Chapter 3 - Analysis of Future Needs

This chapter provides an overview of the campus future growth, impact of growth on existing utilities that currently serve the campus, replacement needs due to aging utility infrastructure, and modifications required to the utility system to accommodate proposed new buildings on campus. Information from this chapter was collected from general demand projections, review of proposed building uses, and review of proposed architectural master plan.

Campus Future Growth

The campus is currently slated for growth not only in terms of adding new buildings to its campus but also expanding existing buildings. A total of approximately 370,000 square feet is planned to be added to the campus inventory as part of this Facilities Master Plan. Table 1 provides a summary of the proposed buildings along with their approximate square footages. A campus map showing the proposed facilities that are being added under the Facilities Master Plan is enclosed at the end of the chapter.

TABLE 1 - Proposed Buildings and Square Footages

Building Name	GSF	Proposed Timeline (Years)
Peterson Hall 3 Replacement Building	160,000	3
Liberal Arts Building (Phases 1 and 2)	155,000	5
Parking Structure 3	416,000	5 to 8
Student Recreation Center	120,000	5 to 8
Nursing School Expansion	5,000	5 to 8
Outpost Replacement Building	8,000	
Liberal Arts Complex	155,000	8 to 10
Student Services Complex	70,000	8 to 10
Engineering 3 & 4	80,000	
Corporate Yard Expansion	61,000	10 to 15
Parking Structure 5 (Lot 7)	-	
Parking Structure 4 (Lot 14)	-	
Satellite Dining Facility (Lot 15)	-	

Domestic Water

Table 2 provides an analysis of the proposed buildings and the impact they may cause to the existing Campus Domestic Water system. Some of the proposed buildings are located on top of existing water lines that will need to be relocated, while some are not. Some of the proposed buildings are directly adjacent to existing lines which could potentially provide water services, while some buildings will need additional water lines to connect to the existing Campus water network.

TABLE 2 - Analysis of Proposed Systems' Impact on Domestic Water System

Building / Location	Area (SF)	Description of Impact to Campuswide Utilities
Peterson Hall 3 Replacement Building	160,000	The proposed replacement building for Peterson Hall 3 is located on top of an existing 8-inch line that connects two existing 6-inch lines running north/south on the east and west sides of the Peterson Halls. It also conflicts with several small services that connect the Campus network to each of the buildings that will be demolished. The 8-inch line will need to be rerouted, most likely to the north around the New Science Building. The conflicting individual services to the existing buildings will not need to be replaced, as the proposed building can be served from either of the 6-inch lines to the east and west.
Liberal Arts Building (Phases 1 and 2)	155,000	The proposed replacement building for Peterson Halls 1 & 2 and Faculty Office 5 is located on top of an existing 6-inch main on the west side of the Peterson Halls. The existing 6-inch main will need to be rerouted, most likely to the southwest around the proposed building.
Parking Structure 3	416,000	The proposed Parking Structure 3 is not located on top of any existing water lines. The building could potentially be served by 8-inch line to the south of the building.
Student Recreation Center	120,000	The proposed Recreation Building is not located on top of any existing water lines. The building could potentially be served by 8-inch lines to the north, west and south of the building.
Nursing Building Addition	5,000	The proposed Nursing Building Addition should not interfere with any existing water lines.
Outpost Replacement Building	8,000	The proposed Outpost should not interfere with any existing water lines. The building could potentially be served by adjacent water lines.
Liberal Arts Complex	155,000	The proposed replacement building for Liberal Arts 2, 3 & 4, Instructional Resources, Lecture Hall and Faculty Office 2 conflicts with the existing service connections to the existing 6-inch main, but not the main itself. These connections can be removed with the construction of the proposed building. There is also a drinking fountain located to the east of Instructional Resources that will need to be removed or reconnected during the construction of the proposed building.
Student Services Complex	70,000	The proposed Student Services Complex is not located on top of any existing water lines. The proposed building could potentially be served by a 6-inch line to the south of the building.
Engineering 3 & 4	80,000	The proposed replacement building for Engineering 3 & 4 is in conflict with a 6-inch line to the north and a 6-inch line to the west. Additionally there is a conflict with the 4-inch service line that connects Engineering 2 to the Campus network. The 4-inch and 6-inch lines will need to be relocated to accommodate the proposed building. The relocated 6-inch lines could potentially serve the proposed building.
Corporate Yard Expansion	71,000	The proposed Corporate Yard Expansion should not interfere with any existing water mains, but may interfere with services to buildings in the general vicinity of the Corporate Yard. The proposed building could potentially be served by the adjacent water lines.
Parking Structure 5 (Lot 7)	-	The western edge of the work limit of the proposed Parking Structure conflicts with an existing 6-inch water line. However, the 6-inch water line is undersized and should be replaced with a 10-inch line. The replacement water line can be constructed further to the west of the Parking Structure. There is also an existing fire hydrant in the current Parking Lot that will need to be removed and relocated along East Campus Drive. The extent of the new 10-inch line should cover from the 10-inch line being constructed in East Campus Drive as part of Peterson 1 and 2 and extend to the existing 8-inch water meter on Seventh Street.
Parking Structure 4 (Lot 14)	-	The proposed structure does not interfere with any of the existing water lines.
Satellite Dining Facility (Lot 15)	-	The proposed building is in conflict with a 8-inch line to the south. The 8-inch lines will need to be relocated to accommodate the proposed building. The relocated 6-inch lines could potentially serve the proposed building.

Sanitary Sewer

With the replacement of some existing buildings and the construction of some new buildings, the current student population is expected to increase in the near future, placing additional demands on the existing sanitary sewer system by increasing the potential for additional sewage flow. The additional flow rate can be expressed as gallons per day per square foot, calculated based on the student population and the guidelines for estimated average daily sewer flows. This method yields a net increase in sewage flow for the built out condition. Approximately 111,650 gpd of sewer flow will be added to the campus sewer system. The new buildings and replacement buildings will add approximately 106,000 gpd, while the population density growth (number of students per square foot of building) will add another 5650 gpd. Refer to the Appendix for New and Replacement Buildings Impact calculations.

Standard design criteria for new sewers limit the flow depth to one-half the pipe diameter (i.e. d/D =< 0.50), and require a minimum velocity of 3 feet per second (fps). Velocities of 2 fps or greater are typically considered being self-scouring, meaning that they prevent deposition of solids in the pipes. These flow rates and velocities are desirable minimum standards when analyzing existing sewer systems, as well as when designing new ones.

Psomas performed calculations to determine the present volume of flow and capacity in the existing campus sanitary sewer system. Calculations were also performed to determine the effect of the proposed campus expansions on the sewer system. Based on student population and existing and proposed building square footages, flow rates were calculated for the affected pipes. The additional flow rates can be expressed in gallons per square foot based on the student population and standard guidelines for estimated average daily sewer flows for dormitories or non-dormitory University buildings.

Those sewer lines that will be affected by the construction of new buildings or the renovation of existing buildings were analyzed based on the square footages of the buildings that feed into them. Again, using criteria from the County of Los Angeles, flow rates were calculated based on the existing and proposed square footages to determine whether the existing sewer system has enough capacity to accommodate potential future flows.

Table 1 provides an analysis of the proposed buildings and the impact they will have on the existing Campus sanitary sewer system. Some of the proposed buildings are located on top of existing sewer lines that will need to be relocated, while some are not. Some of the proposed buildings are directly adjacent to existing lines which could potentially provide sewer laterals, while some buildings will need additional sewer lines to connect to the existing Campus sewer network. Some of the sewer lines as detailed in the sewer video report were found to be in poor condition by the sewer video inspection.

TABLE 1 - Analysis of Proposed Systems' Impact on Sanitary Sewer System

Building / Location	Area (SF)	Description of Impact to Campuswide Utilities
Peterson Hall 3 Replacement Building	160,000	The western edge of the proposed replacement building for Peterson Hall 3 and Science Lecture Hall conflicts with the existing 10-inch main to the west of the project. The proposed building also conflicts with the 4-inch and 6-inch lines that serve the existing buildings that will be demolished. The 10-inch line will need to be relocated further to the west to accommodate the proposed building. The proposed building can be served from either the existing 10-inch line to the west or the existing 8-inch line to the east. Based on sewer video, the 10-inch adjacent to the project site is in good condition, but further downstream and further upstream there are large portions of pipe with problems with root intrusion and cracking.
Liberal Arts Building (Phases 1 & 2)	155,000	The western edge of the proposed replacement building for Peterson Halls 1 & 2 and Faculty Office 5 conflicts with the existing 10-inch main near the southwest corner of Peterson Hall 1. The conflicting line will need to be relocated further to the west. The proposed building can be served from either the existing 6-inch line to the south or the relocated 10-inch line to the west. Based on sewer video, the 10-inch line was found to be in good condition, but further downstream and further upstream there are large portions of pipe with problems with root intrusion and cracking. The 6-inch line was found to have several locations with minor to major root intrusion.
Parking Structure 3	416,000	The location of the proposed Parking Structure 3 does not conflict with any existing sanitary sewer mains. There is a 24-inch LACSD main to the west that could provide a sewer service* to the proposed Structure, or 6-inch and 8-inch Campus lines further to the west that could provide service. The 6-inch and 8-inch Campus lines were found to be in good condition based on sewer video.
Student Recreation Center	120,000	The western edge of the proposed Recreation Building conflicts with the existing 24-inch LACSD main to the west of the proposed building. The conflicting line will need to be relocated further to the west or the building's western edge will need to be moved to easterly to avoid the main. The proposed building can be served from either the existing 24-inch main to the west or the 8-inch Campus line to the south.
Nursing Building Addition	5,000	The proposed Nursing Building addition does not conflict with any existing sanitary sewer lines.
Outpost Replacement Building	8,000	The proposed Outpost should not interfere with any existing sanitary sewer lines. The building could potentially be served by adjacent sewer lines.
Liberal Arts Complex	155,000	The proposed replacement building for Liberal Arts 2, 3 & 4, Instructional Resources, Lecture Hall and Faculty Office 2 conflicts with the existing 3-inch main that serves some of the Liberal Arts buildings. The 3-inch service can be removed along with the Liberal Arts buildings in the construction of the proposed building. The proposed building could potentially be served by the 6-inch Campus line to the west of the Liberal Arts buildings. The 6-inch line was found to be in good condition based on sewer video.
Student Services Complex	70,000	The proposed Student Services Complex is not located on top of any existing sewer lines. The proposed building could potentially be served by the 12-inch Campus line to the southwest of the building.
Engineering 3 & 4	80,000	The proposed replacement building for Engineering 3 & 4 is not in conflict with any existing sewer lines. The proposed building could potentially be served by the 6-inch Campus line to the west of the building. The sewer line to the west was found to have some severe cracking near the manhole just west of Engineering 3, as well as several moderate cracks near the southwest corner of Engineering 3.
Corporate Yard Expansion	71,000	The proposed Corporate Yard Expansion should not interfere with any existing sanitary sewer mains, but may interfere with services to buildings in the general vicinity of the Corporate Yard. The proposed building could potentially be served by adjacent sewer lines.
Parking Structure 5 (Lot 7)	-	The proposed structure does not interfere with any of the existing sewer lines.
Parking Structure 4 (Lot 14)	-	The proposed structure does not interfere with any of the existing sewer lines.
Satellite Dining Facility (Lot 15)	-	The proposed building does not interfere with any of the existing sewer lines. The proposed building could potentially be served by a 4" line located on the south side of the proposed facility.

