CHABOT
LAS POSITAS
COMMUNITY
COLLEGE
DISTRICT

CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT
TOTAL COST OF OWNERSHIP PLAN

DECEMBER 9, 2016

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CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT
TOTAL COST OWNERSHIP

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SECTION 1 - INTRODUCTION

The Chabot-Las Positas Community College District is implementing a Total Cost of Ownership (TCO) process to provide a data driven process to assure adequate, well maintained facility assets to meet the educational mission of the District. The TCO process considers all costs associated with an asset from acquisition to demolition. TCO provides a means to evaluate initial development cost with long term operational cost and ongoing repair, renovation and upgrades. The TCO process provides data to compare District costs to operate, maintain and refurbish with state and national averages to identify areas of improvement. The TCO provides estimates of future costs to operate and maintain facilities providing information for future budgeting and funding decisions. Integral to the TCO process is assessment of custodial, maintenance and grounds staffing needed to maintain the facility to the level of care desired by the Colleges.

The implementation of the TCO program will formalize and integrate the current independent facility development and operations programs. The goals of the TCO program are:

- Establish a defined systematic methodology to evaluate life cycle costs of facility development and operation.
- Establishing custodial, maintenance and grounds staffing based on definable standards of care.
- Establishing operational cost benchmarks and goals for improvement.
- Provide a structured means to project annual costs to operate and maintain assets providing input to the annual budgeting process.
- Identify long term funding needs for repair, renovation and upgrades providing input to the Measure A Bond program funding allocations.

SECTION 2 - BACKGROUND INFORMATION

With the passage of the $498M Measure B Bond in 2004, the Chabot-Las Positas Community College District embarked on a program to provide new and/or updated facilities at Las Positas College and Chabot College. The program was informed through the combination of educational program needs and sustainability guidelines. The Educational Program defined space needs from which the Facility Master Plan was developed. The Board of Trustees 2005 sustainability guidelines[1] provided clear direction to the District to integrate sustainability in the planning and operation of all District facilities. Infrastructure system improvements were developed as part of the Facilities Master Plan including upgrades and expansions to the overall campus utility systems. With the passage of the $950M Measure A Bond in 2016, the District has the opportunity to implement the updated 2012 Facilities Master Plan developed in conjunction with the updated Educational Master Plan and to continue the Board of Trustees commitment to sustainability and stewardship of the District's physical assets.

The recently adopted 2014 Accreditation Standards of the Accrediting Commission for Community and Junior Colleges- Western Association of Schools (ACCJC) instituted accreditation standards for development and long term management of a college's physical assets. The relevant standards are:

SECTION III- RESOURCES[2]

B. PHYSICAL RESOURCES

1. The institution assures safe and sufficient physical resources at all locations where it offers courses, programs, and learning support services. They are constructed and maintained to assure access, safety, security, and a healthful learning and working environment.
2. The institution plans, acquires or builds, maintains, and upgrades or replaces its physical resources, including facilities, equipment, land, and other assets, in a manner that assures effective utilization and the continuing quality necessary to support its programs and services and achieve its mission.
3. To assure the feasibility and effectiveness of physical resources in supporting institutional programs and services, the institution plans and evaluates its facilities and equipment on a regular basis, taking utilization and other relevant data into account.
4. Long-range capital plans support institutional improvement goals and reflect projections of the total cost of ownership of new facilities and equipment.

Throughout the implementation of Measure B, the District has demonstrated full compliance with these new standards. The District is implementing a Total Cost of Ownership program to formalize the process of planning and managing the development and long term operation costs of the District's physical assets.

1 Appendix 1-Board of Trustee 2005 Sustainability Guidelines
2 ACCJC 2014 Accreditation Standards

The District has adopted a Board Policy BP 3250[3] and Administrative Procedure _____[4] outlining the Total Cost of Ownership program to provide a structured data driven approach to funding the development, operation and long term refurbishment of District assets. A comprehensive Total Cost of Ownership process includes the cost of a facility from initial planning and construction, through operation and refurbishment to final replacement or disposal. The District has funded new facility development from local and state bond sources. Annual operating expense including maintenance and operations staff and expenses and utilities are funded from annual General Fund allocations. Major repairs, renovations and updates have been funded from state programs and Measure B bond funds. Regardless of funding source, all investment in District assets are accounted through the District Fund Budgets. This centralized accounting system provides means to transparently identify, track and report on total investment in District facilities.

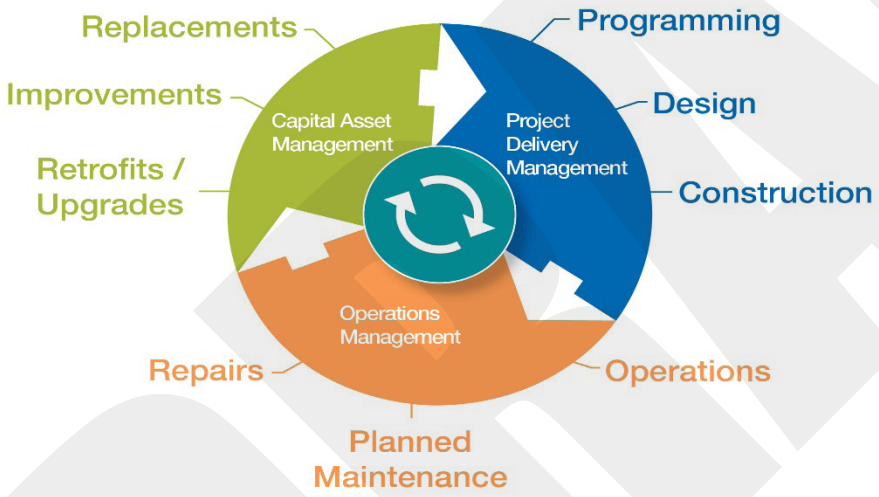
3 Appendix 3-
4

SECTION 3 - TOTAL COST OF OWNERSHIP DEFINITIONS

The Total Cost of Ownership (TCO) process considers all costs associated with an asset from acquisition to demolition. TCO provides a means to evaluate initial development cost with long term operational cost and ongoing repair, renovation and upgrades. The TCO process provides data to compare District costs to operate, maintain and refurbish with state and national averages to identify areas of improvement. The TCO provides estimates of future costs to operate and maintain facilities providing information for future budgeting and funding decisions. Integral to the TCO process is assessment of custodial, maintenance and grounds staffing needed to maintain the facility to the level of care desired by the Colleges.

The Total Cost of Ownership process provides a structured means to measure the effectiveness of the programs implemented and chart program improvements. The Total Cost of Ownership program focuses on three primary facility ownership phases:

- Facility Development- Planning, Design, Construction, Commissioning
- Annual Operations – Maintenance and Operations staffing, building utilities, maintenance costs, repairs.
- Long Term Management- Scheduled and Deferred Maintenance, Renovation, Updating and Reuse.



The APPA (formally the Association of Physical Plant Administrators) has developed a number of Key Performance Factors that can be evaluated and tracked to judge performance against local and national performance of peer organizations. Some of these Key Performance Factors are:

Facility Planning

- Building Utilization Capacity/Load Ratio
- Project Development Cost per Square Foot

Annual Operations

- Custodial Staff per Building Gross Square Foot
- Maintenance staff Per Building Gross Square Foot
- Grounds Staff per Acre
- Electrical- Cost and Use per Gross Square Feet

- Natural Gas- Cost and Use per Gross Square Feet
- Energy Use Intensity- Total Energy Use per Gross Square Feet
- Total Utility Cost per Gross Square Feet
- Annual expense for maintenance and custodial materials, supplies and vendors

Long Term Management

- Facility Condition- Facility Condition Index
- Facility Condition- Amount of Deferred Maintenance
- Average investment for Renovation, Upgrades, Repurpose

DEFINITIONS

The facilities management industry has developed some standardized terms and definitions relating the Total Cost of Ownership. A partnership including the APPA (previously Association of Physical Plant Administrators) published a Glossary and Definitions of Terms associated with the Total Cost of Ownership Management[5]. In addition, the California State Community College Chancellor's Office have defined terms relating to the ownership and operation of community college facilities. Some of the key terms are:

Total Cost of Ownership (TCO)-Lifecycle Cost Management

Total Cost of Ownership (TCO) is a dollar per gross square foot value ($/GSF) associated with a facility. It is a calculation of all facilities-specific costs (not including furnishings or non-facility specific equipment) divided by estimated lifespan of the building (30 to 50 years), and the total gross area.
Facilities specific costs include all construction, preservation, maintenance, and operations costs. TCO is a strategic asset management practice that considers all costs of operations and maintenance, and other costs, in addition to acquisition costs. TCO, therefore includes the representation of the sum total of the present value of all direct, indirect, recurring and non-recurring costs incurred or estimated to be incurred in the design, development, production, operation, maintenance of a facility/structure/asset over its anticipated lifespan. (Inclusive of site/utilities, new construction, deferred maintenance, preventive/routine maintenance, renovation, compliance, capital renewal, and occupancy costs.) Land values are specifically excluded.

Utilization Rate-Capacity/Load Ratio

The utilization rate is an indicator used to determine how efficiently available space is being used. The California Community College Chancellor's Office's (CCCCO) FUSION system lists the Capacity Load Ratio five key space types for each college in the State. The Cap Load Ratio compares the amount educational space required to support college enrollment measured by weekly student contact hours (WSCH) with the CCCCO's established utilization factor for lecture, laboratory, office, library and Audio/Visual spaces on the college campus. The calculations are based on assignable square feet, which is a measure of the space within a building that can be used for instruction. It does not include hallways, mechanical spaces or other non-educational space. A 100% Cap Load Ratio indicates that the available space matches the needs of the student classroom hours. A Cap Load Ratio exceeding 100% indicates more available space than needed to support the calculated need.

$$\text{Capacity Ratio} = \frac{\text{Actual Assignable Square Footage}}{\text{Calculated Required Square Footage (based on student population)}}$$

5 Appendix 3- Asset Lifecycle Model for Total Cost of Ownership Management, Framework, Glossary and Definitions

Lifecycle Cost Analysis

An estimating procedure used to determine the cost of facility system/component renewal based on the average useful life of an individual component. This procedure is typically based upon visual observations, via a facilities conditions assessment/audit, to determine the remaining useful life of a system and the development of cost models for the facility. This process enables multi-year modeling of future replacement costs and timing

Facility Operating Cost per Gross Square Foot (GSF)

An asset management practice that considers the yearly costs of facilities operations and maintenance as compared to the APPA Facility Operating Gross Square Foot Performance Indicator.

