Appendix

This section of the document includes information that was generated during the planning process and used in the development of the Facilities Master Plan Recommendations.

The following are included:

- **Educational Planning Quantification**
- **Master Plan Alternate**
- **Circulation and Parking - Analysis & Study**
- **Suggested Plant Species List**
- **Building Mechanical Systems**
- **Building Electrical Systems**
- **Security Guidelines**
- **Chabot College IT Master Plan**

EDUCATIONAL PLANNING QUANTIFICATION

The Chabot College Educational Master Plan was developed in 2002 and serves as the foundation for the development of the 2005 Facilities Master Plan Recommendations. As part of this planning process educational program forecasts were developed and planning data was quantified in order to forecast the types and amount of space that will be required as the campus is developed. This section includes a summary of the material that was developed as part of this effort.

The Facilities Master Plan is intended to accommodate a potential growth of up to 17,500 students on the Chabot College campus. It should be emphasized that, for planning purposes, the exact year in which a projected student enrollment is achieved is not critical. What is critical is that the trend in student enrollment will be recognized and instructional programs, support services, facilities and staffing master planned to be responsive when that level of enrollment is ultimately achieved.

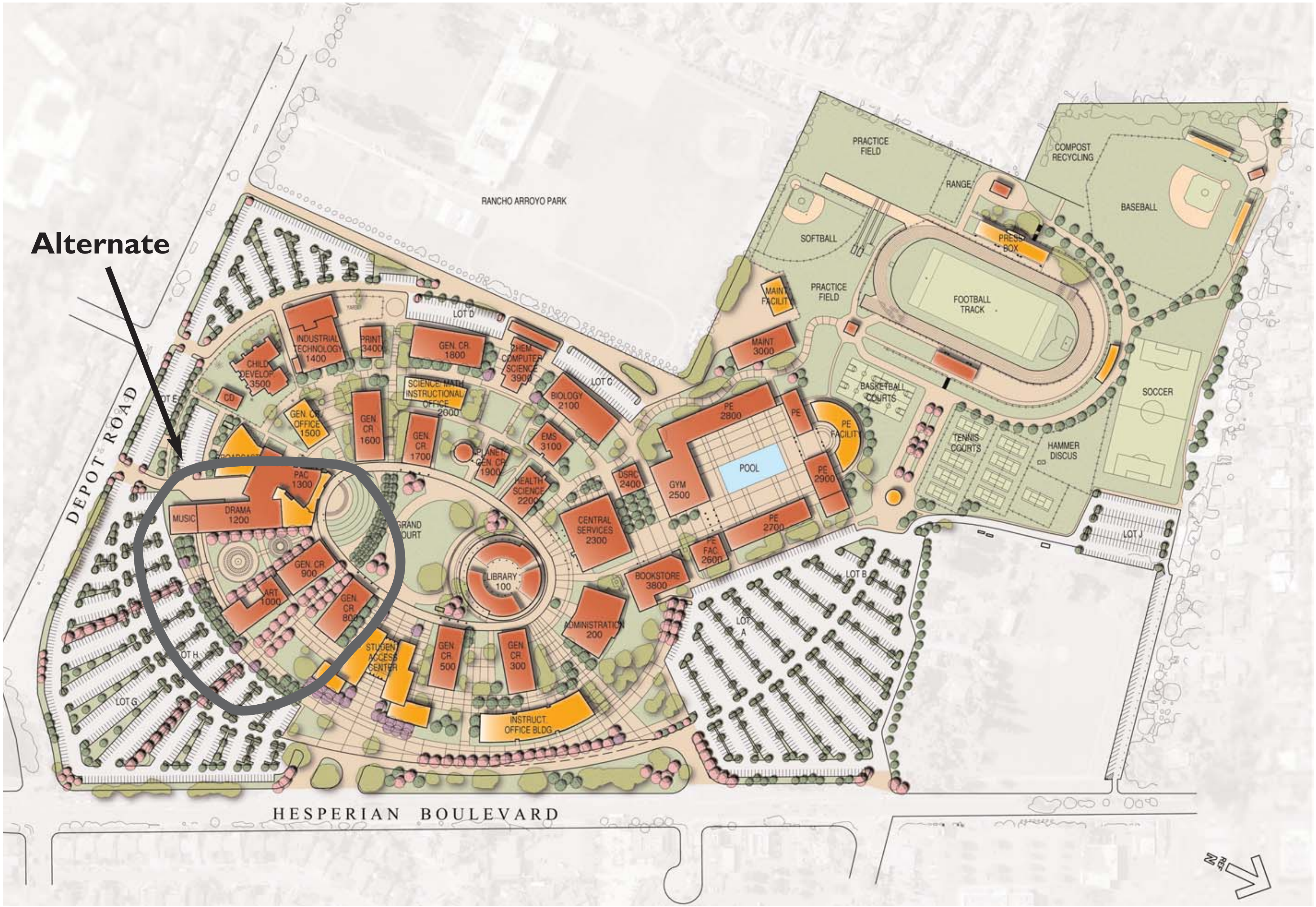
Title 5 of the California Administrative Code prescribes standards for the utilization and planning of space for public community colleges. These standards, when applied to the total number of students served, assist in the quantification of space needs for facilities master planning. Using the College's Existing Space Inventory, needs were identified to address the projected growth.

The Facilities Master Plan Recommendations include a translation of projected space needs into renovated and newly constructed facilities. As spaces are programmed and designed, it is critical that the maximum degree of flexibility be incorporated in order to accommodate future needs as they arise. Of particular interest, is the College’s desire to incorporate Learning College principles throughout the the campus. These will be explored further as the Facilities Master Plan is implemented.

MASTER PLAN ALTERNATE

Following the preliminary approval of the Facilities Master Plan, an alternative for one area of the campus was explored. The area involved the Performing Arts proposed entry and Building 1100.

The Facilities Master Plan drawing indicates that Building 1100 will remain and be incorporated as part of the development of the Performing Arts entry and courtyard. An alternative approach would be to remove this facility and move the functions to the new Instructional Office Building. The Master Plan Alternate on the following page illustrates this alternative approach.



Master Plan Alternate CHABOT COLLEGE

CIRCULATION AND PARKING - ANALYSIS & STUDY

Circulation and Parking Analysis

Background and Design Objectives

The Chabot College Campus is located on the south side of Hesperian Boulevard, west of Depot Road in the City of Hayward, California. Chabot College was constructed in 1965, and is currently undergoing a major facilities revision, of which this Circulation and Parking Design is an integral component.

Chabot College currently accommodates approximately 15,250 students, and this is forecast to increase to a capacity of 17,500 students. This increase in enrollment and activities at Chabot College will increase demand for parking and will add to campus traffic and circulation issues. At the same time, the changes to the campus' parking and access envisioned in the Facilities Master Plan may eliminate some parking spaces and will reduce the total number of driveways from the College to adjoining streets. The Facilities Master Plan, from a transportation perspective, focuses on the Plan's accommodation of future parking needs, improvements to site access and circulation, safe pedestrian and bicycle access, and convenient public transit service to the future Chabot College.

The following design objectives were applied as measures of the effectiveness of the design features of the Facilities Master Plan:

- **Parking capacity in the Facilities Master Plan should maintain or improve on current conditions.** In a March, 2004 study, Sandis Humber Jones estimated that current campus parking facilities provide approximately 1 space per 6.2 students. As a design objective, this ratio of 1 parking space per 6.2 students was used as a measure of the Facilities Master Plan's effectiveness in addressing future campus parking demand.

- **Campus parking lots should make the most efficient use of available space.** The Facilities Master Plan envisions a more intensive use of the Chabot Campus site, and those areas set aside for parking will need to be used efficiently to provide the maximum number of spaces if the goal of maintaining or improving on current conditions is to be achieved. As a design objective, the most efficient application of industry standards to achieve adequate future parking capacity was used as a goal for the Facilities Master Plan.