* Obtaining a new connection permit for one of the existing LACSD mains is not recommended, as it is up to the discretion of the County whether they will consider issuing such a permit. Wherever possible, it would be preferable to connect to existing Campus mains that already tie in to one of the County mains.

Storm Drain

Table 1 provides an analysis of the proposed buildings and the impact they may cause to the existing Campus storm drain system. Some of the proposed buildings are located on top of existing sewer lines that will need to be relocated, while some of the proposed buildings are not. Some of the proposed buildings are directly adjacent to existing storm drain lines which could potentially provide storm drain connections, while some buildings will need additional storm drain lines to connect to the existing Campus storm drain network.

The proposed build-out condition has approximately the same hydrology as the existing condition. The new buildings planned for construction are generally replacing either old buildings or parking lots. Consequently the drainage patterns and imperviousness should not be affected dramatically by the improvements.

TABLE 1 - Analysis of Proposed Systems' Impact on Storm Drain System

Building/ Location	Area (SF)	Description of Impact to Campuswide Utilities
Peterson Hall 3 Replacement Building	160,000	The proposed replacement building for Peterson Hall 3 and Science Lecture Hall is located on top of existing 6-inch and 12-inch lines that collect local runoff and tie to the Campus network. The lines and area drains can be removed during the construction of the proposed building. The proposed building could potentially be served by the 12-inch line to the west or the 21-inch line to the east.
Liberal Arts Building (Phases 1 & 2)	155,000	The proposed replacement building for Peterson Halls 1 & 2 and Faculty Office 5 only conflicts with existing local collection lines and area drains that can be removed during construction of the proposed building. The proposed building could potentially be served by the 10-inch line to the south.
Parking Structure 3	416,000	The location of the proposed Parking Structure 3 conflicts with the existing 15-inch line that collects local drainage in the northern third of Parking Lot 11. The 15-inch line will need to be removed and the 10-inch line that collects runoff from the eastern portion of the Lot which is to remain will need to be reconnected to the Campus system via the 12-inch line to the south of the proposed building.
Student Recreation Center	120,000	The proposed Recreation Building conflicts with existing 15-inch local collection lines and area drains in Parking Lot 11 that can be removed during construction of the proposed building. It also interferes with a 4-inch line that collects runoff from the south and ties into the lines in Lot 11. This 4-inch line will need to be relocated. The proposed building could potentially be served by the existing 15-inch line to the southwest.
Nursing Building Addition	5,000	The proposed Nursing Building addition does not conflict with any existing storm drain lines
Outpost Replacement Building	8,000	The proposed Outpost should not interfere with any existing storm drain lines. The building could potentially be served by adjacent storm drain lines.
Liberal Arts Complex	155,000	The proposed replacement building for Liberal Arts 2, 3 & 4, Instructional Resources, Lecture Hall and Faculty Office 2 only conflicts with existing local collection lines and area drains that can be removed during construction of the proposed building. The proposed building could potentially be served by the 10-inch line to the south or the 8-inch line to the west.
Student Services Complex	70,000	The proposed Parking Structure 3 conflicts with a storm drain line that collects some local area drainage and outlets to the Channel. It also conflicts with a sump pump that connects to a 6-inch line that also outlets to the Channel. The area drains and storm drain outlet to the Channel will need to be relocated further to the west of the proposed building as will the sump pump.
Engineering 3 & 4	80,000	The proposed replacement building for Engineering 3 & 4 conflicts with 4-inch, 6-inch and 8-inch storm drain lines that take care of local drainage for the buildings that will be removed as part of the project. The proposed building also conflicts with a 4-inch local drainage line to the east of the building that must be reconnected to the Campus network, either to the 8-inch line to the south or the 6-inch line to the north. The proposed building could potentially be served by the 12-inch line to the west or the 8-inch line to the south.
Corporate Yard Expansion	71,000	The proposed Corporate Yard Expansion should not interfere with any existing storm drain mains, but may interfere with services to buildings in the general vicinity of the Corporate Yard. The proposed building could potentially be served by adjacent storm drain lines.
Parking Structure 5 (Lot 7)	-	The proposed structure conflicts with 18-inch and 12-inch storm drain lines. The same need to be relocated to accomodate the proposed facility.
Parking Structure 4 (Lot 14)	-	The proposed structure does not interfere with any of the existing storm drain lines. However, drainage in parking lot 14 will have to be evaluated as part of the proposed structure project.
Satellite Dining Facility (Lot 15)	-	The proposed building conflicts with 6-inch and 8-inch storm drain lines. The same need to be relocated to accomodate the proposed facility.

Water Quality

In addition to capacity conditions, CSULB must comply with the requirements of the Federal Water Pollution Control Act (Clean Water Act). One requirement of the Clean Water Act, as implemented in Los Angeles County, is compliance with the Standard Urban Stormwater Mitigation Plan (SUSMP). The SUSMP outlines the necessary Best Management Practices (BMPs), which must be incorporated into design plans for projects that meet certain criteria. The list of criteria is extensive and somewhat confusing. In simplified terms, SUSMP applies to the following types of projects at CSULB:

- Residential developments larger than 10 dwelling units (i.e. student housing).
- Commercial developments (defined to include educational facilities) that create more than 100,000 square feet of impermeable area (including roofs, driveways, parking, sidewalks, etc.).
- Redevelopment projects (i.e. remodeling) that make improvements to 50 percent or more of an existing structure are required to implement SUSMP for both the newly developed and the existing areas.
- Parking lots greater than 5,000 square feet or with more than 25 parking spaces.

Additionally, projects having the following characteristics or activities are required to address the applicable sections of the SUSMP:

- Food service
- Equipment repair or maintenance
- Animal confinement, pet care facilities, stables, kennels, etc.
- Hillside location

The primary objectives of SUSMP are to:

- Effectively prohibit non-storm water discharges, and
- Reduce the discharge of pollutants from storm water conveyance systems to the maximum extent practicable.

The Best Management Practices (BMPs) included in SUSMP include, but are not limited to:

- Provide reduced width sidewalks and incorporate a landscape buffer between sidewalks and streets.
- Design streets for minimum required pavement widths.
- Use permeable materials for private sidewalks, driveways, parking lots, or interior roadway surfaces (e.g. hybrid lots, parking groves, permeable overflow parking, etc.).
- Use open space development that incorporates smaller lot sizes (e.g. multi-story construction)
- Reduce overall imperviousness associated with parking lots by providing compact car spaces, minimizing stall dimensions, incorporating efficient parking lanes, and using pervious materials in spillover parking areas.
- Direct rooftop runoff to pervious areas such as yards, open channels, or vegetated areas and avoid routing rooftop runoff to the roadway or the storm water conveyance system.
- Vegetated swales and strips
- Extended/dry detention basins
- Infiltration basins
- Infiltration trenches
- Wet ponds
- Constructed wetlands
- Oil/water separators
- Catch basin and/or storm drain inserts
- Continuous flow deflection/separation systems
- Media filtration
- Bioretention facility
- Dry-wells
- Cisterns
- Foundation planting
- Normal flow storage/separation systems
- Clarifiers
- Filtration systems
- Primary waste water treatment systems

Appendix B from SUSMP contains a detailed description of many of the BMPs mentioned above. A copy of these descriptions is included in the Appendices folder.

BMP features shall be incorporated into existing buildings during remodeling when possible. In some cases is may be feasible to redirect rooftop drains to existing landscape areas. However in many cases it may be too costly or impractical to retrofit existing buildings. The use of catch basin inserts is possible, but maintenance requirements would be substantial. Therefore, use of basins or ponds is considered the most cost effective approach when feasible.

In-fill development on the developed portion of the existing campus is constrained by the lack of space and by the configuration of the existing infrastructure. New buildings shall incorporate BMP features where possible, such as minimizing impermeable areas, the use of cisterns, and directing rooftop runoff to pervious areas.

Irrigation Water

Table 1 provides an analysis of the proposed buildings and the impact they may cause to the existing Campus Irrigation Water system. Because the portion of the Campus north of the Bouton Creek Channel is served by a reclaimed water line in Atherton Street, there are irrigation mains that can interfere with the buildings on that half of the Campus. On the southern half of the Campus, the irrigation lines are served from domestic water lines, so any mains that interfere with buildings are discussed in the domestic water section. Some of the proposed buildings are adjacent to existing irrigation services which could potentially provide irrigation water, while some buildings will need additional irrigation services to connect to the existing Campus water network.

TABLE 1 - Analysis of Proposed Systems' Impact on Irrigation WaterSystem

Building/ Location	Area (SF)	Description of Impact to Campuswide Utilities
Peterson Hall 3 Replacement Building	160,000	The proposed replacement building for Peterson Hall 3, Microbiology and Science Lecture Hall is located on top of several small irrigation water lines that serve the planted areas surrounding the buildings that will be demolished. Future Irrigation water services can be provided from either of the two existing 6-inch water lines that run north/south on the east and west sides of the Peterson Halls.
Liberal Arts Building (Phases 1 & 2)	155,000	The proposed replacement building for Peterson Halls 1 & 2 and Faculty Office 5 does not conflict with any existing irrigation lines, but is located on top of an existing 6-inch water main on the west side of the Peterson Halls. Future Irrigation water services can be provided from either the relocated 6-inch water line on the west side or the 6-inch water line on the east side of the Peterson Halls.
Parking Structure 3	416,000	The proposed Parking Structure 3 does not conflict with any existing irrigation or domestic water lines. Future Irrigation water services can be provided from either the 6-inch reclaimed water line to the north or the 4-inch reclaimed water line to the west.
Student Recreation Center	120,000	The proposed Recreation Building does not conflict with any existing irrigation or domestic water lines. Future Irrigation water services can be provided from the 6-inch reclaimed water line to the west.
Nursing Building Addition	5,000	The proposed Nursing Building addition does not conflict with any existing irrigation lines.
Outpost Replacement Building	8,000	The proposed Outpost should not interfere with any existing irrigation lines. The building could potentially be served by adjacent water lines.
Liberal Arts Complex	155,000	The proposed replacement building for Liberal Arts 2, 3 & 4, Instructional Resources, Lecture Hall and Faculty Office 2 does not conflict with any existing irrigation water lines, but it is located on top of an existing 3-inch water main on running through Liberal Arts 4. There are several irrigation water valves located around the site of the proposed building that could be used to provide irrigation water, otherwise it could potentially come from the 6-inch domestic water line to the west.
Student Services Complex	70,000	The proposed Student Services Complex is not located on top of any existing irrigation water lines. The Structure could potentially be served by a 6-inch domestic water line to the south of the building.
Engineering 3 & 4	80,000	The proposed replacement building for Engineering 3 & 4 does not conflict with any reclaimed water lines. There are several irrigation water valves surrounding the location of the proposed building that could potentially provide irrigation service, otherwise it could potentially come from the 6-inch domestic water line to the north and west.
Corporate Yard Expansion	71,000	The proposed Corporate Yard Expansion should not interfere with any existing irrigation mains, but may interfere with local irrigation services in the general vicinity of the Corporate Yard. The proposed building could potentially be served by the adjacent water lines or reclaimed water lines.
Parking Structure 5 (Lot 7)	-	Refer to Table 2 in the domestic water section for recommendations.
Parking Structure 4 (Lot 14)	-	Refer to Table 2 in the domestic water section for recommendations.
Satellite Dining Facility (Lot 15)	-	Refer to Table 2 in the domestic water section for recommendations.