- Custodial Costs per GSF: The yearly costs of custodial labor
- Grounds Keeping Costs per GSF: The yearly costs of grounds labor
- Maintenance Costs per GSF: the yearly cost of maintenance labor
- Energy Use per square foot: The yearly Use of gas and electricity
- Utility Costs per square foot: the yearly costs of utilities including gas, electrical, water, sewer. (services for telecommunications, data and other electronic services is not included)
- Facility Maintenance Expenses: the yearly costs of materials, equipment, service providers to maintain the facilities

Energy Usage

This performance indicator is expressed as a ratio of British Thermal Units (BTUs) for each Gross Square Foot (GSF) of facility, group of facilities, site or portfolio. This indicator represents a universal energy consumption metric that is commonly considered a worldwide standard. This energy usage metric can be tracked over a given period of time to measure changes and variances of energy usage. Major factors that affect BTU per gross square foot are outside ambient temperature, building load changes, and building envelope and equipment efficiencies. The total energy usage includes the amount of energy it takes for heating, cooling, lighting and equipment operation per gross square foot. The indicator is traditionally represented as total energy consumed annually or monthly. All fuels and electricity are converted to their respective heat, or BTU content, for the purpose of totaling all energy consumed.

Energy Usage = British Thermal Units = BTUs
Gross Area = GSF

Energy Terms

Terms used when listing energy usage include:
MBTU- Thousand BTU
MMBTU- Million BTU
kW- Kilo Watts- Thousand watts) (electrical power)
MW-Mega Watt (Million watts)
kWh- Kilo Watt hours (electrical energy usage)
MWH-Mega Watt (million watt) Hours (electrical energy usage)

Normal/Routine Maintenance and Minor Repairs

Cyclical, planned work activities funded through the annual budget cycle, done to continue or achieve either the originally anticipated life of a fixed asset (i.e., buildings and fixed equipment), or an established suitable level of performance. Normal/routine maintenance is performed on capital assets such as buildings and fixed equipment to help them reach their originally anticipated life. Deficiency items are typically low in cost to correct and are normally accomplished as part of the annual operation and maintenance (O&M) funds. Normal/routine maintenance excludes activities that expand the capacity of an asset, or otherwise upgrade the asset to serve needs greater than, or different from those originally intended.

Repair(s)

Work that is performed to return equipment to service after a failure, or to make its operation more efficient. The restoration of a facility or component thereof to such condition that it may be effectively utilized for its designated purposes by overhaul, reprocessing, or replacement of constituent parts or materials that have deteriorated by action of the elements or usage and have not been corrected through maintenance.

Preventive Maintenance

Preventive Maintenance (PM) consists of a series of maintenance requirements that provide a basis for planning, scheduling, and executing scheduled maintenance, which is planned versus corrective in nature. The purpose of PM is improving equipment life, to avoiding any unplanned maintenance activity and minimize equipment breakdowns. These PM activities can be defined through a Maintenance Plan (MP). The purpose of a Maintenance Plan is to describe the best means to maximize equipment operational availability, while minimizing equipment downtime. Once developed, the MP will typically identify PM task descriptions and schedules, troubleshooting, corrective maintenance (repair) task descriptions, and spare parts identification, stock (quantity), and any unique storage requirements. This information will be incorporated in the manual, both as tabular data and text.

Deferred Maintenance:

The total dollar amount of existing maintenance repairs and required replacements (capital renewal), not accomplished when they should have been, not funded in the current fiscal year or otherwise delayed to the future. Typically quantified by a comprehensive facilities condition assessment/audit of buildings, grounds, fixed equipment and infrastructure. These needs have not been scheduled to be accomplished in the current budget cycle and thereby are postponed until future funding budget cycles. For calculation of facility condition index (FCI) values, deferred maintenance does not include code generated renovation or renovation for a new use.

Facility Condition Assessment (FCA)/Audit

The structured development of a profile of existing facilities conditions, typically placed in an electronic database format, and populated with detailed facility condition inspection information. A detailed facility condition assessment (FCA) typically involves an assessment team of three professionals (architect, mechanical engineer, electrical engineer). The assessment team depends upon robust, scalable methodologies to assure accurate and consistent information. It is recommended that a FCA be done on a regular basis, approximately every three years, or conduct a portion of the overall portfolio annually. The FCA identifies existing deficient conditions (requirements), in a logical grouping, with priorities, and associated recommended corrections and corrective costs. Costs are generally based upon industry standard cost databases (e.g., Building News, Craftsman Book Company, Richardson General Construction Estimating Standards, RSMeans).

Facility Condition Index (FCI)

A comparative industry indicator/benchmark used to indicate the relative physical condition of a facility, group of buildings. The facility condition index (FCI) is expressed as a ratio of the cost of remedying existing deficiencies (Deferred Maintenance, DM) and capital renewal (CR) requirements to the current replacement value (CRV) (i.e., FCI= (DM+CR)/CRV). The FCI provides a corresponding rule of thumb for the annual reinvestment rate or reserve account to prevent further accumulation of deferred maintenance deficiencies. The FCI value is a snapshot in time, calculated on a periodic basis. The FCI is represented on a scale 0% to 100%, with higher FCI values, representing poorer facility's condition. A "fair to good facility" is generally expressed as having an FCI of less than 10-15%.

Facilities Deterioration Rate:

Each element in a facility has an effective useful life. The replacement of these elements over time may be expressed as a percentage of current total building replacement value per year. A benchmark deterioration rate for a reasonably well maintained facility is approximately 2.5% of the total building replacement value per annum.

Current Replacement Value (CRV)

The total expenditure in current dollars required to replace any facility at the institution, inclusive of construction costs, design costs, project management costs and project administrative costs. Construction costs are calculated as replacement in function vs. in-kind. The value of design (10%), project management (5%), and administrative costs (5%) can be estimated at 20% of the construction cost.

Recapitalization/Reinvestment Rate

A facility, system, or component with existing deficiencies will deteriorate at a faster rate than a component that is in good condition. The level of annual funding for facility renewal and deferred maintenance expressed as a percentage of facility replacement values. Altering the recapitalization/reinvestment rate has direct impact upon the facility condition index (FCI) and associated deferred maintenance levels over time.

Adaptation/Renovation/Modernization

The improvement, addition or expansion of facilities by work performed to change the interior alignment of space or the physical characteristics of an existing facility so it can be used more effectively, be adapted for new use, or comply with existing codes. Includes the total amount of expenditures required to meet evolving technological, programmatic or regulatory demands.

APPA Maintenance, Custodial and Grounds Level of Care Standards

The APPA defined standards[6] for five levels of care for the maintenance of facilities and grounds in conjunction with their Key Performance Indicators. The standards can be used by institutions to develop staffing levels based on the institutions desired level of care for each of the three areas of maintenance. The standards are described as follows:

Element	Level 1	Level 2	Level 3	Level 4	Level 5
Maintenance	Showpiece Facility	Comprehensive Stewardship	Managed Care	Reactive Management	Crisis Response
Custodial	Orderly Spotlessness	Ordinary Tidiness	Casual Inattention	Moderate Dinginess	Unkempt Neglect
Grounds	Well- Manicured Landscape	High Level of Maintenance	Moderate Level of Maintenance	Moderately Low Level of Maintenance	Minimum Level of Maintenance

Nationwide surveys of higher educational institutions by School Dude[7], indicated that 88 percent have established APPA Level 2 or 3 as the standard of care level for their institutions.

6 Appendix XX APPA Maintenance, Custodial and Grounds Standards of Care
7 School Dude is a national provider of maintenance work order software. Appendix 9.

SECTION 4 - TOTAL COST OF OWNERSHIP PROGRAM

The District's adoption of a Total Cost of Ownership (TCO) program recognizes the need to formalize and integrate a number of current independent facility development and operations initiatives and programs. The Total Cost of Ownership Program provides a number of benefits to the District including:

- Providing a structured approach to the stewardship of the District's assets
- Providing Benchmarks to measure facility operations performance against Goals and identify opportunities for improvement
- Creating a proactive rather than reactive approach to project development and facility operation
- An objective means to set custodial, maintenance and grounds staffing using national standards of care.
- Develop performance Information to establish facility operating budgets
- Identify long term funding needs, and sources to support a structured facility renovation and replacement program

The District's Total Cost of Operation program is divided into three major elements:

- **Facility Development Cost**- the cost of planning, designing, constructing, furnishing and commissioning new facilities.
- **Annual Operating Costs**- the cost of staff, utilities and maintenance and operations expenses to maintain the facilities in operating condition with buildings and grounds clean and maintained.
- **Long Term Management Costs** – the costs of scheduled and deferred Maintenance, renovation and replacement and facility repurpose and upgrades.

SECTION 4.1 - FACILITY DEVELOPMENT COST

The Total Cost of Ownership process begins with the initial planning of a new facility or renovation of existing facilities. While the Facility Development Cost typically only represents 10%-15% of the Total Cost of Ownership, the cost must be well managed to assure long term value of the facility.

The District uses an integrated master planning approach that aligns the Educational Master Plan with the Facility Master Plan. The Educational Master Plan is developed from educational program reviews that articulate needed and desired facility attributes to support the projected educational program. Facility projects define how space needs will be meet; through new facilities or renovation of existing space. The Facility Master Plan combines facility projects with supporting infrastructure improvements adding deferred maintenance needs, upgrades required by code or technology and management.

Once a project is approved by the Board of Trustees, a project team is assembled to define the project. The project team includes user groups, designers, facility development management, college management and operations and maintenance staff. The project definition includes educational programs' unique space requirements and special needs, cost budget, schedule and specialized operation and maintenance requirements.