- **Campus access to the surrounding street system should provide acceptable traffic levels-of-service for students, staff and the surrounding community with the anticipated addition of increased College traffic.** Increased enrollment at Chabot College can be expected to increase daily and peak period traffic to and from the Campus. The Facilities Master Plan also changes the configuration and total number of campus access points. As a design objective, level-of-service (LOS) "D" at all campus driveways was used as the measure of the Plan's effectiveness in addressing future access needs.

- **Connectivity between Chabot College's parking lots should be improved.** Currently, connectivity between the ten campus parking lots is poor. In many cases, students and staff must exit the campus to Hesperian Boulevard or Depot Road to travel to another campus parking lot. This increases the impact of college traffic on the surrounding street system, and is inconvenient for the campus community as well. As a design objective, improved connectivity between campus parking areas was used as the measure of effectiveness for the Facilities Master Plan.

- **Pedestrian safety and parking lot security should be emphasized.** The safety of pedestrians, disabled persons, bicyclists and drivers is a primary design objective for the Facilities Master Plan, and the plan's design was based on an uncompromising commitment to providing the safest possible conditions in the campus' parking areas and circulation facilities. This emphasis is expressed in recommendations relative to sidewalks, crosswalks, visibility, signing and striping, and lighting.

Existing Campus Access and Circulation Facilities

Access to Chabot College is provided via five driveways on Hesperian Boulevard and four driveways on Depot Road. Two of the campus' driveways on Hesperian Boulevard accommodate both entering and exiting traffic, with left-turns permitted to northbound Hesperian Boulevard. Two of the Hesperian Boulevard driveways are exit-only, and one is entry-only. The intersection of Hesperian Boulevard, Turner Court and the Chabot College driveway is signalized. All other campus driveways on Hesperian Boulevard are controlled by STOP signs on the driveway approach. All four of the campus driveways on Depot Road allow "full-access" with left and right-turns permitted to and from the driveways, and all are controlled by STOP signs on the driveway approach. All-way STOP signs are provided at the intersection of Depot Road, Dodge Street and the campus driveway.

While Chabot College is blessed with numerous access points to the surrounding street system, internal circulation at the campus is poor. No connections are provided between many of the parking lots, and vehicles must exit to the street to go to another lot if their first choice is full. This is inconvenient for the Chabot College community, and adds to campus traffic on Hesperian Boulevard and Depot Road. Access to parking lots A, B and J is provided via a signalized driveway on Hesperian Boulevard at Turner Court. Access to lots F, G, and H is provided via un-signalized driveways on Hesperian Boulevard and Depot Road. Access to lots C, D and E is provided via un-signalized driveways on Depot Road. As previously noted, there are no internal roadways connecting lots A/B/J to lots F/G/H, and likewise no connection to lots C/D/E.

Existing Campus Parking Facilities and Occupancy

Parking at Chabot College is provided in ten surface lots, totaling 2,495 spaces. (Sandis, Humber, Jones. March, 2004) Parking occupancy at Chabot College was surveyed in April, 2005. The surveys were conducted on a Wednesday and a Thursday to account for class scheduling patterns. The parking occupancy counts were taken from 8:00 AM until 12:00 PM to capture peak daytime demand, and from 5:00 PM until 7:00 PM to measure evening demand.

Forecast Enrollment at Chabot College

Forecasts of future enrollment at Chabot College are important for campus parking and transportation systems. Demand for on-campus parking and college traffic generation are directly affected by the number of students, faculty and staff who attend classes or work at Chabot College. In this analysis of future traffic and parking conditions at Chabot College, enrollment (and staffing levels) are used as the "predictor variable" for estimates of campus traffic generation and changes in parking demand.

Based on information provided by the Chabot-Las Positas Community College District (CLPCCD), Chabot College is forecast to increase enrollment from 15,249 in 2005 to a maximum enrollment of 17,500.

Facilities Master Plan Campus Access and Circulation Facilities

The Chabot College Facilities Master Plan includes significant improvements to circulation and access, targeted at some of the problems of the existing campus. Most importantly, the Facilities Master Plan proposes a "ring road" through the campus' parking areas, addressing the existing deficiencies of on-campus connectivity between parking lots. The "ring road" can be seen on the draft Facilities Master Plan, extending from Lot B at the north of the campus through lots A, B, G, H, F and E to the southwest corner of the campus. This will allow vehicles to travel between the campus' parking areas without having to exit to Hesperian Boulevard and/or Depot Road. This will reduce the effects of Chabot College traffic on the surrounding street system, while being much more convenient for the campus community.

Also improved is the road connecting Lot B northward to Lot J. This one-way (northbound) connecting roadway improves on the geometric design features of the existing road, removing some of the inconvenient left-right turn sections.

In combination with the on-site circulation improvements, the Facilities Master Plan proposes changes to the access points to the Chabot campus. On Hesperian Boulevard, the "ring road" allows the consolidation of driveways, resulting in the removal of one exit-only driveway from the current public transit stop and drop-off area adjacent to Lot A. The bus stop area will be relocated to the west side of the "ring road" near the proposed Instructional Office Building. On Depot Road, the Facilities Master Plan proposes to remove the most easterly campus driveway (near Hesperian Boulevard), but maintains the remaining three driveways in their current locations. Removal of the most easterly driveway will reduce turning-movement conflicts near the intersection of Hesperian Boulevard and Depot Road.

Facilities Master Plan Parking Facilities

The Facilities Master Plan proposes major revisions to the Chabot campus parking areas. As previously noted, the Plan envisions a "ring road" connecting the campus parking lots. While this improves connectivity and on-campus circulation, it also allows for an increase in on-site parking capacity. The improvement of parking capacity by re-striping will result in a gain of 338 new parking spaces.

To create this increase in campus parking capacity, the Master Planning Team conducted a design effort for the planned campus parking areas, guided by the following design targets:

- Make the most efficient use of parking areas to maximize the number of available spaces. The Master Plan applied traffic engineering standards to the design of campus parking areas to ensure that the maximum number of spaces could be provided for the Facilities Master Plan. The design effort used a standard parking space "template" of 8-foot 9-inch width by 18-foot length. This standard specification is recommended by the Urban Land Institute (ULI) in their publication "The Dimensions of Parking, Fourth Edition".

- Emphasize Safety and Security in campus parking areas. The safety and security of all people using the Chabot College parking areas was given the highest priority in the Master Plan. Parking lot safety includes both traffic safety concerns and personal safety/security issues. The Master Plan addressed the traffic safety aspect by developing standard, formal signing and striping plans for pedestrian crosswalks, STOP signs and other traffic management features.

The parking lot design emphasizes visibility from the campus "ring road" as well as from Hesperian Boulevard and Depot Road. The "radial" arrangement of the parking aisles is explicitly aimed at the security of parking lot users. Good visibility in campus parking areas equals enhanced security for Chabot's students, staff and visitors.

- Improve connectivity between campus parking areas. The "ring road" is an important improvement to the Chabot campus, and addresses an existing deficiency. The Master Plan applied traffic engineering principles and standards to the design of the "ring road" to develop recommendations for STOP signs and other traffic control features to manage traffic and minimize potential conflict points.