Chilled and Heating Hot Water Systems

The following is an analysis of the proposed buildings and the impact they cause to the existing central heating and cooling system.

Peterson Hall #3 Replacement:

Currently Peterson Hall 3, Bldg 39, has heating and ventilation only. The proposed replacement for this building will also encompass buildings 40, 42 and 43. Of these buildings 40 and 42 have heat from the central plant and building 40 the Science Lecture Hall has local DX cooling. The replacement building now in design will have Chilled Water (CHW) and Heating Hot Water (HHW) supplied from the Central Plant. The estimated load on the central plant for this building is 540 tons of cooling and 6,400 MBH of heating. This is a diversified load for the whole building that is based on the campus trends we have seen on similar buildings. Since none of the existing buildings currently use Central Plant CHW, the net affect to the Central Plant is about 540 tons. The Heating system on the existing buildings uses about 3,030 mbh, so the net increase in heating load is 3,370 mbh.

Liberal Arts Building (Phase 1 & 2):

Currently Peterson Halls 1 and 2, Bldgs 37 and 38, have heating and ventilation only. The Liberal Arts Building on this site will also encompass building 45. Building 45, the Faculty Office 5 building has central plant hot water and local DX cooling. The proposed building will have Chilled Water (CHW) and Heating Hot Water (HHW) supplied from the Central Plant. The estimated load on the central plant for this building is 300 tons of cooling and 5,900 MBH of heating. This is a diversified load for the whole building that is based on the campus trends we have seen on similar buildings. Since none of the buildings currently use Central Plant CHW, the net affect to the Central Plant is the whole 300 tons. The Heating system on the existing buildings uses about 5,700 mbh, so the net increase in heating load is only 200 mbh.

Nursing Building Addition:

The proposed Nursing Building Addition will add 5000 square feet to the existing building. The estimated loads for this building is 17 tons of cooling and 150 mbh of heating.

Student Recreation Center:

The proposed Recreation Building is a completely new building. The estimated loads for this building are 436 tons of cooling and 3,600 mbh of heating.

Liberal Arts Complex:

Currently Liberal Arts 2, 3, and 4 , Bldgs 13, 12 and 11, have heating and ventilation only. This is also true for Faculty Office 2, the Lecture Hall and the KKJZ buildings, numbers 16, 17 and 18 respectively, although building 18 does have local DX cooling. The proposed complex will have Chilled Water (CHW) and Heating Hot Water (HHW) supplied from the Central Plant. The estimated load on the central plant for this building is 120 tons of cooling and 2,400 MBH of heating. This is a diversified load for the whole building that is based on the campus trends we have seen on similar buildings. Since none of the buildings currently use Central Plant CHW, the net affect to the Central Plant is the whole 120 tons. The Heating system on the existing buildings uses about 1,700 mbh, so the net increase in heating load is about 700 mbh.

Student Services Complex:

The proposed Brotman Hall Expansion is a new building. The estimated loads for this building are 175 tons of cooling and 2,100 mbh of heating.

Engineering 3 and 4 Replacement:

Currently Engineering 3 and 4, Bldgs 52 and 53, have heating and ventilation only. The proposed replacement building will have Chilled Water (CHW) and Heating Hot Water (HHW) supplied from the Central Plant. The estimated load on the central plant for this building is about 175 tons of cooling and 2,600 MBH of heating. This is a diversified load for the whole building that is based on the campus trends we have seen on similar buildings. Since none of the existing buildings currently use Central Plant CHW, the net affect to the Central Plant is the whole 1750 tons. The Heating system on the existing buildings uses about 680 mbh, so the net increase in heating load is only 200 mbh.

University Music Center

This existing cluster of buildings is planned to be connected to the Central Plant heating and cooling systems. This would add 120 tons cooling and 900 mbh of heating load to the Central Plant.

Table 1 details the cooling and heating loads for the referenced buildings. With a few notable exceptions, only those buildings that connect to the central plant are shown.

Distribution System

An analysis of the three loops serving the campus is shown below. A computer model of the distribution loops was generated to analyze the flow and estimate the pressure drops.

West Loop

No construction will occur in the West loop during phase 1; therefore pumping loads will remain unchanged.

During phase 2, construction of the Nursing Building Addition will be completed. The expansion will be connected to the central plant through the connection to the existing building (3” HHW pipe and 3” CHW pipe). Phase 2 construction will add approximately 8 gpm to the HHW secondary pumping load and 22 gpm to the CHW secondary pumping load. The current pumps should be evaluated at each phase for compatibility with flow requirements.

The Student Services Complex will be added to the central plant during phase 3. The building will be connected at WVP 3 using 3” HHW pipe and 4” CHW pipe. Phase 3 construction will add approximately 105gpm and 34ft of head to the HHW secondary pumping load and 233gpm and 5ft of head to the CHW secondary pumping load.

South Loop

In phase 1, the Peterson Hall 3 project will likely be connected to the central plant at the Microbiology utility pit. The HHW will require 4” pipe, and the CHW will require 8” pipe. The new load will increase the HHW secondary pumping by 100gpm and 5ft of head, and increase the CHW secondary pumping by 711gpm and 5ft of head.

The replacement of Peterson Halls 1 & 2 will occur during phase 2. The new building will be connected to the central plant at south valve pit number 14 (SVP 14) with 4” HHW pipe and 6” CHW pipe. The existing valve pit tee, which currently serves building 15, will have to be modified to accommodate the new connection. Phase 2 construction will add approximately 77gpm and 10ft of head to the HHW secondary pumping load, and 390gpm and 16ft of

Buildings			Central Plant Service Loop		Cooling				Heating				Remarks	Conditioned Area (ft^2)
#	Symbol	Name / Description		Cooling Heating	Calc'd (Tons)	Installed (Tons)	CP Load (Tons)	H_2O FLOW (GPM)	Calc (MBH)	Inst (MBH)	CP load (MBH)	H_2O Flow (GPM)		
1	BH	Brotman Hall	West	C H	301	360	231	433	2,726	4,184	1,854	93		107,200
2	SHS	Student Health Center	West	C H	63	100	0	91	649	1,059	441	22		19,522
3	NUR	Nursing	West	C H	49	50	38	71	466	445	317	16	HVAC renovated in 1993	12,347
5	FCS	Family & Consumer Sciences	West	C H	109	122	84	157	1,034	1,300	703	35	HVAC renovated in 1993	34,970
6	USU	University Student Union	West	C H	452		346	540	7,480		5,086	216	Updated Jan, 06	161,300
9	PSY	Psychology	South	C H	158	120 + 25	121	209	2,200		1,496	FO3	HHW from FO3	48,912
10	LA 5	Liberal Arts - 5	South	C H	105		80	FO3	1,163		791	FO3	CHW/HHW from FO3	36,000
11	LA 4	Liberal Arts - 4	South	N	---	---	0	0	676		0	--	Phase 3 Renovation	1,058
12	LA 3	Liberal Arts - 3	South	N	---	---	0	0	726	4,150	0	--	Phase 3 Renovation	12,165
13	LA 2	Liberal Arts - 2	South	N	---	---	0	0	667		0	--	Phase 3 Renovation	10,520
14	LA 1	Liberal Arts - 1	South	C H	88	---	67	116	831	1,675	565	26		18,400
15	FO3	Faculty Office 3	South	C H	68	198	52	228	558	4,640	379	123		19,833
16	FO2	Faculty Office 2	South	N	24	---	0	0	298		0	--	Phase 3 Renovation	4,000
17	LH	Lecture Halls 150-151	South	N	22	22	0	0	178	250	0	--	Phase 3 Renovation	5,592
19	LIB	Library	South	C H	305	760	234	685	2,531		1,721	84	New Chillers	130,349
20	AC	Academic Center	South	C H	190		146	LIB	1,534	4,350	1,043	50	CHW from LIB W	71,350
21	MMC	Multi-Media Center	South	C H	24		18	LIB	207		141	LIB W	CHW/HHW from LIB W	5,155
22	ED1	Education 1	South	C H	73	130	56	96	627	803	426	21		19,699
23	ED2	Education 2	South	C H	71		54	94	1,000	1,008	680	31		12,400
24	MHB	McIntosh Humanities Building	South	C H	75	---	57	99	698		475	24		18,000
25	LAB	Language Arts	South	C H	46	60	35	61	522	1,725	355	16		15,296
26	TA	Studio Theatre	South	C H	111	200	85	289	1,334		907	120		32,100
27	UT	University Theatre	South	C H	68		52	TA	884	8,184	601	TA	CHW/HHW from TA	13,900
28	UTC	University Telecommunications	South	C H	40		31	TA	1,600		1,088	TA	CHW/HHW from TA	11,000
32	FA1	Fine Arts 1	South	C H	53		41	70	689	2,112	469	75		9,000
33	FA2	Fine Arts 2	South	H	50	0	0	0	598		407	FA1	HHW from FA1	10,500
34	FA3	Fine Arts 3	South	H	---	---	0	0	683		464	FA1	HHW from FA1	18,410
35	FA4	Fine Arts 4	South	H	---	---	0	0	1,410	1,674	959	44		37,286
37	PH1	Peterson Hall 1	South	N	192		0	0	2,160		0	--	Phase 1 Renovation	43,662
38	PH2	Peterson Hall 2	South	N	193		0	0	2,161	4,030	0	--	Phase 2 Renovation	53,781
39	PH3	Peterson Hall 3	South	N	178		0	0	1,854	4,184	0	--	Phase 2 Renovation	69,744
40	SLH	Science Lecture Hall	South	N	6		0	0			0	--	Phase 1 Renovation	1,832
41	MIC	Microbiology	South	C H	304	320	233	401	3,043	3,347	2,069	96	24 Hr Operation	34,279
42	AH	Animal House	South	N	14	15	0		150		0	--	Phase 1 Renovation	