Facility Development Process

The process to plan, design, construct, commission and open a new facility includes:

- Develop the facility space program to meet the Educational Plan- define space needs by assessing anticipated student enrollment usage (WSCH), special space needs, equipment and furnishings requirements and other functional characteristics.

- Evaluate the impact of the new facility on the Cap Load Ratio[8]- calculate the Cap Load Ratio when the space will be available for use.
- Evaluate the impact of the new facility on the campus infrastructure—include the cost to expand or modify campus utilities or services to support the new or remodeled facility.
- Evaluate options to integrate renovation, upgrades or deferred maintenance projects- include planned or identified adjacent renovation or deferred maintenance projects or required upgrades in the new space project.
- Define the project including specific use, cost budget, schedule and quality—develop budget and schedule based on the space program, develop level of quality based on District and Campus standards.
- Develop and evaluate Life Cycle Cost Model[9]- evaluate options for development using long term life cycle cost including operations cost rather than first cost only.
- Integrate District standards of materials and systems into the design-direct the design team to use District standardized equipment, materials and systems to reduce maintenance and operations training and spare parts inventory[10]
- Perform Value Engineering as systems are selected, update Life Cycle cost analysis as necessary- evaluate major systems for performance against cost to select the best value, not just the lowest initial cost.
- Use national sustainability guidelines such as LEED and California Building Code-CAL Green during the design and construction-identify goals and integrate path to certification choices in the planning and design process.
- Manage the design process- perform detailed reviews at each design milestone to confirm compliance with program, design basis and project budget. Reviews include representatives from user groups, M&O, Safety, Information Technology and college administration.
- Construction Contracting- select the appropriate contracting method and comply with all public contracting regulations to select building general contractor.
- Inspect the construction work to ensure compliance with design and codes, test and document- maintain structured inspection process with comprehensive testing.
- Commission building systems to ensure performance of integrated systems—employ expanding commissioning involving the commissioning agent throughout the design and construction to provide another long term operations perspective in the development process.
- Collect, organize As-Built documents, warranties, operations manuals spare parts—collect and organize maintenance and operations records as the facility is being constructed.
- Develop operations plan that includes custodial and maintenance staffing as well as specialized service contractors--Develop staffing budgets to adjust staff to maintain levels of maintenance acceptable to the College.
- Establish preventative maintenance and scheduled maintenance scope, timing and budget- involve maintenance and operations staff in the design and construction process for training and operations planning.

Capacity to Load Ratios

Part of the new space or renovation decision is an evaluation of the effective use of existing facility assets. The California Community College System has established the Capacity to Load Ratio (Cap Load Ratio) as the state standard for effective space utilization on community college campuses. The Cap Load Ratio compares space required to support student enrollment using Weekly Student Contact Hours (WSCH) with the reasonable use of the available space. A Cap Load Ratio of 100% indicates the effective use of available space. Either new or remodeled

8 Appendix 4- FUSION Project Report Las Positas Building 2100
9 Appendix 5-Life Cycle Cost Analysis- prepared for the new Academic Building 100- Las Positas
10 District and Campus Building Standards http://www.clpccd.org/facilities/

space solutions should result in a Cap Load Ratio at project completion approaching 100% within five years of completion.

The Capacity Load Ratio is a key Performance Metric. The implementation of the 2004 Facility Master Plan could be evaluated by the changes in the Cap Load Ratio from (FY 2005/06)[11], and after (FY 2015/16)[12] implementation of the building program. However, the Cap Load Ratio forecast in 2005 proved to be significantly overstated as a result of the financial recession resulting in lowered enrollments, causing some areas to be overbuilt by 2015/16.

Las Positas Cap Load Ratio

The Las Positas program primarily focused on development of new space to support new programs and a growing student population at the College. As State funding and student enrollment dipped during difficult economic times, some new programs grew slower with corresponding lowered student enrollment than projected resulting in an excess of lecture or classroom space.

Chart 4.1.A - Las Positas FY 05/06 WSCH Projection and Actual to FY 15/16

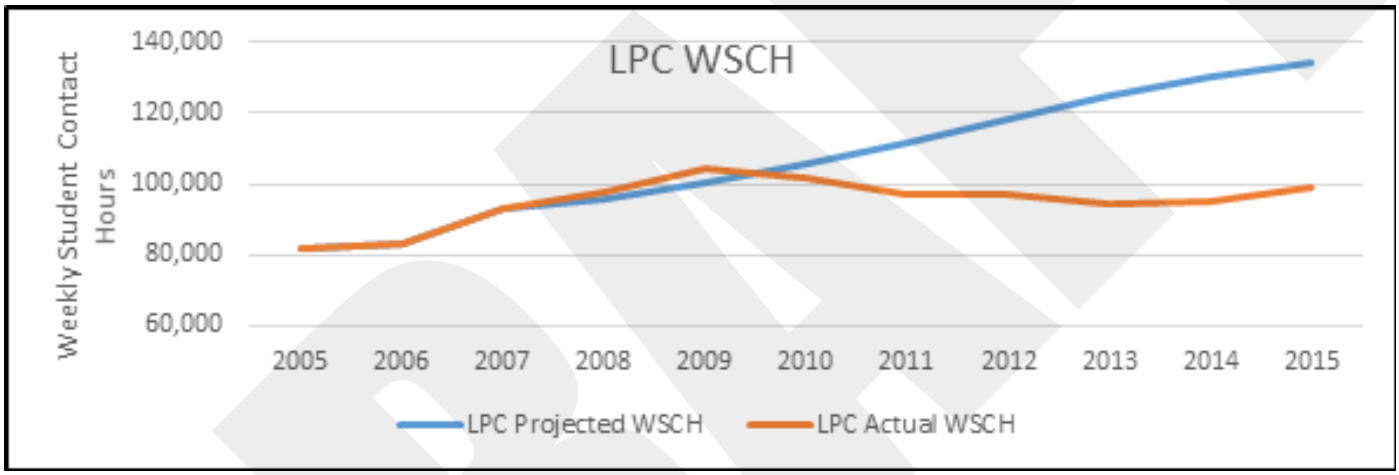
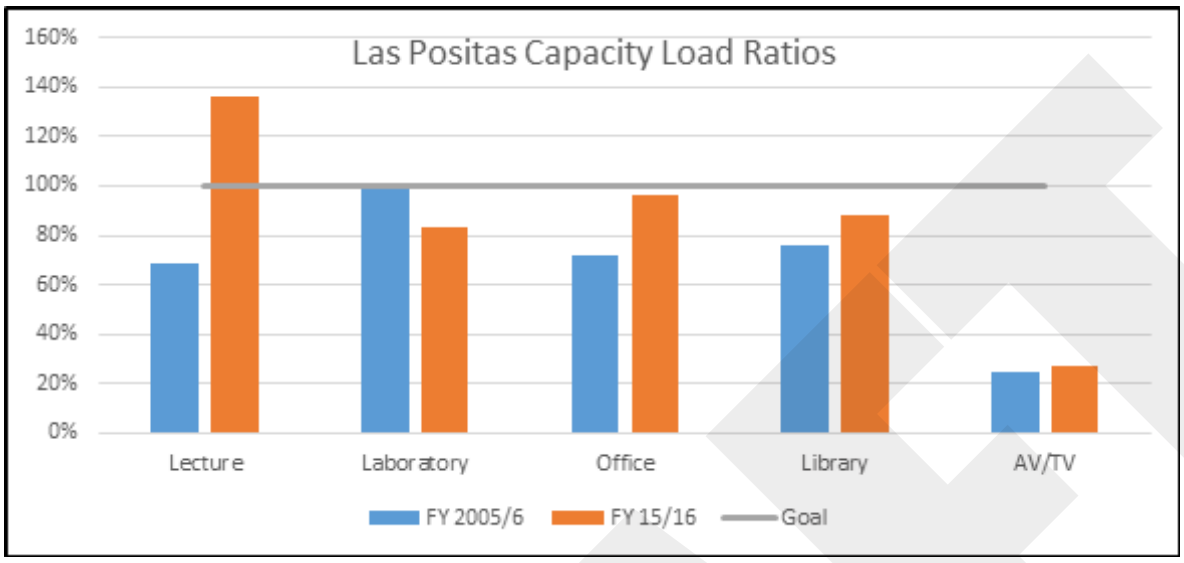


Table 4.1.B - Las Positas College Capacity Load Ratio FY 05/06 and FY 15/16

	Las Positas 2005/06	Las Positas 2015/16
Lecture	67%	136%
Laboratory	100%	84%
Office	72%	96%
Library	76%	88%
Audio Visual/TV	25%	27%

11 Appendix 6- FUSION FY2005/06 Las Positas and Chabot Campus Capacity Load Ratios
12 Appendix 6- FUSION FY2015/16 Las Positas and Chabot Campus Capacity Load Ratios

Chart 4.1.C - Las Positas Capacity Ratio Load Comparison- FY 05/06 and FY 15/16



Chabot Cap Load Ratios

The Chabot College program focused on renovation or replacement of existing space with limited additional new space. The Educational Plan anticipated that the high cap load would gradually reduce with increased student enrollment. The high cap load lecture space in FY 2005/06 anticipated growth through 2015/16 which did not occur resulting in a continuing overbuilt condition in 2015/16.