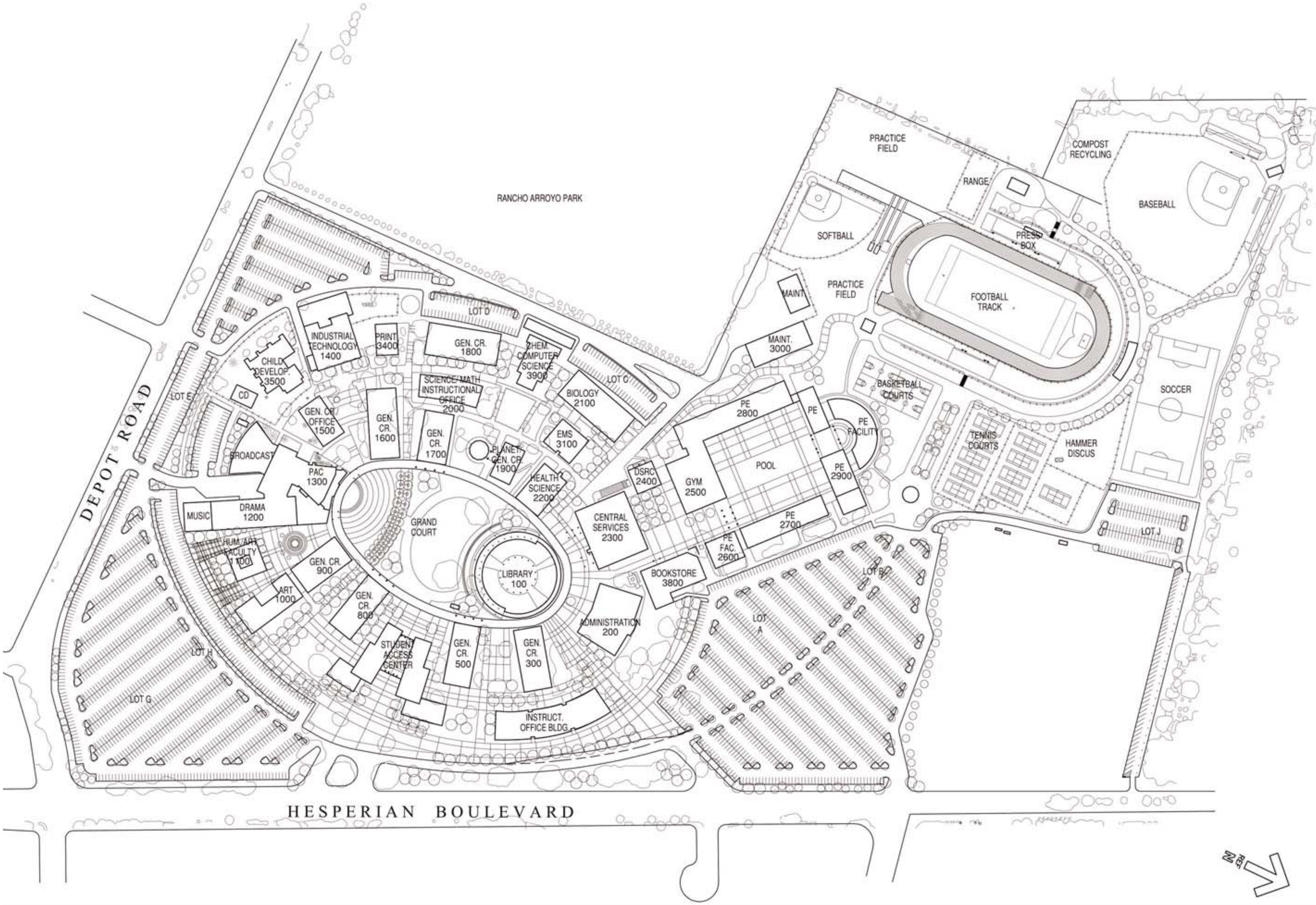
The resulting parking lot plan as shown in the reflect these design goals, as shown in Figure 3. The Facilities Master Plan will provide a total of 2,833 spaces in the campus' parking lots. Based on the design goal of 1 space per 6.2 students, the forecast enrollment of 17,500 students at Chabot College would create a need for 2,823 spaces. The planned 2833 parking spaces would represent a ratio of 1 space per 6.18 students, which exceeds the design goal.

Alternate Parking Study

The parking study shown on the following page depicts a maximum parking alternative for Chabot College. The parking areas would be re-surfaced and re-striped to allow for a mix of compact and standard parking spaces while maintaining the interior connecting road that is a keystone feature of the parking re-design.

Parking for Chabot College currently accommodates an enrollment of approximately 15,250 students, and this is forecast to increase to 17,500 students over the next ten years. This increase in enrollment and activities at Chabot College will increase demand for parking and will add to campus traffic and circulation issues. At the same time, the changes to the campus' parking and access envisioned in the Facilities Master Plan will increase parking spaces while reducing the total number of driveways from the College to adjoining streets. The Facilities Master Plan, from a transportation perspective, focuses on the Plan's accommodation of future parking needs, improvements to site access and circulation, safe pedestrian and bicycle access, and convenient public transit service to the future Chabot College.

This alternative parking study maximizes faculty, staff and student parking while maintaining appropriate ratios for accessible parking. The alternate plan provides 2,833 parking spaces which accommodate a future enrollment of 17,565 students at a ratio of 1 space per 6.2 students.



Alternate Parking Study CHABOT COLLEGE

SUGGESTED PLANT SPECIES LIST

The following plants are recommended for use as campus master plan projects are implemented. They have been selected because of their low water and maintenance needs.

ACCENT TREES

Aesculus x carnea Horse Chestnut	Deciduous	30'-40'	Sun
Acer Rubrum 'Autum Blaze' Red Maple	Deciduous	40'-60'	Sun/Pshade
Arbutus unedo Strawberry Tree	Evergreen	30'-40'	Sun
Cercis occidentalis Western Redbud	Deciduous	15'-20'	Sun
Chitalpa tashkentensis Chitalpa	Deciduous	20'-30'	Sun
Fraxinus 'Fan West' Ash Tree	Deciduous	40'-60'	Sun
Gleditsia triacanhos 'Sunburst' Honey Locust	Deciduous	40'-60'	Sun
Koelreuteria paniculata Goldenrain Tree	Deciduous	20'-35'	Sun
Largerstroemia indica 'Muskogee' Crape Myrtle	Deciduous	15'-20'	Sun
Liriodendron tulipifera Tulip Tree	Deciduous	60'-80'	Sun

Lyonothamnus floribundus Catalina Ironwood	Evergreen	20'-40'	Sun
Magnolia grandiflora Southern Magnolia	Deciduous	60'-80'	Sun
Magonlia x saulangiana Saucer Magnolia	Deciduous	30'-40'	Sun
Pistacia chinensis Chinese Pistache	Deciduous	30'-60'	Sun
Pyrus calleryana 'Aristocrat' Ornamental Pear	Deciduous	35'-40'	Sun
Robinia x ambigua 'Idahoensis' Idaho Locust	Deciduous	30'-40'	Sun

LARGE SCALE TREES

Calodedrus decurrens Incense Cedar	Evergreen	75'-90'	Sun
Cedrus atlantica Atlas Cedar	Evergreen	40'-60'	Sun
Lysiloma microphylla Feather Bush	Deciduous	20'-30'	Sun
Olea europaea 'Swan Hill' Olive	Evergreen	25'-30'	Sun
Platanus x acerifolia London Plane Tree	Deciduous	30'-40'	Sun
Platanus racemosa California Sycamore	Deciduous	30'-80'	Sun
Quercus agrifolia Coast Live Oak	Evergreen	20'-70'	Sun
Quercus douglasii Blue Oak	Deciduous	40'-70'	Sun
Quercus lobata California White Oak	Deciduous	40'-70'	Sun
Quercus suber Cork Oak	Evergreen	30'-60'	Sun
Sequoia sempervirens 'Los Altos' Redwood	Evergreen	70'-90'	Sun/Pshade
Schinus molle California Pepper Tree	Evergreen	25'-40'	Sun
Zelkova serrata Sawleaf Zelkova	Deciduous	40'-60'	Sun

LARGE SCALE SHRUBS

Alyogyne huegelii Blue Hibiscus	Evergreen	6'-10'	Sun
Anisodontea x hypomandarum Cape Mallow	Evergreen	6'-8'	Sun
Arctostaphylos desifloar 'Sentinel' Manzanita	Evergreen	6'-8'	Sun
Carpenteria californica Bush Anemone	Evergreen	6'-8'	Sun
Ceanothus griseus var. horizontalis Ceanothus	Evergreen	6'-10'	Sun
Choisya ternata Mexican Orange	Evergreen	6'-8'	Sun/Pshade
Dodonaea viscose Hopseed Bush	Evergreen	6'-12'	Sun