Buildings			Central Plant Service Loop	Cooling Heating	Cooling				Heating				Remarks	
#	Symbol	Name / Description			Calc'd (Tons)	Installed (Tons)	CP Load (Tons)	H_2O FLOW (Tons)	Calc (MBH)	Inst (MBH)	CP load (MBH)	H_2O Flow (GPM)		
50	EN1	Engineering 1	North	C H	193	300	148	363	1,596	4,020	1,085	55	HVAC renovated in 1992	53,524
51	EN2	Engineering 2	North	C H	59		45	EN1	588	2,144	400	EN4	CHW from EN1	16,616
52	EN3	Engineering 3	North	N	---	---	0	0	510		0	--	Phase 3 Renovation	27,057
53	EN4	Engineering 4	North	N	---	---	0	90	509		0	--	Phase 3 Renovation	15,516
54	TE1	Design	North	C H	65		50	173	1,980	2,790	1,346	96		20,328
55	TE2	Human Services & Design	North	C H	55	130	42	TE1	809		550	TE1	CHW/HHW fromTE1	20,240
56	IT	Engineering Technology	North	C H	100	100	77	144	968	2,000	658	33		37,248
57	FM	Facilities Management	North	N	13	15	0	0	120	122	0	--	Not feasible	
72	DC/CPAC	Performing Arts Center	North	N	260	260	0	0	1,361	1,261	0	--	Not proposed to be connected	
73	PYR	Pyramid Sports Arena	North	C	524	780	402	630	2,880	3,200	0	--	Completed	
81	PA	Pyramid Annex	North	C H	62	49	47	65	780	300	531	30	Completed 2004 or 05	19,510
83	ECS	Engineering/Computer Science	North	C H	350	329	268	504	2,990	1,216	2,033	103	Includes (2) 862 Ton-Hrs TES tanks	65,909
84	HC	Horn Center	North	C	131	174	100	189	830		0	--	Electric Reheat	43,432
85	CBA	College of Business	N/A	N	---	238	0		1,663	614	0	--	Water Source Heat Pumps	58,072
86	CP	Central Plant	CP	C	47	47	36	48			0	--		34,825
94	MLSC	Molecular & Life Science	South	C H	327	691	250	436	1,200	840	816	42	Updated Jan, 06	93,159
F1.5	SSA2	Student Services Complex	West	C H	175	0	175	233	2,800		2,100		Phase 3 Future Bldg due between 2014 and 2016	70,000
F12	0	Liberal Arts Complex	South	C H	310	0	310	413	6,200		4,650		Phase 3 Future Bldg due between 2014 and 2016	155,000
F3.5	NUR2	Nursing School Expansion	West	C H	17	0	17	22	200		150		Phase 2 Future Bldg due between 2011 and 2014	5,000
F37.5	PH1	Peterson Halls 1 & 2	South	C H	292	0	292	390	5,849		4,387		Phase 2 Future Bldg due between 2011 and 2014	146,222
F39	PH3	Peterson Hall 3	South	C H	533	0	533	711	6,400		4,800		Phase 1 Future Bldg due around 2009	160,000
F52	EN5?	Engineering 3 & 4 Replacement	North	C H	160	0	160	80	2,400		1,800		Phase 3 Future Bldg due between 2014 and 2016	80,000
F71	UMC	University Music Center	North	C H	129	120	103	170	1,190	1,304	893		Phase 1 planned connection of (E) bldg to CP	
F93	RCB	Student Recreation Center	North	C H	436	0	436	582	4,800		3,600		Phase 2 Future Bldg due between 2011 and 2014	120,000
					7,615		5,827	9,397	101,336		59,633			
		# of buildings with HHW	44											
		# of buildings with CHW	44											

head to the CHW secondary pumping load.

The Liberal Arts Complex will be added to the central plant in phase 3. The building(s) will be served by two different connections at SVP 11 and 12. Both connections will require 3" HHW pipe, 3" CHW pipe, and modifications to existing valve pits tees. Phase 3 construction will increase the HHW secondary pumping load by 7gpm and 6ft of head, and increase the CHW secondary pumping load by 160gpm and 13ft of head.

North Loop

During phase 1, the University Music Center, B-71, will be connected to the central plant at north valve pit number nine (NVP 9). The HHW connection will be with 3" pipe, and the CHW will be with 4" pipe. The addition of B71 will increase the HHW secondary pumping load by approximately 45gpm and 2ft of head, and increase the CHW secondary pumping load by 170gpm and 2ft of head.

Phase 2 will witness the addition of the Student Recreation Building, B-93. The connection to the central plant will be located between valve pits 5 and 9 with 4" HHW pipe and 6" CHW pipe. The Recreation building will add 180gpm and 15ft of head to the HHW secondary pumping load, and 582gpm and 7ft of head to the CHW secondary pumping load.

The proposed renovation of Engineering 3 & 4 would occur in phase 3. The project will utilize the existing 3" HHW and CHW connections at NVP 6. Secondary pumping requirements will be increased by 45gpm and 20ft of head for HHW and 86gpm and 1ft of head for CHW.

The following table summarizes the flows and velocities in the distribution loops with the new buildings added.

Central Plant Capacity

The affects of the new buildings are shown in the chart below.

During the second phase of construction, an additional 10,800 mbh of heating is shown added to the system. Since the existing boilers are operating between 87 and 88% efficiency, they are generating greater than the scheduled 5,000 mbh (5 million btuh) of heat. Approximately 400 mbh of heat is extracted from the total 6,250 mbh of input heat than is shown on the equipment schedules.

Note that the current cooling capacity is very close to the current load. An usually hot humid week would require that the electric chillers run during peak times to maintain cooling setpoints. To avoid the significant electrical charges of running the chillers during peak electrical demand, an additional 10,000 ton-hrs of cooling is shown added to the system during 2008.

Valvepit	CHW			HHW		
	Pipe Ø (in)	Flow (gpm)	Velocity (ft/s)	Pipe Ø (in)	Flow (gpm)	Velocity (ft/s)
WVP 1	10	1640	6.8	6	609	6.2
WVP 2	10	1173	4.9	4	365	8.1
WVP 3	10	1173	4.9	4	365	8.1
WVP 4	10	940	3.9	4	275	6.1
WVP 5	6	565	6.2	4	186	4.1
WVP 6	3	91	3.6	3	34	1.2
WVP 7	6	429	4.7	4	152	3.4
WVP 8	4	71	1.7	3	15	0.5
Source	14	3580	8.8	8	1308	7.5
SVP 1	12	2087	6.2	6	657	6.7
Main Line	12	1858	5.5	6	618	6.3
MIC ULT	10	1042	4.3	4	339	7.6
SVP 2	8	816	5.3	4	279	6.2
SVP 3	4	190	4.5	4	150	3.3
SVP 4	4	190	4.5	4	104	2.3
SVP 5	3	132	5.2	4	40	0.9
SVP 6	6	626	6.8	4	129	2.9
SVP 7	6	388	4.2	4	65	1.5
SVP 8	6	292	3.2	4	98	2.2
SVP 9	6	388	4.2	3	50	1.7
SVP 10	6	685	7.5	4	187	4.2
SVP 11	8	663	4.3	4	259	5.8
SVP 12	8	743	4.8	6	304	3.1
SVP 13	8	915	5.9	6	304	3.1
SVP 14	8	1493	9.6	6	651	6.6
NVP 1	14	3118	7.6	8	925	5.3
NVP 2	6	415	4.5	4	153	3.4
NVP 3	12	2703	8.0	8	772	4.4
NVP 4	12	2485	7.3	6	528	5.4
NVP 5	12	2353	6.9	6	528	5.4
NVP 6	8	906	5.8	4	278	6.2
NVP 7	8	820	5.3	4	181	4.0
NVP 8	6	355	3.9	4	84	1.9
NVP 9	10	865	3.6	4	70	1.6

HHW	Total gpm	West Loop Secondary Pump		South Loop Secondary Pump		North Loop Secondary Pump	
		gpm	head (ft)	gpm	head (ft)	gpm	head (ft)
Scheduled		380	182	1,123	186	670	180
Existing	2,182	403	67	1,124	150	655	93
Phase 1	2,327	403	67	1,224	155	700	94
Phase 2	2,674	493	153	1,301	165	880	110
Phase 3	2,831	598	187	1,308	171	925	130
Installed Pumps		Paco LF-3015-5 40HP		Paco LF-5015-7 100HP		Paco LF-4015-7 60HP	

CHW	Total gpm	West Loop Secondary Pump		South Loop Secondary Pump		North Loop Secondary Pump	
		gpm	head (ft)	gpm	head (ft)	gpm	head (ft)
Scheduled		1,000	120	1,930	213	1,900	202
Existing	5,739	1,140	56	2,319	99	2,280	100
Phase 1	6,620	1,140	56	3,030	104	2,450	102
Phase 2	7,859	1,407	86	3,420	121	3,032	109
Phase 3	8,338	1,640	91	3,580	133	3,118	110
Installed Pumps		Paco LF-5012-3 50HP		Paco LF-6015-7 150HP		Paco LF-6015-7 150HP	

Central Plant Heating Capacity and Use

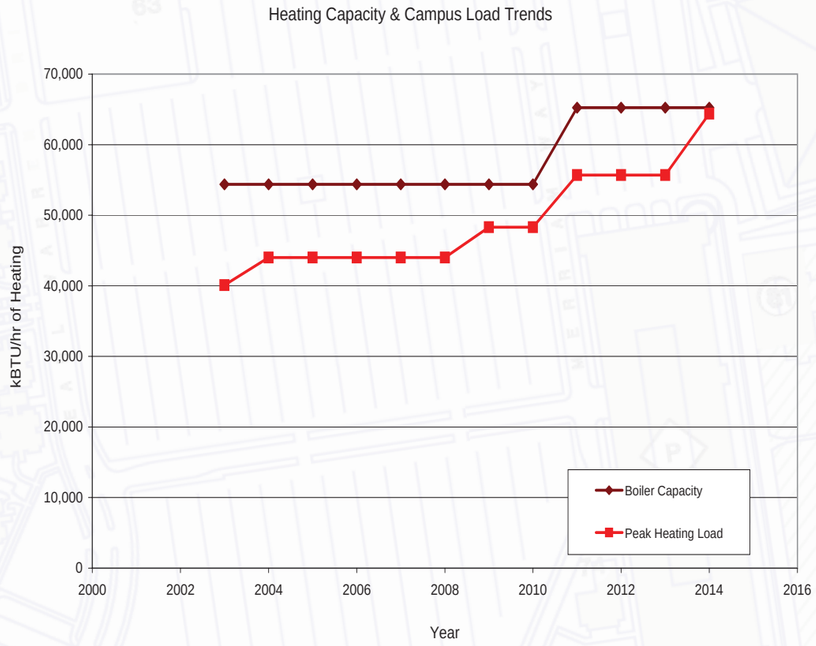
Year	Boiler Capacity kBTU/hr	Peak Heating Load kBTU/hr	North Loop GPM	South Loop GPM	West Loop GPM
2002	54,375				
2003	54,375	40,100			
2004	54,375	44,000	655	1,124	403
2005	54,375	44,000	655	1,124	403
2006	54,375	44,000	655	1,124	403
2007	54,375	44,000	655	1,124	403
2008	54,375	44,000	655	1,124	403
2009	54,375	48,300	688	1,224	403
2010	54,375	48,300	688	1,224	403
2011	65,250	53,500	791	1,386	407
2012	65,250	53,500	791	1,386	407
2013	65,250	53,500	791	1,386	407
2014	65,250	62,200	842	1,519	467