Chart 4.1.D - Chabot FY 05/06 WSCH Projection and Actual to FY 15/16

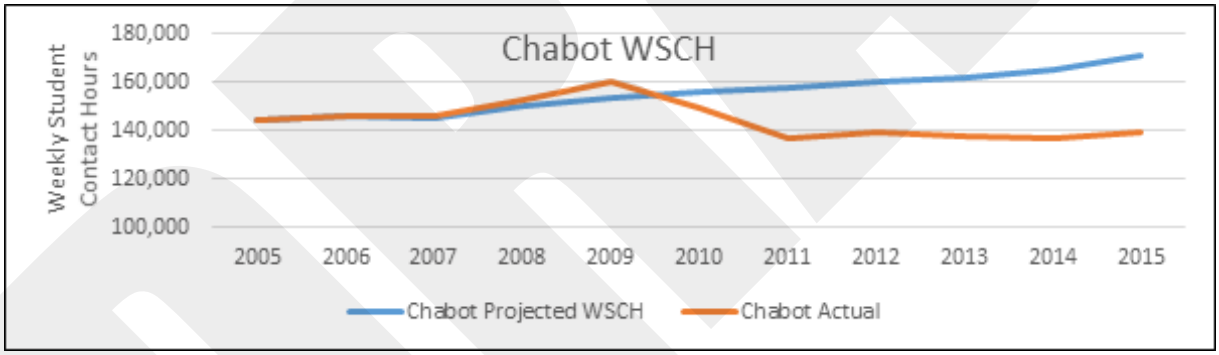
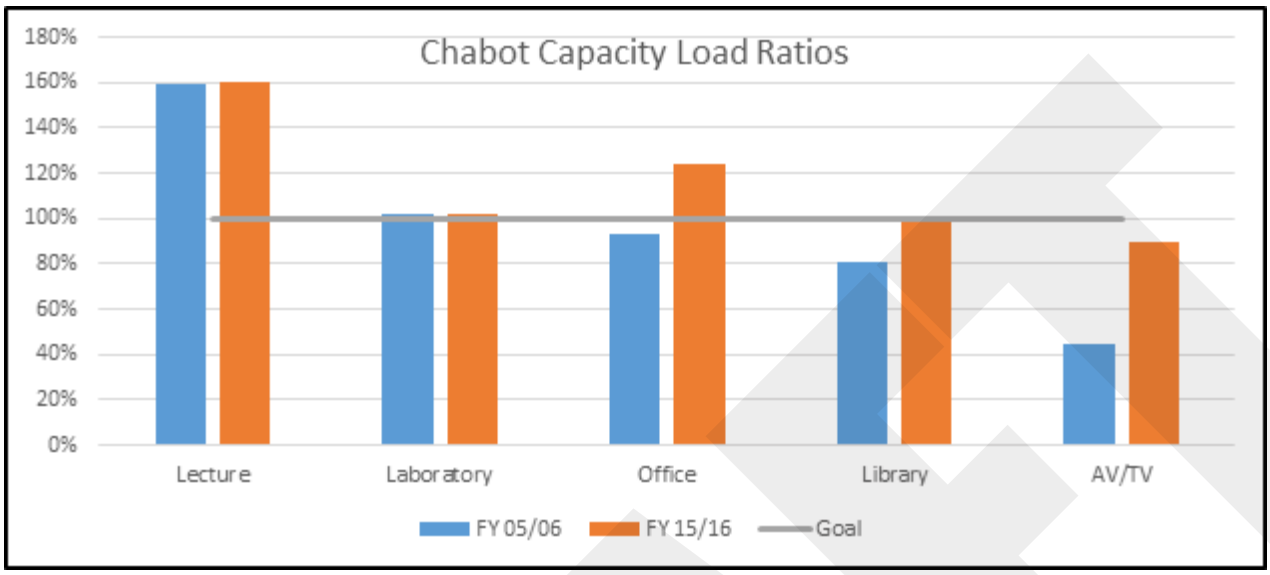


Table 4.1.E - Chabot College Capacity Load Ratio FY 05/06 and FY 15/16

	Chabot 2005/06	Chabot 2015/16
Lecture	159%	160%
Laboratory	102%	104%
Office	93%	123%
Library	81%	101%
Audio Visual/TV	45%	90%

Chart 4.2.F - Chabot Capacity Load Ratios FY 05/06 and FY 15/16



SECTION 4.2 - ANNUAL OPERATIONS COST

The Annual Operations Cost includes

- Maintenance and operations staff wages including maintenance, custodial, grounds and management staff,
- Utilities including gas, electrical, water and sewer
- Facilities maintenance expenses including materials, parts and service vendors

These annual costs will fluctuate due to weather, degree of repairs and changes in building use; but do show trends over time.

SECTION 4.2.1-MAINTENANCE AND OPERATIONS STAFFING

The Maintenance and Operations staff are a District resource. The Director of Maintenance and Operations allocates staff resources to the colleges. Each college has dedicated resources with a full time campus M&O manager. Key trade technicians including electrician and locksmith are shared between the colleges as needed. The M&O staff also includes part time/on-call custodial and grounds staff to respond to work load changes and backfill full time employees due to vacation and sick leave. The following tables show the Full Time Equivalent (FTE) staffing levels for the past six years based on M&O organization charts including management and administration staff. The 2015/16 M&O organization[13] defines the structure and staffing.

The Association of Physical Plant Administrators (APPA) has developed staffing guidelines for maintenance, custodial and grounds staff based on building configuration and use. The guidelines suggest staffing levels for APPA's five defined levels of performance or Standards of Care. The five levels range from Level 1- excellent to Level 5- marginal or poor[14]. APPA and others have developed calculators that calculate suggested staffing based on a building configuration and use.

13 Appendix 8-Maintenance and Operations Organization FY 2015/16
14 Appendix 9-APPA Level of Quality Definitions for Custodial, Maintenance and Grounds maintenance

One tool used by the District to estimate custodial staffing levels is the DabbleFox program providing a detailed room by room assessment of custodial requirements, using assignable square feet and specific flooring materials. The DabbleFox program allows the establishment of an APPA level for each room. The District model is based on a desired Level 2 for restrooms and cafeterias, level 4 for non-student areas such as storage and utility area. The remaining spaces are set at Level 3[15]. The DabbleFox Building summary lists the suggested work hours required to achieve the desired level of custodial maintenance.[16]

Table 4.2.1.A - DabbleFox Calculated Custodial Staffing levels, Las Positas and Chabot

	Level 3	Level 4	GSF- FY15/16	GSF/ Custodian
Las Positas	**16.0**	12.0	468,206	**29,262**
Chabot	**25.0**	20.0	721,614	**28,864**
Total	**41.0**	32.0		

Note: This does not include supervisors

For comparison, the District used a high level calculation model developed by Goshen College using APPA recommended performance factors. Their spreadsheet calculates staffing for all five APPA levels for maintenance, custodial and grounds staff. Input to the model includes campus wide assignable square footage for each type of space based on the educational use category, areas of lobbies, corridors and other non-assignable space. The model adds adjustments for areas of heavy use, various flooring types and age of the facilities[17]. The staffing difference between the models is due to the fact that Goshen model includes supervisors in the staffing count while DabbleFox includes supervisors in a management category. Each College has two custodial supervisors which have been added to the DabbleFox model which correlates with the Goshen staffing model.

Table 4.2.1.B - Goshen College Model Calculated Custodial Staffing levels

	Level 1	Level 2	Level 3	Level 4	Level 5
Las Positas	44.5	24.5	**18.0***	14.5	13
Chabot	73.0	38.0	**28.0***	22.5	20.0
Total	113.5	62.5	**46.0***	37.0	33.0

*includes 2 supervisors per campus and one manager not in the DabbleFox model

15 DabbleFox typical Room Custodial evaluation
16 DabbleFox Custodial Staffing Summary
17 Goshen College Model- Las Positas College and Chabot College

Custodial Staffing per Gross Square Feet

A key performance indicator is the total building Gross Square Feet divided by the number of custodial staff. The higher the gross square feet per staff the lower the level of attention. The combination of adding new buildings and reducing staff due to budget restrictions during the past few years has increased the work load of the custodial staff. The current staffing is below the goal of the APPA Standard Level 3 level of attention as calculated from the DabbleFox application. From 2007 to 2015, the Las Positas custodial staff was reduced while new buildings were completed increasing GSF by over 60% resulting in an overall increase of 77% in the amount of GSF/custodian. At Chabot the building GSF has increased only 13%, the custodial staff was reduced resulting in an overall increase of 40% in the amount of GSF/custodian. The metric is based on custodial workers not including supervisors or managers.

Chart 4.2.1.C - Las Positas GSF/ Custodian Historical data

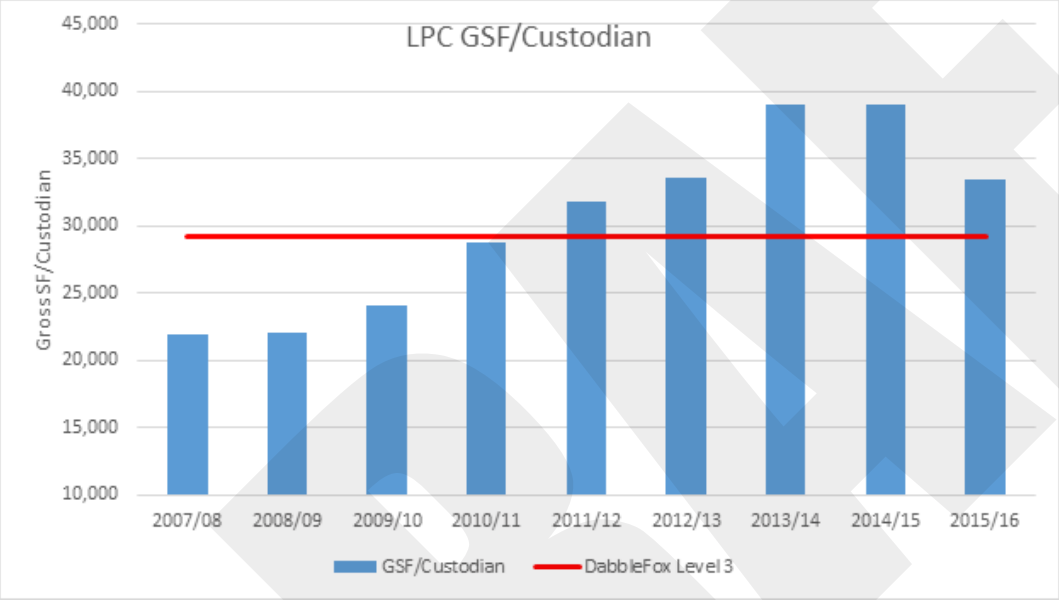


Table 4.2.1.D - Las Positas Gross Square Feet Per Custodian Historical data

Las Positas	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Gross SF	286,056	309,184	312,448	374,780	382,281	403,070	468,206	468,206	468,206
Custodial	13	14	13	12	12	11	11	12	14
Supervision	2	2	2	2	2	2	2	2	2
GSF/Custodial	22,004	22,085	24,034	28,829	31,857	33,589	39,017	39,017	33,443