Echium candicans Pride of Madeira	Evergreen	6'-8'	Sun
Grevillea banksii Red Silky Oak	Evergreen	10'-12'	Sun
Heteromeles arbutifolia Toyon	Evergreen	12-18'	Sun
Keckiella antirrhinoides Yellow Penstemon	Evergreen	6'-8'	Sun
Lavatera thuringiaca Tree Mallow	Evergreen	6'-8'	Sun
Leptospermum rotundifolium Tea tree	Evergreen	6'-9'	Sun
Photina x fraseri Fraser's Photinia	Evergreen	10'-15'	Sun
Pyrachantha coccinea Firethorn	Evergreen	10'-12'	Sun
Rhus glabra Sumac	Evergreen	10'-10'	Sun
Rhus ovata Sugar Bush	Evergreen	15'-20'	Sun
Tibouchina urvilleana Princess Flower	Evergreen	8'-15'	Sun
Vitex agnus-castus Chaste Tree	Evergreen	15'-25'	Sun

SHRUBS
1-1/2 - 4 FEET

Acanthus mollis Bear's Breech	Evergreen	2'-4'	Sun
Artemisia californica California sagebrush	Evergreen	3'-5'	Sun
Buddleja davidii Butterfly Bush	Evergreen	4'-6'	Sun
Calamagrosis foliosa Reed Grass	Evergreen	1'-2'	Sun
Cistus x skanbergii Rockrose	Evergreen	2'-3'	Sun
Deschampsia cespitosa Hair Grass	Evergreen	1'-2'	Sun

Dietes bicolor Fortnight Lily	Evergreen	2'-3'	Sun
Encelia californica Encelia	Evergreen	3'-4'	Sun
Epilobium canum California Fuchsia	Evergreen	1'-2'	Sun
Festuca californica California Fescue	Evergreen	1'-2'	Sun
Gaura lindheimeri Gaura	Evergreen	3'-4'	Sun/Pshade
Lavandula angustifolia English Lavender	Evergreen	1'-2'	Sun
Lavandula dentate French Lavender	Evergreen	3'-4'	Sun
Nassella cernua Nodding Needlegrass	Evergreen	1'-2'	Sun
Penstemon centranthifolius Penstemon	Evergreen	2'-3'	Sun/Pshade
Penstemon clevelandii Penstemon	Evergreen	2'-3'	Sun/Pshade
Phormium tenax 'Jack Spratt' New Zealand Flax	Evergreen	1'-2'	Sun
Polystichum munitum Western Sword Fern	Evergreen	3'-5'	Shade
Rosmarinus officinalis 'Prostratus' Rosemary	Evergreen	1'-2'	Sun

Salvia greggii Sage	Evergreen	1'-4'	Sun
Sidalcea malviflora Checkerbloom	Evergreen	1'-2'	Sun

BUILDING MECHANICAL SYSTEMS

Infrastructure Analysis

Analysis of the existing campus utility infrastructure including fire water, sanitary sewer, storm drainage, gas and electrical systems is included in the document, Chabot Las Positas Community College District; Chabot College Campus - Utility Study dated April 13, 2005. Recommendations for repairing and upgrading underground utilities are addressed as well as new systems and relocations required for implementation of the Recommended Facilities Master Plan.

Parking Lot and Road Conditions

- Analysis of the existing parking lot and site roads including surface condition and drainage is described in the document, Chabot Las Positas Community College District - Chabot College Campus Parking Lots and Site Roads Study.

Building Mechanical Systems

On Wednesday, May 4, 2005 a Mechanical Survey was performed for the Chabot College. The intent of the survey was to evaluate the existing mechanical systems as it applies to the Campus master plan. The evaluation focused on the Heating, Ventilation, and Air Conditioning (HVAC) of the Campus. The evaluation consisted of visual observation of the mechanical systems. It should be noted that the evaluation did not consist of any destructive demolition, performance testing, calculations, etc. Also, equipment life expectancies noted within this evaluation are based on industry standards and can vary based on uses and level of maintenance.

Generally, buildings on Campus were found to be self-contained from a HVAC viewpoint. Some buildings are provided with mechanical cooling (air conditioning) and some are not. Additionally, while a couple of buildings have been recently remodeled, most of the air-handling equipment appears to be original equipment and has outlived its useful life. Most boilers and chillers within the buildings have been replaced (or added) since original building construction; however, some of this equipment will require replacement depending on the extent of its respective building's renovation. It should also be noted that many of the building's original boilers have been replaced within the last ten years. Generally, as boilers where replaced, heating hot water piping within the respective mechanical room was also replaced; however, the original building distribution piping, valves, etc. was retained. In many buildings where we recommend "total replacement of the mechanical systems", the newer boilers may be retained.

The Campus has an existing Alerton Apex 2 building automation system. Generally, mechanical equipment (fans, pumps, etc.) has start/stop capabilities but the mechanical systems are not fully automated. Most buildings have retained the original thermostats, valves, etc. Our recommendation is to upgrade any new systems to be fully controllable/compatible via the building automation system.

Our mechanical assessment generally did not investigate the plumbing systems of each building. In general, each building houses its own water heater. Some heaters are gas fired and a few are electric. As buildings are renovated, we recommend that these systems be upgraded and replaced to meet each building requirements.

Fire protection systems within the buildings are limited. Typical buildings have fire sprinklers within mechanical rooms and custodial rooms. Other areas are not provided with fire sprinklers (this is typical of 1965 construction). Note, several of the new buildings (such as building 3900) are the exception to this and are provided with a fully sprinklered building.

Building Mechanical Systems

BUILDING 100: ADMISSIONS & RECORDS; COUNSELING; STUDENT PERSONNEL SERVICES; FINANCIAL AID; INFORMATION TECHNOLOGY SERVICES; LEARNING COMMUNITIES; MEDIAL SERVICES, BROADCAST CENTER

Building 100 was originally constructed in 1965. The building is provided with mechanical cooling and heating from a ducted HVAC system. The building is equipped with a boiler and chiller located in the first floor mechanical room and a remote cooling tower located within a enclosure under the stairs. Air handling systems are located within the first floor mechanical room and on the 2nd Floor within a mechanical mezzanine.
It should be noted that the mechanical spaces within this building appear to be inadequate and not allow proper maintenance clearances. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.
It should also be noted that the boilers within Building 100 also provide heating hot water to Building 200.

BUILDING 200: ADMINISTRATION

Building 200 was originally constructed in 1966. The building is provided with mechanical cooling and heating from a ducted HVAC system. The building is equipped with a new chiller located in the first floor mechanical room and a newer cooling tower outside the building. Air handling systems are located on elevated platforms. This building does not have a boiler but receives heating hot water from Building 100.

It should be noted that the mechanical spaces within this building appear to be inadequate and not allow proper maintenance clearances. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system and a dedicated split system air-conditioner.

BUILDING 300: BUSINESS EDUCATION

Building 300 was originally constructed in 1966. The building is provided with mechanical cooling and heating from a ducted HVAC system and fan coil units that were installed approximately 4 years ago. The building is equipped with a new chiller located at the outside of the building. The building also has a newer boiler in the first floor mechanical room. Building 300 also houses the Campus data racks. This room is provided with a raised floor air distribution system.

It appears that the mechanical systems serving this building have been recently replaced and are in good condition. The fan-coil HVAC design should be capable of being retained/added to for future renovations of this building (depending on its future use).

BUILDING 400: BUSINESS EDUCATION FACULTY OFFICES

Building 400 was originally constructed in 1965. The building is provided with mechanical heating from radiators and baseboard heaters. Heating hot water is provided from a (newer) boiler located in the first floor mechanical room. The building is not provided with mechanical ventilation.

This building is scheduled to be razed. The owner may want to retain the boiler within this building for spare parts.