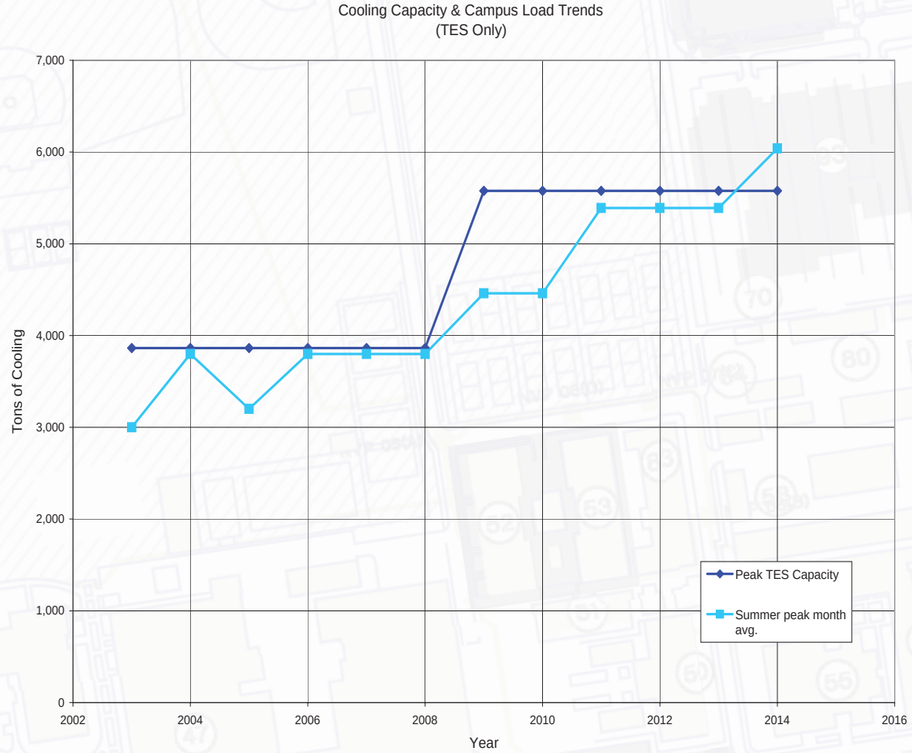
Cooling Capacity and Use

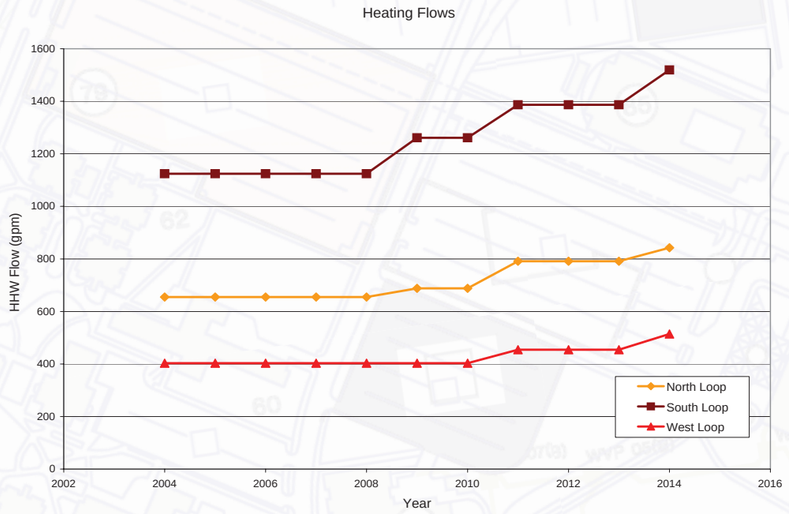
Year	Chiller Cooling Capacity Tons	Peak TES only Capacity Tons	Peak cooling w/ TES Tons	Peak Cooling Load Tons	Summer peak month avg.Tons	North Loop GPM	South Loop GPM	West Loop GPM	Thermal Energy Storage	
									TES daily capacity ton-hrs	11-6 daily load avg. summer peak ton-hrs
2002	4,900	3,864	8,764	3,033	1,637				20,284	13,204
2003	4,900	3,864	8,764	3,000	2,071				20,284	16,424
2004	4,900	3,864	8,764	3,800	1,821	2280	2319	1140	20,284	14,674
2005	4,900	3,864	8,764	3,200	1,862	2280	2319	1140	20,284	15,024
2006	4,900	3,864	8,764	3,800	1,900	2280	2319	1140		
2007	4,900	3,864	8,764	3,800	1,900	2280	2319	1140		
2008	4,900	3,864	8,764	3,800	1,900	2280	2319	1140		
2009	4,900	5,578	10,478	4,460	2,230	2450	3030	1140		
2010	4,900	5,578	10,478	4,460	2,230	2450	3030	1140		
2011	4,900	5,578	10,478	5,210	2,610	3032	3420	1407		
2012	4,900	5,578	10,478	5,210	2,610	3032	3420	1407		
2013	4,900	5,578	10,478	5,210	2,610	3032	3420	1407		
2014	4,900	5,578	10,478	5,860	2,930	3118	3580	1640		

Notes:

Through 2005 average summer loads on based on a full month of load data from the TES tanks and assuming the 1724 ton-hrs in the ECS building are completely used. Rebuild is based on a full 38,000 ton-hr rebuild over the weekend and 12 hours of rebuild for Monday thru Thursday night.


Heating Capacity & Campus Load Trends
kBTU/hr of Heating
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
Year
Boiler Capacity
Peak Heating Load


Cooling Capacity & Campus Load Trends
(TES Only)
Tons of Cooling
7,000
6,000
5,000
4,000
3,000
2,000
1,000
0
2002
2004
2006
2008
2010
2012
2014
2016
Year
Peak TES Capacity
Summer peak month avg.


Heating Flows
HHW Flow (gpm)
1600
1400
1200
1000
800
600
400
200
0
2002
2004
2006
2008
2010
2012
2014
2016
Year
North Loop
South Loop
West Loop

Natural Gas System

The following is an analysis of the proposed buildings and the impact they cause to the existing systems.

Future Natural Gas Distribution

Within the next ten to fifteen years, the University plans to have eight building expansions/additions, three building replacements, one new building, and a new parking structure. The table below provides a summary of the proposed new buildings.

The new Parking Structure #3 will not affect future natural gas loads due to no natural gas demand. Similar to the existing buildings, the natural gas load was estimated based on the domestic hot water demand using the instantaneous method. The domestic hot water demand was calculated by determining the amount of fixture units based on the number of occupants in the building. The table below shows the estimated future building natural gas load.

Natural Gas Pipe Expansion

Natural gas piping expansion will be required for the new 120,000 square-feet Student Recreation Center that is planned for construction within five to eight years. The natural gas load for this proposed building is approximately 4,000 CFH shown the following table. The accompanying figure shows the location of the piping expansion and pipe routing for the new Recreation Center. The existing 4-inch line adjacent to the Corporation Yard should be extended approximately 400 ft to the location of the new Recreation Center and have a 2-inch branch to serve the proposed building.

The other natural gas piping expansion is for the Liberal Arts 2, 3, 4 (Buildings 11, 12, and 13, respectively) and the Faculty Office 2 Building (Building 16). The expansion for these buildings are planned for construction within eight to ten years. The natural gas load for the building expansions are shown in the following table. The accompanying figure shows the location of the pipe expansion as well as the routing. A pipe size of 1-1/2-inch pipe is adequate to serve the existing building and the expansion.

Other existing NG pipe branches for buildings with additions and an increase in NG load are not required to upgrade the NG pipes. The existing NG pipe sizes are adequate to serve the buildings with their new loads.

The existing NG distribution system has adequate capacity to serve the future buildings as well as the added NG load for buildings with additions or extensions. The calculated pressure drop is approximately 1.1 psig.

The gas needs of the cogeneration plant should be evaluated based on the system capacity recommended as part of a separate feasibility study. Based on the location of the Cogeneration Plant, the connection to the gas infrastructure should be determined.

Estimated Future Buildings Natural Gas Load

Bldg #	Building Name	Bldg ID	SQFT	Building Function	Occupancy Factor (SF/ Person)[1]	No. of People[7]	No. of Fixture Units[2]	HW (GPM)[4]	BTUH[5]	NG for DHW (CFH)[6]
1	Student Services Complex	BH	70,000	Offices	100	0	0	12	480,000	480
3	Nursing-Building Addition	NUR	5,000	Treatment Room	240	0	0	50	2,000,000	2,000
11	Liberal Arts	LA4	45,790	Classrooms/ Offices	60	0	0	13.0	520,000	520
12	Liberal Arts	LA3	44,311	Classrooms/ Offices	60	0	0	13.0	520,000	520
13	Liberal Arts	LA2	46,292	Classrooms/ Offices	60	0	0	13.0	520,000	520
16	Faculty Office	FO2	48,006	Offices	100	0	0	10.0	400,000	400
37	Peterson Hall-Replacement	PH1	160,000	Laboratories	20	0	0	49	1,960,000	1,960
38 & 39	Liberal Arts Building (Phases 1 & 2)	PH2 & PH3	155,000	Laboratories	20	0	0	48	1,920,000	1,920
58	Corporation Yard-Expansion	CORP	71,000	Offices	100	0	0	5	200,000	200
	Student Recreation Center		120,000	Rec Center	25	0	0	100	4,000,000	4,000
Total			907,266							14,640

Note 1: Values from 2005 Title 24
Note 2: 2003 ASHRAE Applications Chapter 49 Table 14
Note 3: Note Used
Note 4: 2003 ASHRAE Applications Chapter 49 Figure 22 and 23
Note 5: BTUH = GPM X (140-60) X 500
Note 6: 1000 BTU/CF
Note 7: Number of people at 50% diversity

Electrical Service and Distribution System

An evaluation of the existing Electrical System currently serving the campus revealed that the existing electrical infrastructure is in good condition. Our evaluation also revealed that the existing system provides a reliable means of distributing power to each building located on the campus.

The campus current electrical demand peaks during the months of September and October and is about 11,000 kVA. The demand for the remaining months of the year varies from 8000-10000kVA. A review of the new and replacement buildings proposed as part of the master plan revealed that the campus would add an additional installed capacity of approximately 12,000kVA to their existing installed capacity of 58,000kVA. Based on the current demand to installed ratio, this would add a demand of approximately 3000kVA to the current demand of the campus.