Chart 4.2.1.E - Chabot College GSF/ Custodian Historical Data

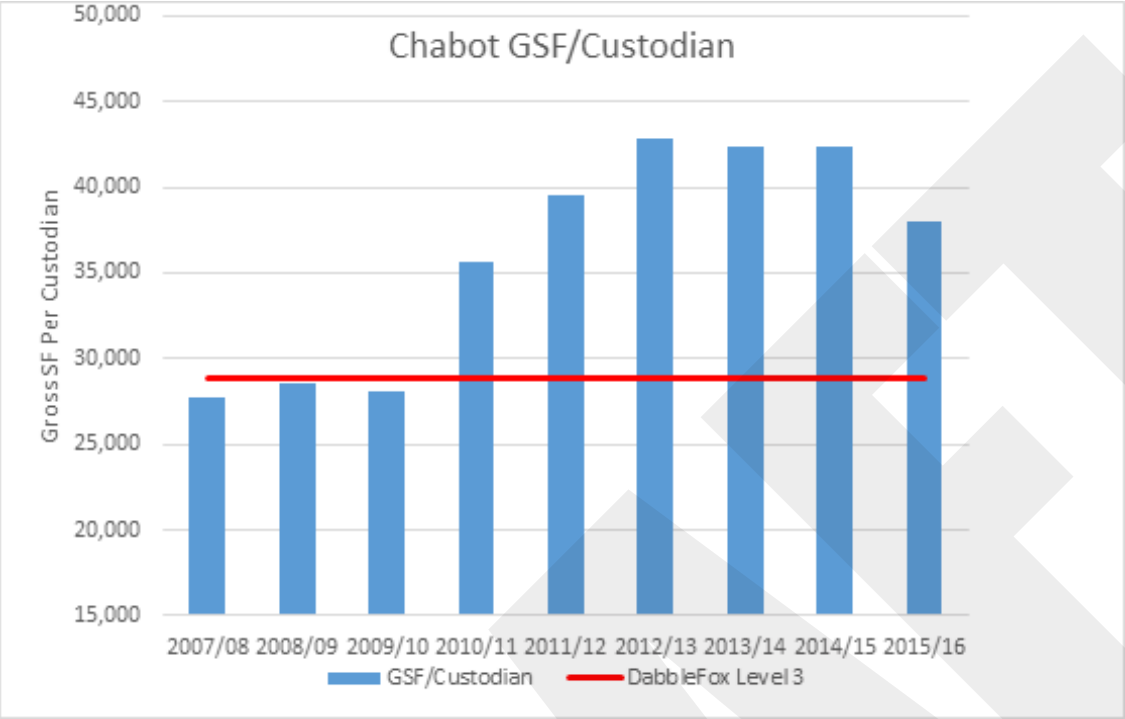


Table 4.2.1.F - Chabot Gross Square Feet per Custodial Staff Historical Data

Chabot	07/08	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Gross SF	636,856	629,133	629,133	712,080	712,080	728,642	720,967	720,967	721,614
Custodial	24	23	24	20	18	17	17	18	20
Supervision	2	2	2	2	2	2	2	2	2
GSF/Cust	26,436	27,580	26,012	35,604	39,560	42,861	42,410	40,054	36,081

Maintenance Staffing Per Gross Square Feet

Maintenance staff are a joint resource between the campuses. Skilled trade (such as electrician or locksmith) time is allocated 60% to Chabot and 40% to Las Positas. The Goshen model was used for suggested staffing at a Level 3 level of attention. The key performance indicator of building Gross Square Feet per maintenance staff is based on maintenance workers not including supervisors or managers. The District M&O maintenance staff includes a full time vehicle mechanic to service district vehicles in addition one manager at each college. The key performance evaluation for maintenance staff considers the total combined gross square feet of both campuses. As with custodial staff, the combination of new space and constrained budgets caused staffing coverage to drop below the goal of APPA Level 3 level of attention.

Table 4.2.1.G - Goshen Model Calculated Maintenance Staffing

Maintenance	Level 1	Level 2	Level 3	Level 4	Level 5	Actual 15/16
Las Positas	10.5	7.5	**6.0**	4.0	3.0	**6.0**
Chabot	17.5	13.5	**10.0**	6.5	4.0	**7.0**
Combined	28.0	21.0	**16.0**	10.5	7.0	**13.0**

Chart 4.2.1.H - Combined GSF per Maintenance staff Historical data

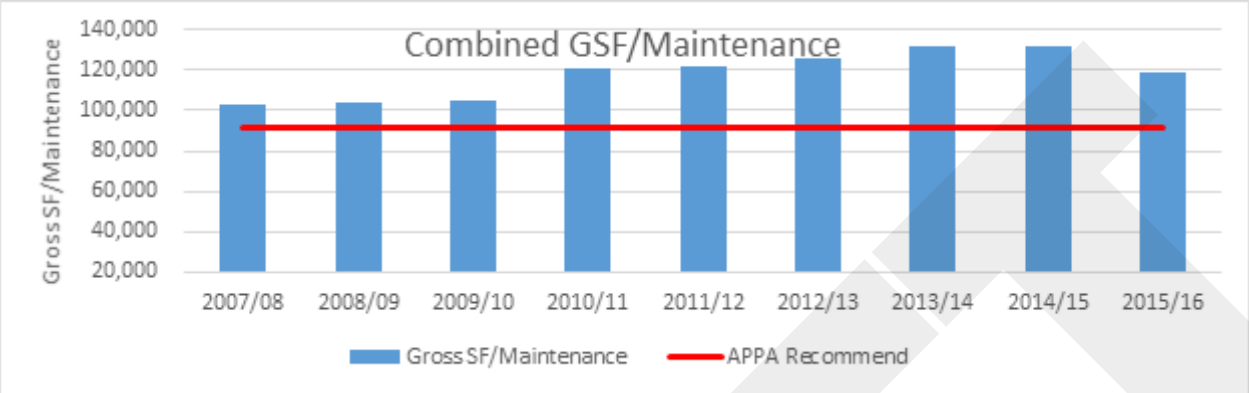


Table 4.2.1.I - Combined Gross SF per Maintenance staff

	09/10	10/11	11/12	12/13	13/14	14/15	15/16
Gross SF	941,581	1,086,860	1,094,361	1,131,712	1,189,173	1,189,173	1,189,173
Maint Staff	9	9	9	9	9	9	10
Supervisor*	3	3	3	3	3	3	3
GSF/Maint	104,620	120,762	121,596	125,746	132,130	132,130	118,982

- Supervisor group includes full vehicle maintenance mechanic not assigned to building maintenance.

Grounds Staffing Levels

The grounds staff maintains the exterior grounds landscaping including lawn, shrubs, trees and flowering plants. The Las Positas campus is 145 acres and the Chabot campus is 95 acres. They are also responsible for the maintenance of the athletic fields. The athletic field maintenance includes mowing, irrigation, striping and repairs after athletic events. The colleges have multiple athletic fields. Las Positas added an artificial turf soccer field and a natural turf football/track field and over 30 acres of new development. Chabot's athletic fields were upgraded but not expanded converting to an artificial turf football field with upgraded natural turf soccer, baseball and softball fields.[18] Grounds staff do share some time between campuses as needed. The Goshen model was used for suggested staffing levels to meet a Level 3 level of attention. Recommended staffing at a Level 3 are based on the type of landscaping. Level 3 coverage per person ranges from 16,000 SF/grounds staff for flower beds to 6 acres/grounds staff for football fields. Grounds staff work load increased as new buildings with upgraded landscaping and new athletic fields were added during the Measure B program without corresponding increases in Grounds staff.

Table 4.2.1.J - Goshen Model Calculated Grounds Staffing

Grounds Staff	Level 1	Level 2	Level 3	Level 4	Level 5	Actual 15/16
Las Positas	15.5	11.5	**5.5**	4.5	2	**4.0**
Chabot	16.0	10.0	**7.5**	6.0	2.5	**6.0**
Total Grounds	31.5	21.5	**13.0**	10.5	4.5	**10.0**

18 Appendix 17 Las Positas and Chabot Campus Maps

Chart 4.2.1.K - Combined Grounds Staffing Historical Data

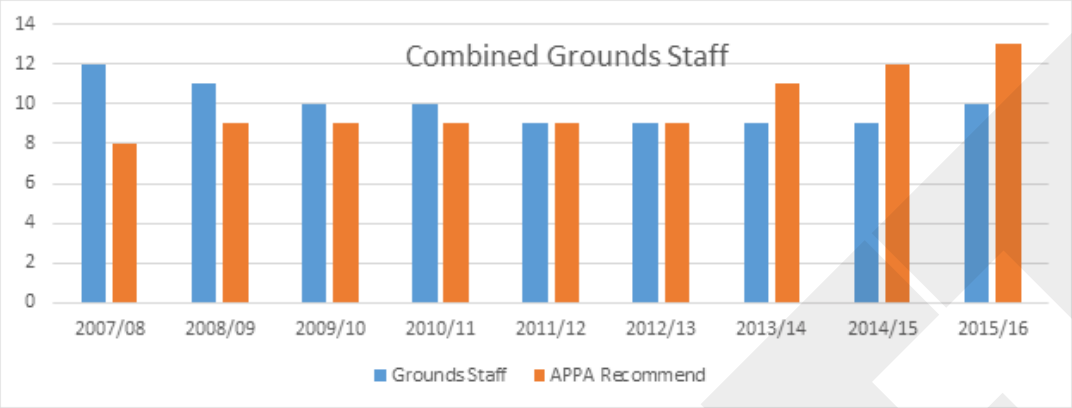


Table 4.2.1.L - Combined Grounds Staffing Historical Data

Grounds	08/09	09/10	10/11	11/12	12/13	13/14	14/15	15/16
APPA Est	9	9	9	9	9	11	12	13
Total	11	10	10	9	9	9	9	10

Calculated Combined Colleges M&O Staffing Levels

The following table summarizes the suggested staffing levels combining the DabbleFox and Goshen models for custodial, maintenance and grounds. The last column contains the actual Las Positas and Chabot M&O staffing for FY 2015/16. The staffing numbers are Full Time Equivalent (FTE) positions. These M&O staffing numbers include managers and supervisors but do not include the M&O Director nor administrative support staff.