BUILDING 500: SOCIAL SCIENCES

Building 500 was originally constructed in 1965. The building is provided with mechanical heating from baseboard heaters. Heating hot water is provided from a boiler located in the first floor mechanical room. Building ventilation is via operable windows and a central building exhaust fan.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 800: LANGUAGE ARTS

Building 800 was originally constructed in 1965. The building is provided with mechanical heating baseboard heaters (with the exception of a computer lab). Heating hot water is provided from a boiler located in the first floor mechanical room. Building ventilation is via operable windows and a central building exhaust fan. Several ductless split system air conditioning units have been retrofitted to serve a first floor computer lab. With the exception of this computer lab, air conditioning is not provided to this building.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 900: HUMANITIES

Building 900 was originally constructed in 1965. The building is provided with mechanical heating from baseboard heaters. Heating hot water is provided from two boilers located in the first floor mechanical room. Building ventilation is via operable windows and a central building exhaust fan. It should also be noted that the boilers within Building 900 also provide heating hot water to Building 1000.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 1000: ART

Building 1000 was originally constructed in 1965 and has recently been expanded. The building is provided with mechanical heating and ventilation from a ducted HVAC system located in a ground floor mechanical room. Heating hot water is provided from building 900.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 1100: HUMANITIES FACULTY OFFICES

Building 1100 was originally constructed in 1965. The building is provided with mechanical heating from radiators and baseboard heaters. Heating hot water is provided from a boiler located in the first floor mechanical room. The building is not provided with mechanical ventilation.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 1200: MUSIC SKILLS CENTER, LITTLE THEATRE

Building 1200 was originally constructed in 1965, and an addition was constructed at a later date. The building is provided with mechanical heating, cooling, and ventilation from multiple ducted HVAC systems located in an attic mechanical room. Access to mechanical equipment is inadequate. Chilled water is provided to the building via a cooling tower (located outside of mechanical room) and chiller (located within first floor mechanical room). Heating is provided from a boiler located in the first floor mechanical room.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 1300: AUDITORIUM

Building 1300 was originally constructed in 1967. The building is provided with mechanical heating, cooling, and ventilation from multiple ducted HVAC systems. A large built-up multizone unit is located above the balcony that serves the public areas (seating, entrance, etc.) of the Auditorium. Multiple HVAC systems are located in the back of the Auditorium in a mezzanine mechanical room. These systems serve support areas (offices, stage production, etc.) of the building. Chilled water is provided to the building via a cooling tower (located outside of building 1200) and chiller (located within first floor mechanical room). Heating is provided from a 3 boilers located in the first floor mechanical room.

The boilers and chillers serving this building appear to be relatively new (4-5 years old) and do not require replacement; however, any renovation of this building should include a replacement of the air-handling units and associated ductwork systems. Note that replacement of the large built-up multizone unit could consist of fan, motor, controls, etc. replacement while the unit enclosure could be retained.

BUILDING 1400: (INDUSTRIAL) TECHNOLOGY CENTER

Building 1400 contains both technical/vocational classrooms and shops. No mechanical ventilation is provided in the shops (heat is provided by gas fired unit heaters); however, this would be expected. Fan coil units provide heating, cooling, and ventilation to the classrooms within the building. Chilled water is provided to the building via an air-cooled chiller located on the ground just outside the building. Heating is provided by an outdoor boiler located adjacent to the chiller.

It appears that this building is scheduled for a major renovation. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 1500: TECHNOLOGY AND ENGINEERING FACULTY OFFICES, CLASSROOMS

Building 1500 was originally constructed in 1965 and has had some minor renovations. The building is provided with mechanical heating and ventilation from a ducted HVAC system located in a ground floor mechanical room. Some rooms are also provided with baseboard heaters. Heating hot water is provided from a boiler located within the ground floor mechanical room.

This building is scheduled to be razed. The owner may want to retain the boiler within this building for spare parts.

BUILDING 1600: TECHNOLOGY/ENGINEERING/GRAPHIC ARTS

Building 1600 was originally constructed in 1965. The original building was provided with mechanical heating from baseboard heaters; however, this building has been retrofitted with mechanical cooling within the last 10 years. This retrofit included the addition of an air-cooled chiller and fan coil units. Heating hot water is provided from a boiler located in the first floor mechanical room.

While this building has been retrofitted with cooling, any major renovation of this building should consider a total removal and replacement of the entire mechanical system. As currently designed, any major renovation may have issues with controllability, access to mechanical equipment, and flexibility of modifying the mechanical systems.

BUILDING 1700: MATHEMATICS, PHYSICS, GEOLOGY

Building 1700 was originally constructed in 1965. The building is provided with mechanical heating from baseboard heaters. Heating hot water is provided from a boiler located in the first floor mechanical room. Building ventilation is via operable windows and a central building exhaust fan.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.
It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 1800: CLASSROOM BUILDING AND TESTING CENTER

Building 1800 was originally constructed in 1965 and was previously used as a chemistry building. The building has since been converted to its current use as a classroom and testing center. The building is provided with a ducted heating/ventilating unit located in the buildings mechanical room. Heating hot water is provided from 2 boilers located in the first floor mechanical room.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 1900: SCIENCE LECTURE HALLS, PLANETARIUM

Building 1900 was originally constructed in 1965 and houses the Planetarium and three lecture halls. The lecture halls are provided with heating, ventilation, and air conditioning via a single large fan coil unit located above the ceiling. This unit is largely in-accessible. The planetarium is provided with its individual ducted HVAC unit. The building is equipped with a chiller located in the first floor mechanical room and a cooling tower outside the building. A single boiler located in the first floor mechanical room provides heating hot water to the building.
It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2000: SCIENCE AND MATHEMATICS FACULTY OFFICES

Building 2000 was originally constructed in 1965 and has had little to no improvements. Heating and ventilation are provided to this building by a ducted heating/ventilation system. Heating is also provided to some areas with radiant wall heaters. Heating hot water is provided by a newer boiler located within the first floor mechanical room.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.
It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2100: BIOLOGICAL SCIENCES

Building 2100 was originally constructed in 1965 and has been retrofitted with air conditioning (about 2 years ago). The building renovation provided a new packaged chilled water skid unit, fan coil units (above ceilings), and an air-handling unit (located within mechanical room). This building is also equipped with a packed DX air conditioning unit located on the roof that serves a small computer room. Heating hot water is provided by two newer boilers located within the first floor mechanical room.

While this building has been retrofitted with cooling, any major renovation of this building should consider a total removal and replacement of the entire mechanical system. As currently designed, a renovation may have issues with controllability, access to mechanical equipment, and flexibility of modifying the mechanical systems. Additionally, depending on the extent of a renovation, additional mechanical spaces may be required.

BUILDING 2200: HEALTH SCIENCES, DENTAL HEALTH

Building 2200 was originally constructed in 1965 and has had little to no improvements. Heating and ventilation are provided to this building by a ducted heating/ventilation system (located on a platform). Heating hot water is provided by a newer boiler located within the first floor mechanical room.
It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2300: CAFETERIA, STUDENT CENTER, CAMPUS SECURITY

Building 2300 was originally constructed in 1966 and has had little to no improvements. Heating and ventilation are provided by various ducted HVAC units located in multiple mechanical rooms (located on the first and second floor). Multiple exhaust fans are on the roof serving the kitchen hoods. An older boiler located in a ground floor mechanical room provides heating hot water to the building and a second newer boiler provides 140^{o}F hot water to the kitchen area. It should also be noted that the boilers within Building 2300 also provide heating hot water to Building 2400.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.
It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2400: DISABLED STUDENTS RESOURCES CENTER

Building 2400 was originally constructed in 1965 and has been recently renovated. The renovation of this building included the HVAC systems. This building is provided with heating, ventilation, and air condition via multiple fan coil units located throughout the building. Chilled water is provided via an air cooled chiller. Heating hot water is not produced within the building but is provided from a boiler located in Building 2300.

It appears that the mechanical systems serving this building are relatively new and only minor renovations are scheduled for this building. Any renovation of this building should include minor renovations to the mechanical system.