A review of future installed capacity and current demand of the campus revealed that no modifications to the SCE capacity would be required to accommodate this future demand of the campus. The campus currently has a peak demand of 11,000kVA with an assumed power factor of 0.8 and is expected to grow to approximately 12,000kVA with the addition of new facilities. This future estimate is again projected based on the campus current ratio of installed capacity versus its current demand.

Table 1 provides an analysis of the proposed buildings and the modifications that will be required to support the new buildings.

Building/Location	Area (SF)	Proposed Installed Capacity (KVA)	Description of Impact to Campuswide Utilities
Peterson Hall 3 Replacement Building	160,000	2000	The proposed replacement building for Perterson Hall 3, and Science Lecture Hall does not conflict with any existing electrical infrastructure. This replacement does not significantly change the demand of the campus.
Liberal Arts Building (Phases 1 and 2)	155,000	2000	The proposed replacement building for Perterson Hall 1 & 2 and Faculty Office 5 is located on top of existing underground conduit and feeders that should be relocated. This replacement does not significantly change the demand of the campus.
Parking Structure 3	416,000	2000	The proposed parking structure building does not conflict with existing electrical infrastructure.
Student Recreation Center	120,000	2000	The proposed Recreation Building does not conflict with existing electrical infrastructure.
Nursing Building Addition	5,000	750	The proposed replacement building for Nursing School Expansion is located on top of existing underground conduit and feeders that will be relocated.
Outpost Replacement Building	8,000	225	The proposed outpost replacement building is located on top of underground feeders that will need to relocation.
Liberal Arts Complex	155,000	2000	The proposed replacement building for Liberal Arts 2, 3, & 4, Instructional Resources, Lecture Hall and Faculty Office 2 is located on top of existing electrical underground conduit, and feeders that will need relocation. This replacement does not significantly change the demand of the campus.
Student Services Complex	70,000	1000	The proposed Student Service Complex does not conflict with existing electrical infrastructure.
Engineering 3 & 4	80,000	1500	The proposed replacement building for Engineering 3 & 4 does not conflict with exisitng electrical infrastructure.
Corporate Yard Expansion	71,000	1000	The proposed Corporate Yard Expansion does not conflict with any existing electrical infrastructure.
Parking Structure 5 (Lot 7)	-		The proposed structure does not conflict with any existing electrical infrastructure.
Parking Structure 4 (Lot 14)	-		The proposed structure does not conflict with any existing electrical infrastructure.
Satellite Dining Facility (Lot 15)	-		The proposed building does not conflict with any existing electrical infrastructure.

Telecommunication Systems

The following is an analysis of the proposed buildings and the impact they cause to the existing systems. This section describes the future requirements for major telecommunications systems and the requirements for each of the proposed building projects.

Voice Over Internet Protocol (VOIP)

The University will continue to provide switched voice services over the existing Ericsson switching system utilizing the existing copper cable network. The switching system will continue to be upgraded with software and hardware enhancements when available from the manufacturer. As additional services are required from new buildings or major renovations, the copper cable system will be expanded to accommodate the new growth requirements. Voice Over Internet Protocol (VoIP) will be available on the existing switching network for special applications but the majority of services will be provided over the existing Ericsson system.

Data Network

The University will continue utilizing the existing Cisco data switches over the interbuilding fiber cable system for providing data service to the campus. Data electromnics will continue to be upgraded when required for the introduction of new applications or additional capacity.

Future Needs

The new buildings will require connections to the campus voice and data network through the campus copper and fiber optic cable systems. The requirements for each building were based on the following criteria:

Underground Conduit

Each typical state-owned building will be provided with a minimum of four, four inch diameter conduits from the serving manhole to the building entrance room. The allocation of the conduits will be as follows: (1) copper cables for voice services, (2) fiber optic cables for data services, (3) replacement cables for future cutovers, and (4) spare for future dedicated cable networks. For some buildings with a very small demand, the number of four inch conduits will be reduced to two. For some non-state residence halls the requirement was reduced to three, four inch conduits.

Copper Cable

For most new buildings the number of copper cable pairs were based on one and one half cable pairs for each proposed outlet containing voice cables.

Fiber Optic Cable

The criteria for a typical building included the current campus standard of a hybrid fiber cable with 24 singlemode optics and 12 multimode optics under one cable sheath. The multimode optics will be the campus standard of 50 micron type. Each fiber cable will be installed in a one inch diameter innerduct to provide cable protection and to maximize the utilization of the underground conduit system. For buildings with a small utilization, the cable size was reduced to 12 singlemode optics and 6 multimode optics. For buildings with a high utilization, the typical forecast was increases to 48 singlemode optics and 24 multimode optics.

The requirements for the proposed underground building conduits, copper cable, and fiber cable to serve each building project are shown in Table T-3:

Requirements For Proposed Building Projects

Projects Sorted By Serving MDF Building

Project #	MDF A	Conduit Qty/Size	Copper Ca Size	Fiber Ca Size (SM/MM)
1	Peterson Hall III Replacement	(6) 4”	600 Pair	36/18
2	Liberal Arts Building (Phases 1 & 2)	(6) 4”	600 Pair	36/18
3	Liberal Arts Complex	(4) 4”	900 Pair	24/12
4	Parking Structure Lot 72	(2) 4”	100 Pair	12/6
	MDF B			
*5	Parking Structure 2 (Bldg #91)	(4) 4”	100 Pair	12/6
6	Parking Structure 3 (Bldg #92)	(2) 4”	100 Pair	12/6
7	Student Recreation Center (Bldg #93)	(4) 4”	300 Pair	24/12
8	Engineering 3 & 4 Replacement	(4) 4”	300 Pair	48/24
9	Outpost Replacement Building	(4) 4”	100 Pair	24/12
10	Satellite Dining Facility (Lot 15)	(4) 4”	300 Pair	24/12
	MDF C			
**11	Student Services Complex	None	None	None
12	Nursing Building Addition	(4) 4”	300 Pair	24/12
13	Parking Structure Lot 14	(2) 4”	100 Pair	12/6

Legend:

SM = Singlemode Optics; MM = Multimode Optics

* Completed in 2006

** Serve new building addition from BDF1.1 Brotman Hall with (4), 4 inch riser conduits, 600 pair copper riser cable, and 24/12 fiber riser cable.

A description of each building project is shown below that includes the new infrastructure requirements, existing infrastructure conflicts, options, and demolition plans. See Chapter 4, for recommendations.

Project #1 – Peterson Hall III Replacement Building

Building Entrance Pathway and Media Requirements:

- (6) 4 inch diameter underground entrance conduits
- 600 pair copper building entrance cable. (This building will require service before the University implements VOIP technology.)
- Fiber optic cable with 36 singlemode/18 multimode optics.

Existing Infrastructure Conflicts:

The existing facilities that will removed in the demolition on the west side of the building site extend southward through the main quad and westward through the proposed site for the Liberal Arts Complex. Due to this future conflict, our only recommendation is provide facilities to the new building from the existing ductbank on East Campus Drive.

The existing fusion splice for the fiber cables serving buildings in this portion of campus is in conflict with the proposed Peterson Hall I & II replacement project. Our recommendation is to relocate the fusion splice on this project in order to utilize the existing fiber optic cables to MDF A for the Peterson Hall III Replacement Building.

Demolition of Existing Facilities:

Remove Existing Facilities Serving Building 39, PHIII:

- (7) underground conduits from manhole TMH#4. Conduits vary in size from 2 to 4 inches in diameter.
- 900 pair underground copper cable from splice in manhole TMH#5.
- Underground fiber optic cable with 48 singlemode /24 multimode optics from BDF in PH II.
- (4) 1 inch diameter innerducts in (1) 4" conduit.

Remove Existing Facilities Serving Building 40, Science Lecture Hall from Building 39, PHIII:

- (1) 2 inch conduit underneath building.
- 25 pair underground copper cable.
- 12/6 fiber optic cable.

Remove Existing Facilities Serving Building 41, Microbiology from Building 39, PHIII:

- (1) 2 inch conduit
- 24 optic fiber cable.

Project #2 – Liberal Arts Building (Phases 1&2)

Building Entrance Pathway and Media Requirements:

- (6) 4 inch diameter underground entrance conduits
- 600 pair copper building entrance cable. (This building will require service before the University implements VOIP technology.)
- Fiber optic cable with 36 singlemode/18 multimode optics.

Existing Infrastructure Conflicts:

The existing copper and fiber optic cables from MDF A to Building 38, PH II are in the ductbank that is in conflict with project 4, Liberal Arts Complex. After the implementation of project #1, the existing copper and fiber cables to MDF A will no longer be required and can be removed in project #2.

Demolition of Existing Facilities:

Remove Existing Facilities Serving Building 37, PHI:

- Cutoff (4) underground conduits from manhole CMH#14.
- 600 pair underground copper cable from splice in manhole CMH#14.
- Underground fiber optic cable with 48 singlemode /24 multimode optics from fusion splice in manhole CMH#14. (Fusion splice moved to manhole CMH#14 on project #1.)
- (4) 1 inch diameter innerducts in (1) 4" conduit from manhole CMH#14.

Remove Existing Facilities Serving Building 45, Faculty Office Building 5, from Building 39, PHIII:

- (4) 4 inch underground conduits, (5) 2 inch conduits, and pull box CPB117B serving building 45 and building 37.
- 200 pair underground copper cable from splice in manhole CMH#14.
- Underground fiber optic cable with 24 singlemode /12 multimode optics from fusion splice in manhole CMH#14. (Fusion splice moved to manhole CMH#14 on project #1.)

Remove Existing Facilities Serving Building 38, Peterson Hall II:

- (4) 4 inch conduits from manhole TMH#5 and (2) 2 inch conduits from PH II.
- 900 pair underground copper cable from splice in manhole TMH#5.
- Underground fiber optic cable with 96 singlemode /48 multimode optics from BDF in Building 38, PHII, to MDF A.
- (4) 1 inch innerducts in (1) 4 inch conduit from manhole CMH#6C to MDF A.

Project #3 – Liberal Arts Complex

Building Entrance Pathway and Media Requirements:

- (4) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 24 singlemode/12 multimode optics.

Existing Infrastructure Conflicts:

There are three telecommunications ductbanks that are in conflict with the proposed building site area. The major conflict is the east-west ductbank between building 11 and building 12 that originates at MDF A building and extends eastward into the main quad and serves buildings 94, 6, 15, 16, 38, and 40. This ductbank was the original pathway into the abandoned MDF in the basement of building 12 that previously contained the cable terminations and equipment for all cables in the south portion of campus as well as the demarcation with Verizon Communications. Cables serving Buildings 38, 40, and 16 will be eliminated during the demolition phase of projects #1, #2, and #3 but service must be rerouted and maintained to buildings 94, 6, and 15.