Table 4.2.1.M - Las Positas Total M&O APPA Recommended Staffing levels

Las Positas	Level 1	Level 2	Level 3	Level 4	Level 5	Actual 15/16
Maintenance	10.5	7.5	**6.0**	4.0	3.0	**5.5**
Custodial	48.0	28.5	**18.0**	15.0	14.0	**16.0**
Grounds	17.5	11.5	**5.5**	4.5	2	**4.0**

Table 4.2.1.N - Chabot Total M&O APPA Recommended Staffing Levels

Chabot	Level 1	Level 2	Level 3	Level 4	Level 5	Actual 15/16
Maintenance	17.5	13.3	**10.0**	6.5	4.0	**7.5**
Custodial	83.0	49.0	**28.0**	24.0	20.5	**22.0**
Grounds	23.0	15.0	**8.5**	6.0	2.5	**6.0**

Comparing the actual FY 2015/16 staffing with the DabbleFox and Goshen College APPA based staffing, indicates that staff additions are necessary to provide the desired APPA level 3 level of attention at both colleges.

SECTION 4.2.2- MAINTENANCE AND OPERATIONS STAFFING COSTS

Total Maintenance and Operations Staff Cost

The total cost of Maintenance and Operations staff is a key performance indicator. The following staff cost budgets include salary, fringe benefits, overtime for regular classified staff, supervisors, managers and hourly staff for the past two budget years (FY 2014/15 and FY 2015/16) and the current budget year FY 20116/17[19]. Actual cost for FY 2014/15 and FY 2015/16 vary slightly from budgets due to staffing changes throughout the year. Annual budgets are used to allow evaluation of projected staff salary and benefits with planned staffing.

Table 4.2.2.A - Total Las Positas M&O Staff Budgets

Las Positas	FY 14/15	FY 15/16	FY 16/17	Staffing 16/17
Gross SF	468,206	468,206	459,758	459,758
Maintenance	631,380	658,913	716,957	6.5
Custodial	1,128,915	1,305,585	1,403,550	16
Grounds	359,087	368,659	332,620	4
Management	175,722	173,786	225,796	2
Total	2,295,104	2,506,943	2,678,923	28.5
Cost/GSF	$ 4.90	$ 5.35	$ 5.83	

Table 4.2.2.B - Total Chabot M&O Staff Budgets

Chabot	FY 14/15	FY 15/16	FY 16/17	Staff FY 16/17
Gross SF	720,967	721,614	721,614	721,614
Maintenance	822,326	894,983	948,922	7.5
Custodial	1,830,666	1,764,734	1,915,520	22
Grounds	559,517	567,790	611,761	6
Management	175,722	173,786	225,796	2
Total	3,388,231	3,401,293	3,701,999	37.5
Cost/GSF	$ 4.70	$ 4.71	$ 5.13	

Table 4.2.2.C - Combined Total M&O Staff Budgets

Chabot	FY 14/15	Staff	FY 15/16	Staff	FY 16/17	Staff
Gross SF	1,189,820		1,189,820		1,181,820	
Maintenance	$ 1,453,706	12	$ 1,553,896	13	$ 1,665,879	14
Custodial	$ 2,959,581	33	$ 3,070,319	34	$ 3,319,069	38
Grounds	$ 918,604	9	$ 936,449	10	$ 944,381	10
Management	$ 351,444	3	$ 347,572	3.5	$ 451,593	4
Total	$ 5,683,335	57	$ 5,908,236	60.5	$ 6,380,922	66
Cost/GSF	$4.78		$4.97		$ 5.40	

19 Appendix 13-Account Codes XXXXX –XXXX FY 2015/16

Projected Annual Staffing, Staff Wages and Staff Cost per GSF- FY 17/18- to FY 21/22

The following five year staff budgets are based on desired APPA Level 3 level of attention staffing recommendations adjusted for the planned changes in building Gross Square Feet resulting from implementation of the Measure A bond program[20]. The approved FY 16/17 budget and staffing is the starting point. The FY 17/18 projected budget incorporates additional staff to achieve Level 3 level of attention for custodial, maintenance and grounds staff. Note the five percent cost per GSF increase at LPC during FY 19/20 is based on adding new sports fields without any additional new buildings.

Table 4.2.2.D- Las Positas 5 Year Projected M&O Staffing and Costs

Las Positas	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Gross SF	459,757	459,758	496,339	496,339	536,092	562,503
Maintenance	6.5	7.5	7.5	7.5	8.5	8.5
Custodial	16	18.0	20.0	20.0	21.0	22.0
Grounds	4	5.0	5.0	7.0	7.0	7.0
Management	2	2.0	2.0	2.0	2.0	2.0
Total Staff	28.5	32.5	34.5	36.5	38.5	39.5
Est Staff Cost	$2,685,388	$3,018,026	$3,176,422	$3,347,273	$3,580,582	$3,703,292
Est Cost/GSF	$5.84	$6.56	$6.40	$6.74	$6.68	$6.58

Table 4.2.2.E- Chabot 5 Year Projected M&O Staffing and Costs

Chabot	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Gross SF	721,614	721,614	727,530	728,794	739,606	762,606
Maintenance	7.5	8.5	9.5	9.5	9.5	10.5
Custodial	22	28.0	28.0	28.0	29.0	30.0
Grounds	6	8.0	9.0	10.0	10.0	10.0
Management	2	2.0	2.0	2.0	2.0	2.0
Total	37.5	46.5	48.5	49.5	50.5	52.5
Est Staff Cost	$ 3,577,276	$4,188,906	$4,399,585	$4,518,288	$4,668,078	$4,930,498
Est Cost/GSF	$ 4.96	$5.80	$6.05	$6.20	$6.31	$6.47

Table 4.2.2.F Combined 5 Year Projected M&O Staffing and Costs

Chabot	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Gross SF	1,181,372	1,181,372	1,223,869	1,225,133	1,275,698	1,325,109
Maintenance	14	16	17	17	18	19
Custodial	38	46	48	48	50	52
Grounds	10	13	14	17	17	17
Management	4	4	4	4	4	4
Total	66	79	83	86	89	92
Est Staff Cost	$6,262,664	$7,206,932	$7,576,007	$7,865,561	$8,248,660	$8,633,790
Est Cost/GSF	$5.30	$6.10	$6.19	$6.42	$6.47	$6.52

20 Appendix 14-Projected Projects with GSF adjustments

SECTION 4.2.3 - UTILITY USAGE AND COST

Energy Sources Overview

Each college obtains energy from both on-site and utility sources. Las Positas has 2.3 MW of on-site solar generating over 50% of the campus electrical energy use. Chabot has 1.0 MW of solar and 300 kW of natural gas driven co-generation engines which combined generate 30% of the campus electrical energy use. The hot exhaust gases from the co-generation engines are used to heat the swimming pool and campus heating loop. The campuses purchase electrical energy from Pacific Gas and Electric and purchase natural gas through SPURR (School Project for Utility Rate Reduction) a Joint Powers Authority that provides access to the wholesale gas market to California educational institutions.

Las Positas Energy Source and Use

Las Positas exports electrical energy most days. The table below shows the annual amount of energy exported. The exported energy amount is deducted from the sum of energy purchased from PG&E and the energy produced on site to calculate the total energy used by the College. The PG&E grid acts as a battery, accepting over generation and returning that energy at night. The college benefits financially as they sell over generation at daytime peak rates and purchase evening energy at off-peak or part-peak evening rates.

Table 4.2.3.A - Las Positas Historical Energy Source and Use

Las Positas	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	374,780	382,281	403,070	468,206	468,206	468,206
PGE MWh	4,529	4,632	3,573	3,406	3,263	3,798
PV MWh- Total	1,797	1,891	3,025	4,021	3,688	1,170
PV MWh-Export	0	(750)	(1,344)	(1,245)	(1,183)	(495)
Elect-MWh Total	6,326	5,773	5,255	6,186	5,767	5,908
Gas MTherms	176	231	253	241	233	262

Chabot Energy Source and Use

Chabot does not export electrical energy. The co-generation system operates continuously, providing electrical energy plus heat from the engine exhaust. The exhaust heat is used primarily to heat the swimming pools with any surplus added to the campus building hot water heating loop. The natural gas usage is approximately 50% gas to power the co-gen units and 50% gas for building heating.