BUILDING 2500: GYMNASIUM

Building 2500 was originally constructed in 1965. This building is provided with heating and ventilation from 4 elevated fan coil units, which are difficult to access (one in each corner of the gym). Heating hot water is not produced within the building but is provided from Building 2700.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2600: PHYSICAL EDUCATION FACULTY OFFICES, CLASSROOM

Building 2600 was originally constructed in 1965. This building is provided with heating and ventilation from fan coil units located in the ceiling spaces. Heating hot water is not produced within the building but is provided from a boiler located in Building 2700.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2700: WOMEN'S SHOWER AND LOCKER ROOMS, CLASSROOM

Building 2700 was originally constructed in 1965. This building is provided with heating and ventilation from a heating/ventilating unit located in a mechanical room. Two newer boilers located in a ground floor mechanical room provides heating hot water to the building and a second newer boiler provides domestic hot water to the building. It should also be noted that the boilers within Building 2700 also provide heating hot water to Buildings 2500 and 2600.

It should be noted that the mechanical spaces within this building appear to be inadequate to accommodate a building renovation. Additional mechanical spaces should be programmed into any renovations of this building.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2800: MEN'S SHOWER AND LOCKER ROOMS

Building 2700 was originally constructed in 1965. This building is provided with heating and ventilation from a heating/ventilating unit located in a mechanical room. One boiler located in a ground floor mechanical room provides heating hot water to the building and a boiler provides domestic hot water to the building. It should also be noted that the additional boilers, filter, etc. are located within this mechanical room for the pool.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 2900: PHYSICAL EDUCATION CLASSROOMS

Building 2900 was originally constructed in 1965 and was originally designed as "mini-gyms". This building houses racquetball courts, a fitness center, weight room, and assessment center. The building is provided with heating and ventilation via fan coil units within the space. Some of these units are inaccessible (~30 feet above finished floor with no permanent access). Two new boilers have been installed within this building. The boilers appear to have inadequate space for maintenance.

It appears that the mechanical systems serving this building have outlived their useful life. Any renovation of this building should include a total removal and replacement of the entire mechanical system.

BUILDING 3000: MAINTENANCE BUILDING AND WAREHOUSE
Building 3000 is the maintenance building and warehouse. This houses several offices for the maintenance and operation staff. Packaged DX air conditioning units serve the office space and unit heaters are located within the warehouse. Systems associated with this building are small in nature and if this building is renovated, a total removal and remodel of the various systems would be recommended.

BUILDING 3100: EMERGENCY MEDICAL SERVICES
Building 3100 was originally constructed in 1993. The building is provided with heating, ventilation, and air conditioning from fan coil units located within the ceiling space of the building. Hot water is provided via a boiler in the mechanical room and chilled water is provided by an air-cooled chiller.

It appears that the mechanical systems serving this building are relatively new and only minor renovations are scheduled for this building. Any renovation of this building should include minor renovations to the mechanical system.

BUILDING 3200: DISABLED STUDENT PHYSICAL EDUCATION CENTER
Building 3200 is a portable building that has been on campus for about 16 years. The building is self-contained and heating, ventilation, and air conditioning is provided by a wall mounted heat-pump unit.

This building is scheduled to be removed from Campus. Mechanical systems will be removed with the building.

BUILDING 3300: THE ANNEX
Building 3200 is a portable building. The age of the building was not determined. The building is self-contained and heating, ventilation, and air conditioning is provided by a wall mounted heat-pump unit.

This building is scheduled to be removed from Campus. Mechanical systems will be removed with the building.

BUILDING 3400: REPROGRAPHICS CENTER / PRINT SHOP /GRAPHIC ARTS
Building 3400 was originally constructed in 1993. The building is provided with heating, ventilation, and air conditioning from fan coil units located within the ceiling space of the building. Hot water is provided via a boiler in the mechanical room and chilled water is provided by an air-cooled chiller.

It appears that the mechanical systems serving this building are relatively new and only minor renovations are scheduled for this building. Any renovation of this building should include minor renovations to the mechanical system.

BUILDING 3500: EARLY CHILDHOOD DEVELOPMENT CENTER
Building 3500 was originally constructed in 1995. The building is provided with heating, ventilation, and air conditioning from fan coil units located within the ceiling space of the building. Hot water is provided via a boiler in the mechanical room and chilled water is provided by an air-cooled chiller.

It appears that the mechanical systems serving this building are relatively new and only minor renovations are scheduled for this building. Any renovation of this building should include minor renovations to the mechanical system.

BUILDING 3700: EARLY CHILDHOOD DEVELOPMENT CENTER
Building 3700 is a portable building. The age of the building was not determined. The building is self-contained and heating, ventilation, and air conditioning is provided by a wall mounted heat-pump unit.

No apparent renovations appear to be scheduled for this building. Mechanical systems appear to be good shape and do not require replacement.

BUILDING 3800: BOOKSTORE
Building 3800 is a relatively new building; however, the exact construction date was not determined. The building is provided with heating, ventilation, and air conditioning from fan coil units located within the ceiling space of the building. Hot water is provided via a boiler in the mechanical room and chilled water is provided by an air-cooled chiller.

It appears that the mechanical systems serving this building are relatively new and only minor renovations are scheduled for this building. Any renovation of this building should include minor renovations to the mechanical system.

BUILDING 3900: CHEMISTRY / COMPUTER SCIENCE

Building 3900 is a relatively new building; however, the exact construction date was not determined. The building is provided with heating, ventilation, and air conditioning from roof mounted air handling units. Hot water is provided via a boiler in the mechanical room and chilled water is provided by an air-cooled chiller.

It appears that the mechanical systems serving this building are relatively new and only minor renovations are scheduled for this building. Any renovation of this building should include minor renovations to the mechanical system.

Recommendations

For the majority of the mechanical systems, the equipment has outlived its expected useful life and is in need of replacement. Also, the majority of the buildings on campus are self-contained from a HVAC viewpoint. This means that each building is equipped with its own boiler and chiller (for buildings with air conditioning). From a maintenance and operations standpoint, this is a highly inefficient way of serving the campus.

Additionally, existing mechanical spaces generally are inadequate for proper maintenance of the mechanical equipment. Renovation of most buildings should include additional mechanical spaces programmed into each building.

It is our recommendation that the Campus consider building two mini Central Plants which would house central Chillers and Boilers. From these Central plants, chilled water and heating hot water would be circulated around the campus and serve each building. This approach would provide centralized maintenance, fewer pieces of equipment to monitor and maintain, and a more efficient equipment (less energy consumption). Assuming that the Campus build-out will house approximately 700,000 FT2 of space, typical heating cooling spaces for a College Campus in the area are as follows:

- Cooling ~ 1 ton / 400 FT2 x 700,000 FT2 = 1,750 tons
- Heating ~ 30 BTUH / FT2 x 700,000 FT2 = 21,000 MBH

Assuming that two small Central Plants are installed, the Campus could reduce the number of chillers from ~15 to having just a couple (2-4 depending on size chosen). Additionally, the number of boilers could be reduced from ~42 to just a handful (2-10 depending on type and size chosen). This approach will reduce the quantity of equipment for maintenance and provide greater operating efficiencies.

From a fire protection viewpoint, the Campus Buildings have limited fire protection which is typical of buildings constructed in the 1960s. As buildings are upgraded, Code requirements may require for each building to become fully sprinklered.

From a plumbing viewpoint, Buildings have limited plumbing features (required restrooms, drinking fountains, etc.). As buildings are renovated, it should be expected to replace existing plumbing fixtures with new fixtures with features such as: low flow fixtures, automatic flushing features, waterless urinals, etc. Note that the Campus has recently upgraded/replaced building drinking fountains to meet ADA requirements and that some of these fixtures could remain.

BUILDING ELECTRICAL SYSTEMS

SECTION I Overview

On Tuesday, May 10, we visited the Chabot campus for a general evaluation of the electrical systems including interior and exterior lighting. We were able to open a few of the equipment enclosures but this evaluation is not based on a detailed inspection or any testing of transformers and panelboards. At Chabot, the major components of the building systems including the main circuit breaker and major feeder circuit breakers are located outdoors in assemblies know as "Unit Substations." This arrangement has the advantage of conserving building floor space but it has the considerable disadvantage of exposure of the electrical equipment to moisture, heat, and contamination. The original site distribution system had no means of isolating the individual unit substations so very little maintenance was done in the early years. Recently, the Facilities Department added isolation switches that, at least, made the equipment accessible. Despite these efforts, most of the outdoor equipment is as old as the buildings themselves and is in generally poor condition. Two exceptions are the new 12,000 volt Main Substation and the new padmounted equipment at the Bookstore.