There is a second ductbank serving building 10, Liberal Arts 5 and building 16, FO2 that is located in the lawn between building 10 and building 11. The western portion of this ductbank must be maintained or relocated in order to maintain service to building 10.

There is also a third ductbank serving building 14, Liberal Arts 1, and building 18, Instructional Resources that is located in the lawn between building 14 and building 13. The western portion of this ductbank must be maintained or relocated in order to maintain service to building 14.

Options:

We reviewed three options for rerouting services in conflict with the proposed building site. Each option is briefly described below:

Option A: Avoid and Maintain Two Ductbanks Along North and South Site Boundaries And Relocate Ductbank Through Center Of Proposed Site.

This recommendation is to pick a building site by avoiding the two east-west ductbanks across the northern and southern boundaries of the proposed site. This plan would avoid re-routing two separate ductbanks and cables serving building 10 and building 14. The ductbank serving building 10 would also be extended to the east after the demolition of building 16 and terminated in existing manhole CMH#6B in the quad. This would provide a pathway for rerouting the cables through the ductbank in the center of the building site that serves buildings 6, 15, and 94. A fiber cable with 48 singlemode and 24 multimode optics would be installed in the new ductbank from MDF A Building to manhole CMH#6B and spliced to the existing cable to maintain data service to buildings 6 and 15. A new 1800 pair copper cable would be installed in the new ductbank from manhole CMH#54 to CMH#6B and spliced to the existing cables in order to maintain voice service to buildings 94, 6, and 15.

Option B: Relocate Two Ductbanks Along North and South Site Boundaries And Relocate Ductbank Through Center Of Proposed Site.

The northern ductbank serving building 10 would be relocated from the lawn to the existing sidewalk parallel and south of building 10. The ductbank would also be extended to the central quad and terminated in manhole CMH#6B. This plan would require two intercept manholes and the replacement of the sidewalk. Existing copper and fiber optic cables serving building 10 would be replaced with new cables using the new ductbank.

The southern ductbank serving building 14 would be relocated from the lawn to the existing sidewalk parallel and north of building 14. This plan would require two intercept pull boxes. Existing copper and fiber optic cables serving building 14 would be replaced with new cables using the new ductbank.

The copper and fiber cables in the ductbank through the central portion of the proposed building site would be replaced and located in the northern ductbank as described in option A.

Option C: Maintain Two Ductbanks Along North and South Site Boundaries And Relocate Cables Through Center Of Proposed Site Over East Campus Drive.

This option is similar to option A except for the plan to reroute the existing cables over the existing over East Campus Drive to provide service to buildings 94, 15, 6. This plan requires an additional 2000 feet of both copper and fiber cable to reach the buildings.

Demolition of Existing Facilities:

Remove Existing Facilities Serving Building 16, Faculty Office 2

- (4) 4 inch underground conduits from manhole CMH#53. Cutoff conduits at the entrance to the tunnel underneath building 16.
- 300 pair underground copper cable from splice in manhole CMH#53.
- Underground fiber optic cable with 12 singlemode /6 multimode optics from splice in building 10, LA5.
- (4) 1 inch diameter innerducts in (1) 4" conduit from manhole CMH#54.

Remove Existing Facilities Serving Building 17 Lecture Halls 151/152:

- (2) 4 inch underground conduits from manhole TMH#6 and (1) 4 inch conduit to manhole TMH#6.
- 100 pair underground copper cable from splice in manhole TMH#6.
- Underground fiber optic cable with 12 singlemode /6 multimode optics from BDF in Building 12, LA3.

Remove Existing Facilities Serving Building 18, Instructional Resources:

- (4) 4 inch conduits from manhole CMH#55 and (2) 4 inch conduits from building 13, Liberal Arts 2.
- 300 pair underground copper cable from splice in manhole CMH#55.
- Underground fiber optic cable with 24 singlemode /12 multimode optics from BDF in Building 12, LA3.
- (4) 1 inch innerducts in (1) 4 inch conduit from manhole CMH#55.

Remove Existing Facilities Serving Building 11, Liberal Arts 4:

- (2) 4 inch conduits from manhole TMH#6.
- 200 pair underground copper cable from splice in manhole TMH#6.
- Underground fiber optic cable with 12 singlemode /6 multimode optics from BDF in Building 12, LA3.
- (4) 1 inch innerducts in (1) 4 inch conduit from manhole TMH#6.

Remove Existing Facilities Serving Building 12, Liberal Arts 3:

- (9) 4 inch conduits from manhole TMH#6 and (4) 4 inch conduits from building 12 to western boundary of building site westward towards manhole TMH#114. Cutoff existing conduits and re-use to serve new building.
- 200 pair underground copper cable from splice in manhole TMH#6.
- 600 pair underground copper cable from TMH#6 to CMH#114A.
- Underground fiber optic cable with 36 singlemode /18 multimode optics from MDF A.
- (4) 1 inch innerducts in (1) 4 inch conduit from manhole CMH#114A.

Remove Existing Facilities Serving Building 13, Liberal Arts 2:

- (2) 4 inch conduits from basement of building 12, LA3 and (2) 4 inch conduits from building 18, Instructional Resources.
- (50), four pair copper station cables from BDF, building 18, Instructional Resources. (Building 13 is served from BDF in building 18.)

If Option B were implemented, there would be additional demolition to remove the ductbanks, manholes, and cables serving building 10, LA5, and building 14, LA1.

Project #4 – Parking Structure Lot 7

Building Entrance Pathway and Media Requirements:

- (2) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 12 singlemode/6 multimode optics.

Existing Infrastructure Conflicts:

A major ductbank with (12) 4 inch conduits and manhole CMH#5 are located in the roadway along the north boundary of the proposed building site. A second ductbank with (6) 4 inch conduits exits this manhole to the north and serves buildings 27, University Theater, and building 28, University Telecom Center.

This ductbank contains (2) 1800 pair copper cables and (1) 1200 pair copper cable that serves all of the campus buildings on the east side of south campus. It also contains a 400 pair copper screen cable connecting MDF Buildings A and B.

This ductbank also contains seven, fiber optic cables with various cable sizes from 36 optics to 288 optics. The 288 optic cable connects MDF Buildings A and B.

Options:

We reviewed three options for providing service to the new parking structure and dealing with the ductbank in conflict with the proposed building site. Each option is briefly described below:

Option A: Avoid and Maintain The Ductbank Along North Boundary And Serve The Parking Structure From the Existing Manhole.

This option requires the selection of the building site by avoiding the east-west ductbank and manhole CMH#55 in the roadway across the northern boundary of the proposed site. This plan would avoid re-routing the ductbank with the ten copper and fiber cables described above.

Option B: Relocate Ductbank To The Sidewalk Parallel and North of the existing ductbank.

This option requires intercepting the existing ductbank on the west side and north side of the building site with new intercept manholes. A new ductbank with (12) 4 inch conduits would be constructed between the intercept manholes and extended to existing manhole CMH #6. Ten copper and fiber cables would be rerouted to the new ductbank as well as the building entrance cables serving building 27 and 28.

Option C: Relocate Ductbank South of the Proposed Parking Structure Site.

This option would only be implemented if Options A or B could not be implemented. This option would be significantly more expensive due to the additional distance for relocating the existing ductbank and cables. A second ductbank would also be required to intercept the ductbank serving buildings 27 and 28.

Demolition of Existing Facilities:

There will be no demolition required if Option A is implemented.

If Options B or C are implemented, demolition will be required to remove the existing ductbank, manhole, and cables as previously described above.

Project #5 – Parking Structure 2 (Building #91)

Building Entrance Pathway and Media Requirements:

- (4) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service before the University implements VOIP technology.)
- Fiber optic cable with 12 singlemode/6 multimode optics.

This project was under construction at the time of this report. All demolition and upgrade requirements were provided by the Parking Structure Project.

Project #6 – Parking Structure 3 (Building #93)

Building Entrance Pathway and Media Requirements:

- (2) 4 inch diameter underground entrance conduits.
- 50 pair copper building entrance cable. (This building will require service before the University implements VOIP technology.)
- Fiber optic cable with 12 singlemode/6 multimode optics.

Existing Infrastructure Conflicts:

There are no infrastructure conflicts.

Options:

We reviewed three options for providing service to the new parking structure. Each option is briefly described below:

Option A: Serve Parking Structure 3 Directly From MDF B bypassing Parking Structure 2.

This option requires placement of a new 18 optic fiber cable from the new Parking Structure to MDF B. It also utilizes fifty spare copper cable pairs available in manhole CMH#28 that were made available from the demolition of building 77, Temporary Office Building.

Option B: Serve Parking Structure 3 from Parking Structure 2.

The telecommunications room in Parking Structure 3 would havr an IDF that would be served from the BDF in Parking Structure 2. Copper and fiber riser cables would be installed to the BDF in Parking Structure 2. The advantage of this option would be cheaper infrastructure costs but the disadvantages would be the dependency of this building on the other parking structure, and the requirement to install additional cross connect jumper wires in Parking Structure 2 for new voice services. Conduit installation would be the same for the two options. The copper and fiber cable installations would be less expensive in this option due to shorter distances.

Option C: Serve Parking Structure 3 From Parking Structure 2 For Data Service And With Direct Copper Pairs To MDF B For Voice Service.

This option is a combination of options A and B. Parking Structure 3 is served with fiber riser cable from the BDF of Parking Structure 2 for data, and it is served with direct and vacant copper cable pairs in manhole CMH#28.

Demolition of Existing Facilities:

There will be no demolition required.

Project #7 – Student Recreation Center (Building #93)

Building Entrance Pathway and Media Requirements:

- (4) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 24 singlemode/12 multimode optics.

Existing Infrastructure Conflicts:

There are no infrastructure conflicts.

Options:

This building will be served with new copper and fiber cables from MDF B that is located directly below the proposed building site. There are three existing serving manholes that could be used to extend the service entrance conduits into the building. They are CMH#24, CMH#25, or CMH#27. Our recommendation is CMH#25 that is the closest MDF B.

Demolition of Existing Facilities:

There will be no demolition required.

Project #8 – Engineering 3 and 4 Replacement Building

Building Entrance Pathway and Media Requirements:

- (4) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 48 singlemode/24 multimode optics.

Existing Infrastructure Conflicts:

There are no infrastructure conflicts.

Options:

Our recommendation for serving the proposed building is from MDF B with the serving manhole CMH#26A. As an option, the serving manhole could be existing manhole CMH#33. However, this manhole is longer in distance from MDF B and would be a second choice.

There are two small fiber cables, each with 12 singlemode optics and 6 multimode optics. These cables serve the two buildings that will be demolished. Our estimate for new optics to serve the proposed building is 48 singlemode and 24 multimode optics. This will require a new fiber cable direct to MDF B. As an option, the existing fiber cables serving the demolished buildings could be reused. If additional optics will be required, they could be obtained from the existing fiber cable with 96 singlemode and 48 multimode optics serving building 83, ECS. This would require a fiber splice in the BDF of building 83.