Table 4.2.3.B - Chabot Energy Source and Use

Chabot	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	712,080	728,642	720,967	720,967	721,614	721,614
PGE MWh	3,367	3,270	3,087	3,151	3,151	3,580
PV MWh	1,464	1,567	1,514	1,479	1,463	1,291
Co Gen MWh	2,410	1,363	2,094	2,068	1,717	2,202
Elec MWh Total	7,232	6,200	6,693	6,700	6,332	7,073
Gas MTherm	567	571	523	488	481	514

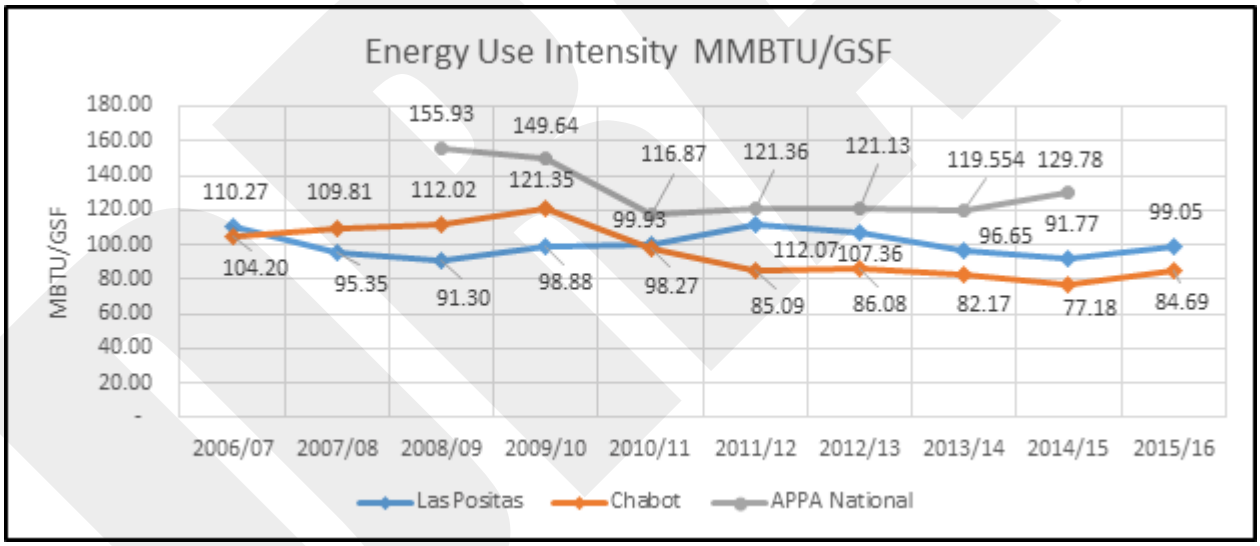
Energy Use Intensity

Energy Use Intensity (EUI) is a key performance benchmark. EUI is calculated as the total energy use in Million British Thermal Units (MMBTU) divided by Building Gross Square Feet. The EUI difference between the two colleges can be ascribed to the warmer inland climate at Las Positas requiring more air conditioning energy than the coastal climate at Chabot. The APPA national EUI average is 130[21]; indicating the Colleges are significantly more energy efficient than the APPA national averages. The District's participation in the Statewide Community College Energy Star Program indicated that Las Positas is 25% more efficient and Chabot 45% more efficient than the Energy Star national portfolio of comparable educational institutions[22].

Table 4.2.3.C - Las Positas Historic Energy Use Intensity

Las Positas	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	374,780	382,281	403,070	468,206	468,206	468,206
Elect MMBTU	19,883	19,703	17,936	21,114	19,684	20,166
Gas MMBTU	17,568	23,139	25,337	24,136	23,283	26,210
Total MMBTU	37,451	42,842	43,273	45,251	42,968	46,376
EUI	98.27	112.07	107.36	96.65	91.77	99.05

Chart 4.2.3.D - Energy Use Intensity Comparison



21 Appendix 15-APPA National Averages
22 Appendix 16-Energy Star Reports 2014/15 Las Positas and Chabot College

Table 4.2.3.E - Chabot College- Energy Use Intensity

Chabot	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	712,080	728,642	720,967	720,967	721,614	721,614
Elect MMBTU	24,683	24,701	23,890	23,998	23,943	24,140
Gas MMBTU	45,294	39,430	39,878	36,376	34,031	36,974
Total MMBTU	69,977	60,593	62,722	59,242	55,643	61,115
EUI	98.27	85.09	86.08	82.17	77.18	84.69

While energy use intensity has declined over time, the cost of energy per square foot has increased over time, due to the changing utility rate structure. As customers installed on-site generation and were able to sell excess generation back to the utilities, the utility company income from energy consumption decreased significantly. The utility companies modified their rate structure reducing consumption or usage rates but increasing peak demand rates. In response to the utility rate structure changes, Las Positas is installing a large scale battery to reduce energy peak demands. The charts below show the initial drop in electrical energy costs in 2011 and 2012 as the new solar arrays begin producing. Then costs begin to rise as the rate structures changed.

Table 4.2.3.F - Las Positas Historic Energy Cost per GSF

Las Positas	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	374,780	382,281	403,070	468,206	468,206	468,206
Elect $$	$637,210	$608,451	$511,581	$651,967	$676,039	$844,191
Elect $$/GSF	$1.70	$1.59	$1.27	$1.39	$1.44	$1.80
Gas $$	$209,429	$156,102	$161,991	$132,624	$190,307	$234,548
Gas $$/GSF	$0.56	$0.41	$0.40	$0.28	$0.41	$0.50
Total Energy $$	$846,639	$764,553	$673,572	$784,591	$866,346	$1,078,739
Total $$/GSF	$2.26	$2.00	$1.67	$1.68	$1.85	$2.30

Table 4.2.3.G - Chabot Historic Energy Cost per GSF

Chabot	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	712,080	728,642	720,967	720,967	721,614	712,080
Elect $$	$462,450	$520,835	$512,041	$564,039	$569,986	$710,133
Elect $$/GSF	$ 0.65	$ 0.77	$ 0.74	$ 0.82	$ 0.83	$ 0.98
Gas $$	$560,872	$291,715	$283,085	$286,730	$249,683	$203,159
Gas $$/GSF	$ 0.79	$ 0.41	$ 0.39	$ 0.40	$ 0.35	$ 0.28
Total Energy $$	$1,022,450	$842,610	$823,175	$875,709	$848,386	$913,292
Total $$/GSF	$1.44	$1.18	$1.13	$1.21	$1.18	$1.27

Utility Costs - Water and Sewer

The cost of water represents 20% of the utility cost for the colleges. Las Positas has access to utility provided reclaimed water which is used for irrigation, fire sprinklers and toilets. The Chabot billing is a combined water and sewer charge. The significant cost difference is source of irrigation water. Las Positas pays for reclaimed water and Chabot uses on-site well water for irrigation. The cost for the Chabot water is reflected in electrical pumping cost rather than a utility charge.

Table 4.2.3.H - Chabot Water and Sewer Cost per GSF

Chabot	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross Square Feet	712,080	712,080	728,642	720,967	720,967	721,614
Total Cost	$ 105,907	$ 110,076	$ 117,350	$ 110,233	$ 119,670	$ 125,028
Total Cost/GSF	$ 0.15	$ 0.15	$ 0.16	$ 0.15	$ 0.17	$ 0.17

Table 4.2.3.I - Las Positas Water and Sewer Cost per GSF

Las Positas	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross Square Feet	374,780	382,281	403,070	468,206	468,206	468,206
Domestic Water	20,491	21,971	28,163	31,979	46,277	40,609
Reclaimed Water	59,635	103,271	107,400	128,828	113,701	109,465
Sewerage	21,834	18,924	24,832	26,055	29,167	30,454
Total Cost	$ 101,960	$144,166	$ 160,395	$ 186,862	$ 189,145	$ 180,528
Total Cost/GSF	$ 0.27	$ 0.38	$ 0.40	$ 0.40	$ 0.40	$ 0.39

Total Utility Cost Per Gross Square Foot

The total utility cost per gross square foot is an APPA performance benchmark.

Chart 4.2.3.J - Las Positas College Historical Utility Cost Distribution

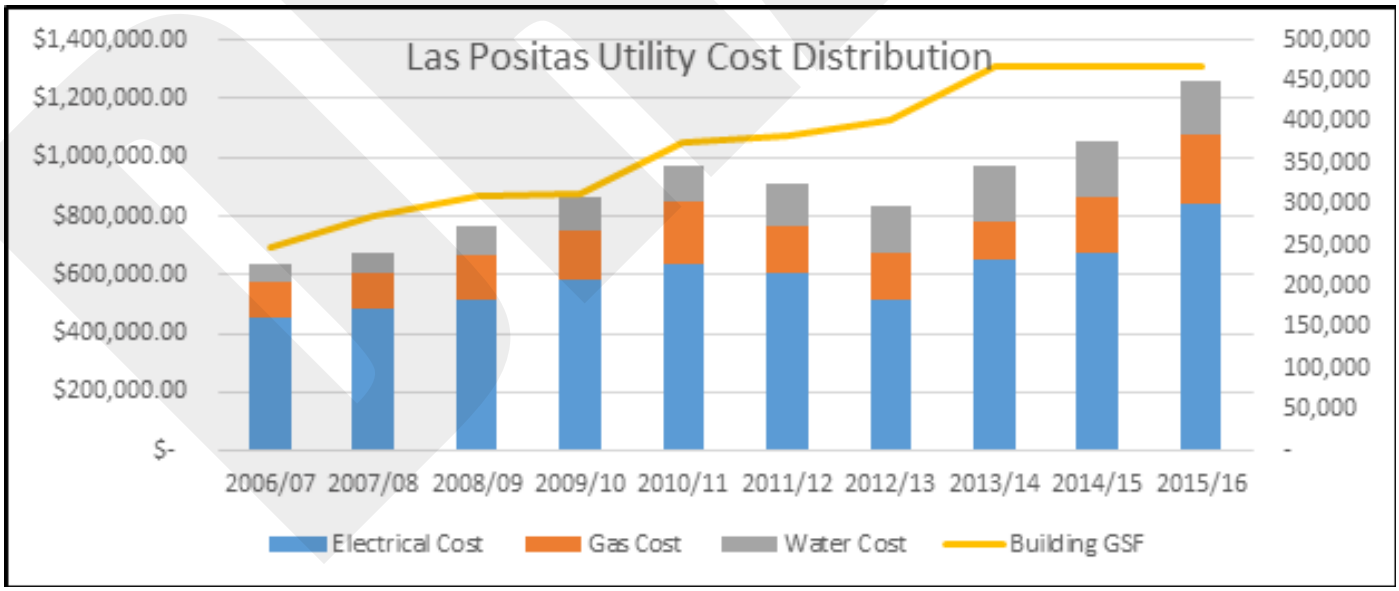


Table 4.2.3.K Las Positas Total Utility Cost per Gross Square Foot

Las Positas	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	374,780	382,281	403,070	468,206	468,206	468,206
Electrical/ GSF	$ 1.70	$ 1.59	$ 1.27	$ 1.39	$ 1.44	$ 1.80
Nat Gas/GSF	$ 0.56	$ 0.41	$ 0.40	$ 0.28	$ 0.41	$ 0.50
Water/GSF	$ 0.27	$ 0.38	$ 0.40	$ 0.40	$ 0.40	$ 0.39
Total Cost/GSF	$ 2.53	$ 2.38	$ 2.07	$ 2.07	$ 2.25	$ 2.69