One result of obsolete electrical equipment is the risk of unplanned outages that can disrupt the operations of the College. A more serious concern is the risk of electrical fire and explosion than can result from the failure of the devices, such as circuit breakers, that are intended to interrupt high fault currents. We understand there have been several such failures in the past and the Facilities Department feels this equipment should be replaced as soon as possible.

Our other findings are typical of similar installations from the 1960's and 1970's. In most cases there is sufficient capacity in the site system and in the individual building systems for the present loads. There may be a shortage of branch circuits and of space in existing panelboards to add additional circuits, especially in areas that have become computer intensive. In many areas, the panelboards are improperly located, such as in janitor closets, and they lack the operating clearances required by current codes. In addition, there is a lack of security at a number of electrical, data and telephone distribution panels.

Replacement of existing unit substations is relatively simple when major remodeling is under way because it is now possible to isolate each one. There are, however, no existing points of connection to the site distribution system for new transformers serving new buildings. This deficiency is addressed more thoroughly in the Site Utility Master Plan. It is important that new infrastructure be provided in advance of the need to connect new buildings.

In the older buildings, where major renovations are contemplated, the existing systems lack capacity for significant increases in load, especially where air conditioning (AC) is proposed. AC will approximately double the building electrical load including load increases associated with new programs.

The interior lighting, generally fluorescent, is also typical of the years in which it was installed. This equipment has low energy efficiency and lacks energy saving controls such as dual level switching and occupancy sensors. New and remodeled buildings will be required to meet California Title 24 Energy Efficiency Standards which will result in the replacement of most lighting.

There has been some effort to retrofit the exterior lighting with more efficient sources but, overall, the lighting is inconsistent across the campus. This will probably be addressed slowly as landscaping and parking lots are improved. The California Building Code has special requirements for outdoor and parking lot lighting at Community Colleges.

SECTION 2 Summary Recommendations

In general, we recommend replacement of the Unit Substations with sealed padmounted transformers. Modern transformers are much smaller than the existing units and the high voltage (12,000 volt switches and fuses) are protected within the sealed tank. Aside from cleaning, painting, and occasional testing of insulating oil, very little maintenance is required. We suggest discontinuing the practice of installing the lower voltage distribution equipment outdoors and, instead, provide dedicated electrical rooms, with proper clearances and security, inside each building. Padmount transformers and dedicated rooms should also be provide for new buildings.

The existing old panelboards should be replaced for safety, reliability, and added capacity. New panelboards with sufficient circuit breaker spaces and with space for future additions should be provided and should be located in secure areas with adequate working clearances.

Since most building services are 480 volts for lighting and building equipment, transformers for the 120 volt receptacles can be located in the dedicated rooms. Specially constructed transformers for high harmonic loads such as found in computer labs should be provided where required.

Central Cooling Plants centralize the heavy electrical loads away from the building electrical systems and provide some economies from lower building demand load. This can be especially useful for providing air conditioning to existing buildings that do not otherwise require major interior electrical upgrades.

Lighting retrofits of existing buildings are usually cost effective and are recommended. Title 24 compliance will result in considerably better efficiency in new buildings.

The cost of energy for improved outdoor lighting will generally offset savings associated with more efficient sources. Energy costs can also be reduced by control systems that reduce lighting, especially parking lot lighting, to minimal levels at time when the lots are not used.

SECURITY GUIDELINES

A campus Security Master Plan has been developed and the primary intent is to define security mitigation standards that integrate efficiently with new building construction and building improvements, saving upgrade costs today by planning for the campus of tomorrow. By first prioritizing the identified campus risks, and then using a multi-faceted approach from the key areas of physical environment, security staffing, and feasible technology, the Security Master Plan presents a clear security philosophy to guide the selection and implementation of campus security upgrades. The Security master Plan addresses long-term system compatibility, communication infrastructure, product obsolescence, and growing demands on the security staff.

While the Security Master Plan uses vulnerability and risk analysis as a foundation for developing guidelines, the Master Plan is not simply a report of current problems on campus. The objective of the Master Plan recommendations and guidelines is to systematically address the following issues:

- Prioritize the identified risks on campus, and thus the budget requirements for mitigation.
- Use risk prioritization to plan mitigation measures systematically, without undisclosed expectations.
- Establish clear security goals that guide the level of implementation over the long-term.
- Provide a standardized approach to security systems to retain compatibility, knowledge basis, and functionality.

Based on this approach, the Security Master Plan will be a central document, used by the District and design teams, to establish the scope and placement of all security equipment during the planning stages of new construction or retrofit upgrade work. Using the concepts presented in the Security Master Plan and working with the Chabot Campus and District Security, the design teams will identify security system architecture and device locations for electronic hardware, access control, intrusion detection, CCTV, and security communications equipment. It is further the intent for the Security Master Plan to address risk mitigation opportunities utilizing environmental design of lighting, pathway visibility, and landscaping. The Security Master Plan will evaluate the potential threats and vulnerabilities to the Chabot College campus, and develop a security program incorporating electronic, programmatic and physical security measures as required to achieve acceptable levels of risk mitigation that can function in harmony with students, campus employees, and District service providers.

CHABOT COLLEGE IT MASTER PLAN

INTRODUCTION

As part of the development of a facilities master plan for Chabot College, a process is underway to identify the requirements for new Information Technology infrastructure and systems, and the impact they will have on the new campus design. The primary goal of this IT Master Plan is to increase the capability of the campus to service the current and future needs of its community. The first step in the Facilities Master Plan will be the renovation of most of the existing facilities and the construction of a few new buildings. This will only address physical capacities on campus. To properly achieve functional expansion, the plan must also address the increased requirements of the systems that support the new campus environment and its users. IT systems are a crucial element.

The provisioning of IT services to this new environment, and the manner in which these services are accessed by the users, will also undergo change. For each new building proposed in the Chabot College Facilities Master Plan, the installation of additional fiber and copper to service them is mandated. As an initial step, a program to evaluate the state of the existing underground cabling pathways was undertaken to assess their reuse in this new environment. Additional conduits will be required to meet the needs of the new environment; however, the reuse of current infrastructure and rerouting of certain conduit segments would minimize additional costs.

Presently the Chabot College Facilities Master Plan documents show conflicts with existing underground cabling infrastructure in areas where new construction is proposed, and the possibility of service outages needs to be evaluated. Proper coordination of the design plans is essential to minimize impact, reduce the costs of later mitigation and eliminate the possibility of service outages during the construction process. A comprehensive approach which addresses all these elements will assure that the end product is achieved effectively, efficiently, and through the most constructive course available.

Establishment of Campus Infrastructure Standards

Evaluation of the current state of the IT infrastructure and technology system standards is an essential part of the Master Plan process. These can then be evaluated against comparable educational facilities and those established by accredited national organizations. The information developed through this evaluation will provide the criteria to perform a gap-analysis, which during any phase of the project will help define necessary changes to existing standards. Implementing these changes will assure that the Chabot College campus standards meet the highest levels of performance, and the long-term goals of the campus and community.

From this evaluation process, a new standard for state-of-the-art infrastructure can be developed. As the baseline for the campus standard continues to evolve over the life of the project, continued enhancements to the campus-wide system standards can be made. CLPCCD District ITS has already issued a first draft of Cabling Infrastructure standard that define the new infrastructure for TCP/IP based connectivity. This document is being enhanced for use by Architect and Engineering teams in the design and engineering new and renovated buildings.

New Construction

Under the current Chabot College Facilities Master Plan, the proposed construction of new buildings will require the implementation of the new Cabling Infrastructure standards. Cost-effective implementation will require coordination with a number of disciplines during the early stages of the design plan for each facility.