Demolition of Existing Facilities:

Remove Existing Facilities Serving Building 52, Engineering 3:

- (2) underground conduits from manhole CMH#33.
- 100 pair underground copper cable from splice in manhole CMH#33.
- Underground fiber optic cable with 12 singlemode /6 multimode optics from fusion splice in BDF of building 51, Engineering 2.
- (4) 1 inch diameter innerducts in (1) 4" conduit from manhole CMH#33.

Remove Existing Facilities Serving Building 53, Engineering 4:

- Cutoff (4) 4 inch underground conduits from manhole CMH#26A.
- 100 pair underground copper cable from splice in manhole CMH#26A.
- Underground fiber optic cable with 12 singlemode /6 multimode optics from MDF B.
- (4) 1 inch diameter innerducts in (1) 4" conduit from manhole CMH#26A.

Project #9 – Outpost Replacement Building

Building Entrance Pathway and Media Requirements:

- (4) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 24 singlemode/12 multimode optics.

Existing Infrastructure Conflicts:

There are no infrastructure conflicts.

Options:

Our recommendation for serving the proposed building is from MDF B with the serving manhole CMH#22A. We considered another option using manhole TMH#17 to the west of the proposed building site, but this option was not recommended due to the obsolesce of the original campus ductbank and manholes and the limited number of conduits in some sections of the ductbanks near manhole TMH#21.

Demolition of Existing Facilities:

Remove Existing Facilities Serving Snack Bar From Basement of building 50, VEC:

- (1) 2 inch underground conduit.
- 25 pair underground copper cable.
- Underground fiber optic cable with 6 multimode optics.

Project #10 – Satellite Dining Facility

Building Entrance Pathway and Media Requirements:

- (4) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 24 singlemode/12 multimode optics.

Existing Infrastructure Conflicts:

There are no infrastructure conflicts.

Options:

This building will be served from MDF B with the serving manhole CMH#61.

Demolition of Existing Facilities:

- There will be no demolition required.

Project #11 – Student Services Complex

Building Entrance Pathway and Media Requirements:

- (6) 4 inch diameter underground entrance conduits.
- 1200 pair copper building entrance cable.
- (2), fiber optic cables with 96 singlemode/48 multimode optics.

Existing Infrastructure Conflicts:

The existing ductbank with (6), 4 inch conduits that serves Building 1, Brotman Hall, is in conflict with the proposed building site.

This ductbank contains (1) 1200 pair copper cable that originates in MDF C and terminates in the BDF of Building 1, Brotman Hall.

This ductbank also contains two, fiber optic cables with 96 singlemode optics and 48 multimode optics. These two trunk cables connect the Data Center in Brotman Hall with MDF Buildings B and C. These two cables transport all of the campus data services in the areas served by MDFs B and C.

Options:

We reviewed two options for providing service to the Student Services Complex that will be adjacent to the east side of Brotman Hall. Each option is briefly described below:

Option A: Avoid and Maintain The Existing Ductbank in the proposed building site.

This option is to build the new Student Services Complex over the existing ductbank by designing the building to avoid the ductbank. This plan would avoid re-routing the ductbank with the three copper and fiber cables described above.

Option B: Relocate Ductbank To Enter Brotman From the Northeast Side Of The Building

This option requires a new ductbank with (6), 4 inch conduits from existing manhole CMH#38A. The new conduits would enter Brotman Hall near the northeast corner of the building and be extended across the first floor ceiling to the existing BDF room adjacent to the Data Center. The 1200 pair copper cable would be replaced from manhole CMH#38A to the BDF in Brotman Hall. The (2), fiber cables each with 144 optics, would be replaced between manhole CMH#38A and the Data Center. These cutovers would be very costly and may require temporary rerouting of data service during the cutovers.

Demolition of Existing Facilities:

There will be no demolition required if Option A is implemented.

If Option B is implemented, demolition will be required to remove the existing ductbank, manhole, and cables as previously described above.

Project #12 –
Nursing Building Addition

Building Entrance Pathway and Media Requirements:

- (4) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 24 singlemode/12 multimode optics.

Existing Infrastructure Conflicts:

An existing ductbank with (9) 4 inch conduits, manhole CMH#44, and ductbank with (4) 4 inch conduits serving Building 2, Student Health Services, are in conflict along the northwest boundary of the proposed building site.

This ductbank contains (1) 1200 pair copper cable that serves building 2, Student Health Services, building 3, Nursing, and building 78, Visitor Information Center. In manhole CMH#44 the copper cable is spliced to two, six hundred pair cables that serve the three buildings. It also contains (1), 400 pair copper screen cable that connects MDF C to MDF A.

This ductbank also contains one fiber cable with 48 singlemode optics and 24 multimode optics. In manhole CMH#44 the fiber cable is splice to two smaller cables that serve the same three buildings.

Options:

We reviewed two options for providing service to the new building and dealing with the ductbank in conflict with the proposed building site. Each option is briefly described below:

Option A: Avoid And Maintain The Ductbank And Manhole Along Northwestern Boundary And Serve The Nursing School Building From The Existing Manhole.

This option is to pick a building site by avoiding the northeast to southwest ductbank and manhole CMH#44 in the parking lot. This plan would avoid re-routing the ductbank with the copper and fiber cables described above.

Option B: Relocate The Ductbank and Cables From the Parking Lot to the street.

This option would require intercepting the existing ductbank in two street locations with new intercept manholes and a pull box to intercept a ductbank with (4) 4 inch conduits serving building 2. A new ductbank with (9) 4 inch conduits would be constructed between the intercept manholes in the roadway and extended to the new pull box to connect with the ductbank serving building 2. Six copper and fiber cables would be rerouted to the new ductbank to maintain the voice and data services to the three existing buildings.

Demolition of Existing Facilities:

There will be no demolition required if Option A is implemented.

If Option B is implemented, demolition will be required to remove the existing ductbank, manhole, and cables as previously described above.

Project #13 – Parking Structure Lot 14

Building Entrance Pathway and Media Requirements:

- (2) 4 inch diameter underground entrance conduits.
- 100 pair copper building entrance cable. (This building will require service after the University implements VOIP technology.)
- Fiber optic cable with 12 singlemode/6 multimode optics.

Existing Infrastructure Conflicts:

Existing MDF C Building and (24), 4inch underground conduits terminated in MDF C are in conflict with the proposed building site. There is also a ductbank with (12), 4 inch conduits along the southwest parking lot boundary that is also in conflict with the proposed building site.

This ductbank contains (2), 1200 pair copper cables that serve building 1, Brotman Hall, building 2, Student Health Services, building 3, Nursing, and building 78, Visitor Information Center. It also has (2) 400 pair copper screen connecting MDF C with MDF A and MDF B.

This ductbank also contains one fiber cable with 96 singlemode optics and 48 multimode optics between MDF C and the Data Center in Building 1, Brotman Hall.

Options:

We reviewed two options for providing service to the new parking structure and for resolving the issue of the ductbank in conflict with the proposed building site. Our assumption was that the existing MDF C building will stay in its current location. Each option is briefly described below:

Option A: Avoid And Maintain The Ductbank And Manhole Along The Southwestern Boundary And Serve The Parking Structure From The Existing Manhole.

This option requires the selection of the building site by avoiding the MDF C building, ductbank, and manhole CMH#41 in the parking lot. This plan would avoid re-routing the ductbank with the copper and fiber cables described above.

Option B: Relocate The Ductbank and Cables From the Parking Lot to the Sidewalk.

This option would require intercepting the existing ductbank in two locations with new intercept manholes and constructing a new ductbank with (12) 4 inch conduits located in the sidewalk. Five copper and fiber cables would be rerouted to the new ductbank to cutover the voice and data services to the four existing buildings.

Demolition of Existing Facilities:

There will be no demolition required if Option A is implemented.

If Option B is implemented, demolition will be required to remove the existing ductbank, manhole, and cables as previously described above.

NO.	BUILDING DESIGNATION
1	Brotman Hall
2	Student Health Services
3	Nursing
4	Soroptomist House
5	Family & Consumer Sciences
6	University Student Union
7	Cafeteria
8	University Bookstore
9	Psychology
10	Liberal Arts 5
11	Liberal Arts 4
12	Liberal Arts 3
13	Liberal Arts 2
14	Liberal Arts 1
15	Faculty Office 3
16	Faculty Office 2
17	Lecture Halls 150-151
18	Faculty Office 1
19	Library
20	Academic Services
21	Multi-Media Center
22	Education 1
23	Education 2
24	McIntosh Humanities Building
25	Language Arts Building
26	Studio Theatre
27	University Theatre
28	University Telecommunications
29	Art Annex
32	Fine Arts 1
33	Fine Arts 2
34	Fine Arts 3
35	Fine Arts 4
36	Faculty Office 4
37	Peterson Hall 1
38	Peterson Hall 2
39	Peterson Hall 3
40	Science Lecture Halls
41	Microbiology
42	Animal House
43	Greenhouse 1&2
44	Electrical Substation (North)
45	Faculty Office 5
46	Social Sciences & Public Affairs
47	University Gymnasiums
48	Health & Human Services Classrooms
49	Health & Human Services Offices
50	Vivian Engineering Center

NO.	BUILDING DESIGNATION
51	Engineering 2
52	Engineering 3
53	Engineering 4
54	Design
55	Human Services & Design
56	Engineering Technology
57	Facilities Management
58	Corporation Yard
59	Patterson Child Development Center
60	Los Alamitos Hall
61	Los Cerritos Hall
62a	Residence Commons
62b	Parkside Commons
63	Recycling Center
64	Greenhouse 3
65	Electrical Substation (South)
66	Reprographics
67	Main Distribution Communications Facility MDF A
68	Restrooms/Storage
69	Softball Field Restroom
70	Main Distribution Communications Facility MDF B
71	University Music Center
72	Carpenter Performing Arts Center & Dance Center
73	Mike and Arline Walter Pyramid
74	Parking Transportation Services
75	International House
76	Earl Burns Miller Japanese Garden
78	Visitor Information Center
79	Main Distribution Communications Facility MDF C
80	University Police
81	Parking Office Building
82	Outpost Food Service
83	Engineering / Computer Science
84	Steve and Nini Horn Center
85	College of Business
86	Central Plant
88	Parking Structure No. 1
89	Housing & Residential Life
91	Parking Structure No. 2
92	Parking Structure No. 3
93	Student Recreation Center
94	Molecular and Life Sciences Center
95	Peterson Hall 3 Replacement Building

Building / Boundary Legend

- EXISTING BUILDING
- FUTURE PARKING STRUCTURE
- POTENTIAL BUILDING SITE
- FUTURE BUILDING
- PLANNED BUILDING SITE

MP
PROPOSED FACILITIES MASTER PLAN