AND FUTURE CONDITIONS

SCALE: 1"=100'

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Revisions

Location Map

Project Title

MONTGOMERY COLLEGE
GERMANTOWN CAMPUS
UTILITY MASTER PLAN

Drawing Title INFORMATION TECHNOLOGY SYSTEMS – SITE PLAN – EXISTING AND FUTURE CONDITIONS

Scale: 1"=100'

Project No.

Date 01–25–13

Drawing Number E–5

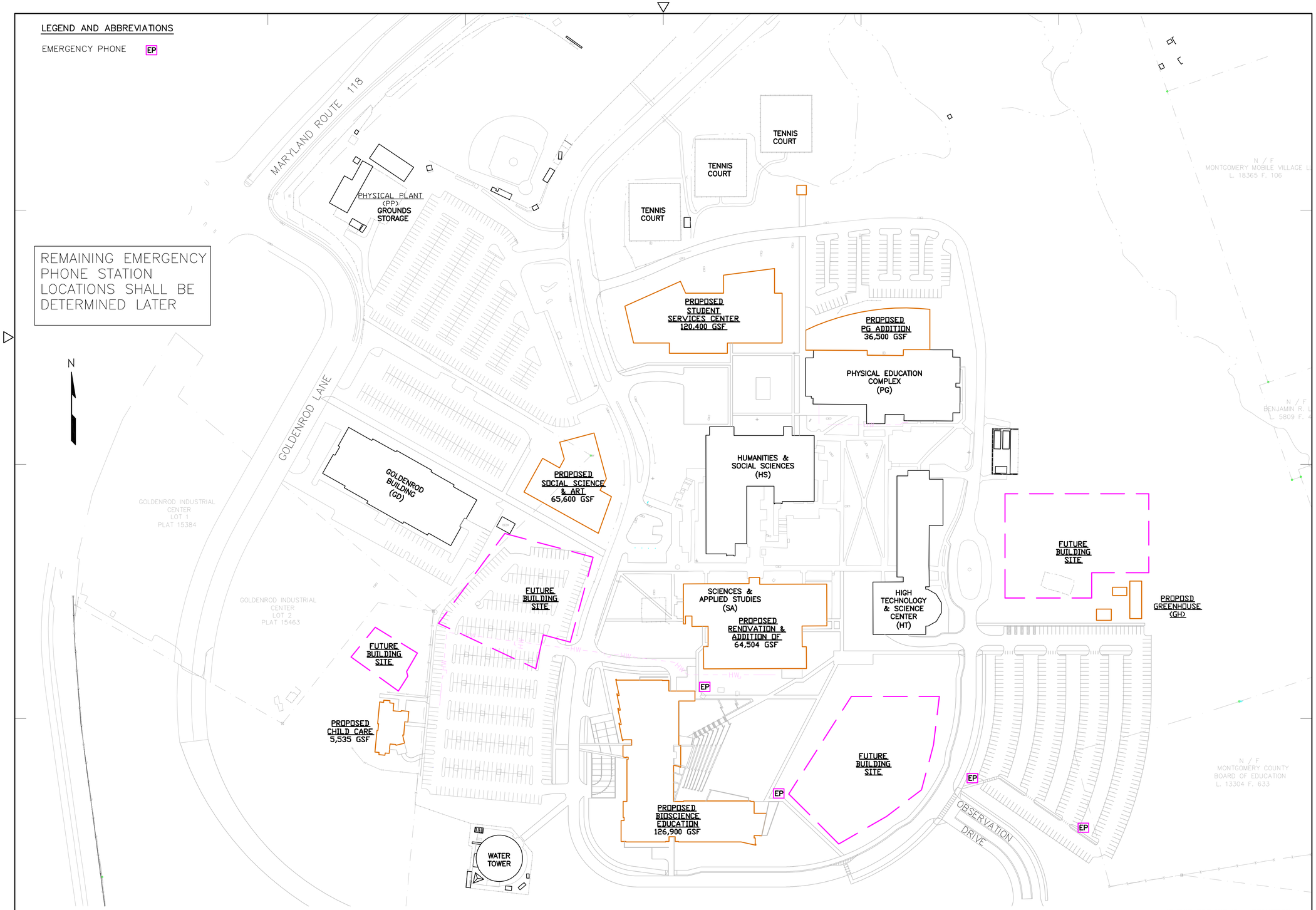
MC Facilities No.

LEGEND AND ABBREVIATIONS

EMERGENCY PHONE EP

REMAINING EMERGENCY PHONE STATION LOCATIONS SHALL BE DETERMINED LATER

N



EXTERIOR EMERGENCY PHONE STATIONS – SITE PLAN – EXISTING CONDITIONS

SCALE: 1"=100'

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100' 0 100'

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No.	Description	Date

Revisions

Location Map

Project Title

MONTGOMERY COLLEGE GERMANTOWN CAMPUS UTILITY MASTER PLAN

Drawing Title

EXTERIOR EMERGENCY PHONE STATIONS – SITE PLAN – FUTURE CONDITIONS

Scale: 1"=100'

Project No.

Date 01–25–13

Drawing Number E–6

MC Facilities No.

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