While the new IT standards addresses initial planning requirements for the new facilities, the success will also be dependent on its ability to adapt to the future of technology. Setting guidelines for the implementation of infrastructure and services that offer extended life expectancy is an important design goal. Assuring that these new facilities can easily adjust to changes in technology without impacting bottom line costs will allow the campus to avoid early obsolescence of the infrastructure.

The high level considerations for the new cabling standards can include:

- Redundant fiber backbone connectivity (Single mode and 50 micron Multi-mode fiber)
- Category 6 voice/data station cabling
- Voice-over-IP (VOIP) ready configuration
- Wireless ready configuration
- Standard classroom/office/lab designs
- Technology Enabled" classroom design standard
- Flexible infrastructure designs for multi-purpose room usage
- Support of building automation systems, such as security, CCTV, and other network-based control systems

Renovated Facilities

The renovation of existing facilities requires the same set of considerations than those of newly constructed facilities. The current Chabot College Facilities Master Plan proposes the renovation of most of the existing buildings, each currently servicing either students, faculty, or staff. The intention of these renovations is to remodel these buildings so that they can be used in the most appropriate manner to serve the campus student, faculty and administrative population. Traditionally, renovations make use of very little except the structural elements of a building. As a general design directive, the infrastructure in buildings with major renovations will be brought into compliance with new cabling standards and construction codes as part of the construction project.

New Data Backbone Infrastructure

The Data Backbone infrastructure at Chabot College is based on multimode fiber that was installed in the early 1990s. This cabling extends from each Building to either Building 3100 or Building 300. At Building 3100, fiber patch cords are used to extend each building connection back to Building 300. This fiber infrastructure needs to be replaced with new cabling that conforms to the design guidelines included in the Cabling Infrastructure Standards document. The key design elements are:

- 50 micron, laser optimized multimode fiber backbone cabling
- single mode fiber backbone cabling
- each building provisioned with two sets of backbone cables which route back to the network switching centers through diverse paths.

Corollary to the provisioning of new fiber backbones is the expansion of the outside plant conduit system. An analysis is underway to evaluate the capacity and usability of the existing conduits. As indicated in the Facilities Master Plan, the new Student Access Center and Performing Arts expansion will impact key routes for production data and voice cables. The conduit analysis information, coupled with the rerouting required to accommodate the new buildings, will allow specific engineering activities which will design the capacities and routing needed for the new fiber backbones. The most cost effective approach is to use the existing infrastructure wherever possible.

District Data Center Migration

Currently, Chabot Campus hosts the District Data Center which provides the data services for Chabot College, Las Positas and the District office. This structure will change as part of the Campus redevelopment plan, transferring the District Data Center functions to the new Information Technology Building at Las Positas campus. Coordination of renovations to Chabot College Building 100 and 300 is critical, so that those renovations can be scheduled after the District ITS functions and equipment are relocated to the new Information Technology Building. Likewise all construction activity should be very protective of power and data connectivity, to ensure that service disruptions are minimized.

EVALUATION OF NETWORKING EQUIPMENT AND ARCHITECTURE

Critical to the success of the network connectivity is a clear definition of future requirements based on present understanding of the students and faculty. Once collected, this information can be used to develop a core network design plan that services the needs defined. An assessment of future needs should be undertaken that addresses data, voice and video requirements and support for converged systems. The outcome will be a comprehensive IT network infrastructure design that will address the needs of the environment as it continues to expand.

The recommendations made in the categories to follow are life-cycle based. This means that based on current technology life expectancy set by the manufacturers, the replacement of equipment or applications may be warranted more then one time during the life of this project.

Core Switching and Routing

The successful performance of all network systems is based on the capability of the core devices that control transmission and pathways. Core switches and routers define the parameters for all network traffic, setting prioritization and dictating how information gets from one point to the other. These core system designs can have several topologies, generally dependent on the type of information they handle and the capability of the systems they support. Core systems must be robust, inter-dependent, and designed to meet the capacity and criticality of the information that travels through them.

For the Chabot campus, it is essential that the plan for the core system address capacity issues first. The changes proposed in the Master Plan will put great demands on existing systems, and this impact must be included as part of any existing core systems assessment. These systems may address the needs of the campus at present, but planning is required to assure that they capable of expanding current provisioning as the environment expands. Defining these elements is critical for the IT Master Plan to meet its goal.

Initial considerations include:

- Installation of new core switching/routing equipment to address immediate and future needs
- Increased capacity at port level for greater throughput
- Reallocation of existing core switching/routing equipment for use in distribution/access layers
- Expansion of distribution capabilities through installation of additional fiber and retermination or replacement of existing problems
- Multiple routing capabilities supported by a diverse core system configuration

Firewalls and Security

The inherent nature of today's College campuses increases the requirements for protecting the systems and applications that run them. Open environments for learning while directed at eliminating restrictions to students and faculty, also promotes unauthorized traffic. Securing these environments while maintaining open access and performance levels, can be a difficult task. The integration of appropriate firewall appliances and/or applications that control access and restrict unauthorized traffic is crucial to providing secure and uninterrupted service on the network. This plan includes the enhancement of current firewall technology and subsequent upgrades to support new functions.

Desktops and Laptops

The immediate plan for Chabot College is to replace existing desktops and laptops with newer, more capable equipment, and establish the District standard four-year equipment life cycle. In conjunction with the rollout of new desktop systems, the capability of the users to access and utilize these services must also be enhanced. To properly address the service requirements of the students and faculty it is essential that the equipment they use meet minimum educational standards.

The District has established standards for equipment configurations and replacement life cycle. As Chabot College grows, so will the demands of the faculty and student body, driving the need to create more robust educational services. Providing the proper tools to allow the users to transition this period of growth will greatly impact their experience at Chabot College. To assure that the users are provided with the broadest level of capabilities it is essential that new campus standards for PC's and laptops are enacted.

Server Technology

The data server environment that is currently provisioned at Chabot College, while adequate to meet present day requirements, needs to be enhanced to be prepared for the future. The District ITS and CC Computer Support staff are presently defining new standards for this environment which will establish a foundation for future server technology planning.

The servers in this environment presently distribute and manage enterprise applications and support the storage requirements of the administrative users, students and faculty. The expansion of this environment will drive broader requirements for performance and provisioning, which will put greater demands on those who manage it. The Chabot campus is expected to expand enrollment over the course of the redevelopment project and a plan is required to assure all growth considerations are addressed. It will be critical to create appropriate levels of redundancy and use load-balancing and clustering to create failover capability. Consolidation of equipment where appropriate, should also be a consideration, reducing the environmental impacts on the facility and creating stability within the new core system configuration. Where high capacity storage is required, investigation and standardization on the appropriate storage technology and backup solution will be pursued.

Wireless Networking

Chabot College would like to utilize wireless networking to augment the existing wired environment, applying industry best practices and standards. Wireless capabilities enhance any environment where the demand for access to the web and data continues to expand. The deployment of wireless networking is becoming more mainstream in educational environments, though at present there are still serious concerns about security and performance. The use of wireless connectivity to access stored information and web sites has increased the capability of schools to service their rapidly expanding requirements. The infrastructure of many educational institutions today cannot immediately service the demand for access, and deploying a wireless LAN environment provides them with a short-term expansion option.

As access to networks for day-to-day use increases, so will the demands on existing capacities. The deployment of secure, robust wireless access systems can mitigate the need for immediate infrastructure improvements. As an adjunct to existing wired access, wireless networking can expand the service capabilities with limited financial impact.

External Network Connectivity

Internet connectivity is provided through a CENIC DS-3 connection. This provides robust bandwidth for support of instructional data access and videoconferencing.

When the District Data Center moves to the Las Positas Campus, it is essential that high-capacity bandwidth be available, so that excellent performance to the Administrative Enterprise computer system will be maintained. This connectivity is reliant on the implementation of a separate CENIC DS-3 connection to the LPC site, or other high-speed connectivity alternatives. This improved infrastructure will allow transparency of connectivity to the remote Data Center systems, with comparable services to what Chabot College users are accustomed to in the current topology.