Chart 4.2.3.L - Chabot Historical Total Utility Cost Distribution

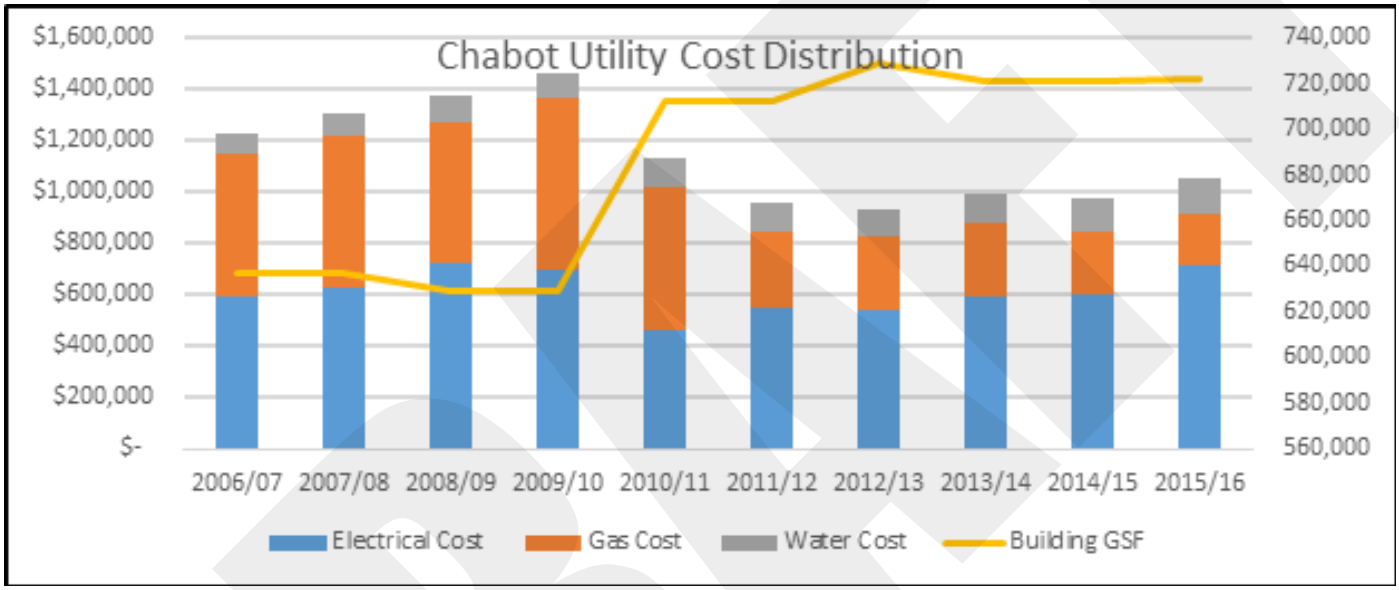


Table 4.2.3.M - Chabot Total Utility Cost per Gross Square Foot

Chabot	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross SF	712,080	712,080	728,642	720,967	720,967	721,614
Electrical/ GSF	$ 0.65	$ 0.77	$ 0.74	$ 0.82	$ 0.83	$ 0.98
Nat Gas/GSF	$ 0.79	$ 0.41	$ 0.39	$ 0.40	$ 0.35	$ 0.28
Water/GSF	$ 0.15	$ 0.16	$ 0.15	$ 0.17	$ 0.17	$ 0.20
Total Cost/GSF	$ 1.58	$ 1.35	$ 1.28	$ 1.38	$ 1.35	$ 1.46

SECTION 4.2.4 - MAINTENANCE AND OPERATIONS OPERATING EXPENSE

The Maintenance and Operations expense includes materials and supplies for the maintenance, custodial and grounds departments. It also includes service contracts for specialized equipment such as elevators and the automatic fire sprinkler systems and contracts for large repair projects. The expenses include each college's M&O equipment and District owned vans used for transportation to off campus events. These expenses are accumulated in a District wide account and distributed proportional to each college's gross square feet for this evaluation. The M&O expense costs dipped during the reduced District budgets and increased as District funding was restored.

Table 4.2.4.A - Las Positas Historical M&O Operations Expenses

Las Positas	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross Sq Feet	374,780	382,281	403,070	468,206	468,206	468,206
General	$14,758	$11,530	$12,424	$8,437	$10,450	$32,671
Maintenance	$115,349	$144,354	$159,121	$169,384	$280,021	$437,903
Custodial	$100,990	$99,727	$83,063	$88,923	$89,361	$107,691
Grounds	$9,188	$7,395	$10,424	$21,278	$20,489	$68,955
District Share	$62,109	$52,964	$51,491	$43,863	$44,182	$64,457
Total M&O	$302,394	$315,971	$316,525	$331,885	$444,503	$711,677
$$/GSF	$ 0.81	$ 0.83	$ 0.78	$ 0.71	$ 0.95	$ 1.52

Chart 4.2.4.B - Las Positas Historical M&O Operations Expenses

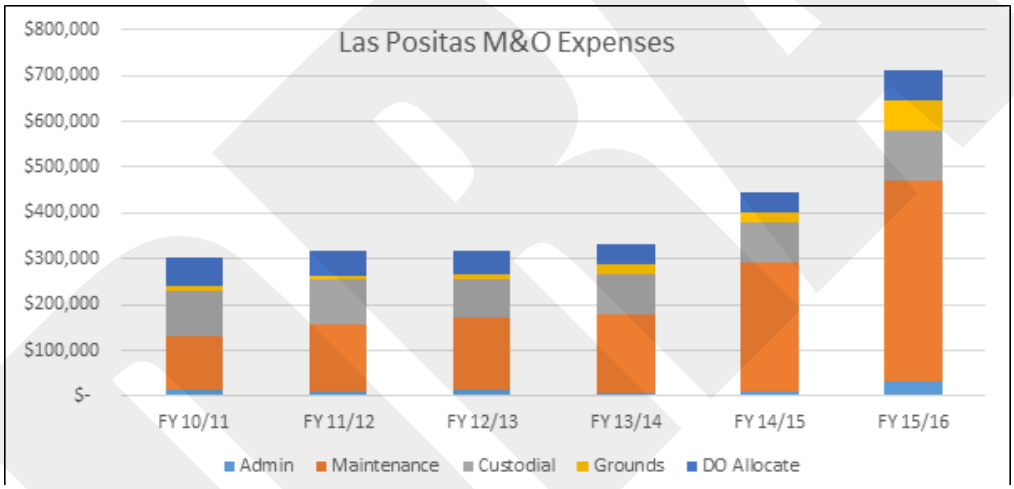
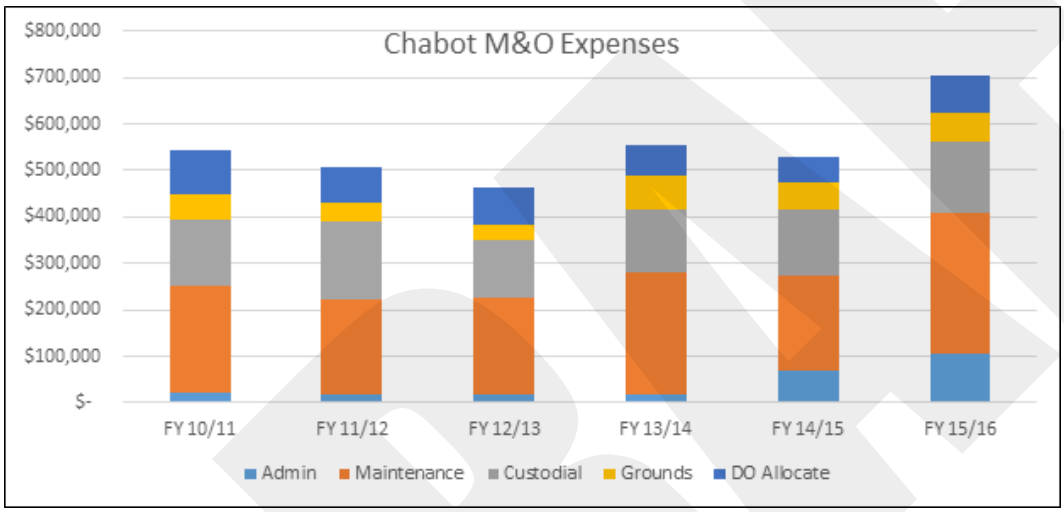


Table 4.2.4.C - Chabot Historical M&O Operations Expenses

Chabot	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16
Gross Sq Feet	712,080	712,080	728,642	720,967	720,967	721,614
General	$23,138	$19,500	$19,199	$16,389	$69,317	$104,004
Maintenance	$226,875	$203,023	$206,088	$264,375	$204,602	$302,835
Custodial	$143,240	$167,200	$123,057	$135,461	$141,538	$155,247
Grounds	$55,616	$38,967	$35,837	$73,426	$57,857	$61,876
District Share	$93,163	$79,446	$77,237	$65,794	$54,001	$78,781
Total M&O	$542,032	$508,136	$461,419	$555,446	$527,315	$702,743
$$/GSF	$ 0.76	$ 0.71	$ 0.63	$ 0.77	$ 0.73	$ 0.97

Chart 4.2.4.D - Chabot Historical M&O Operations Expenses



As part of the Total Cost of Ownership Program the District is updating their Preventative Maintenance program to systematically perform maintenance on building and campus components with 2-5 year useful life spans, such as florescent light bulbs, painting, seal coating roofs and roads. Studies have shown a structured preventative maintenance program will reduce repair costs and increase staff performance. The new School Dude software program alters the maintenance staff of an upcoming preventative maintenance task, records completion and schedules when the next inspection or action is required for each scheduled equipment or system.

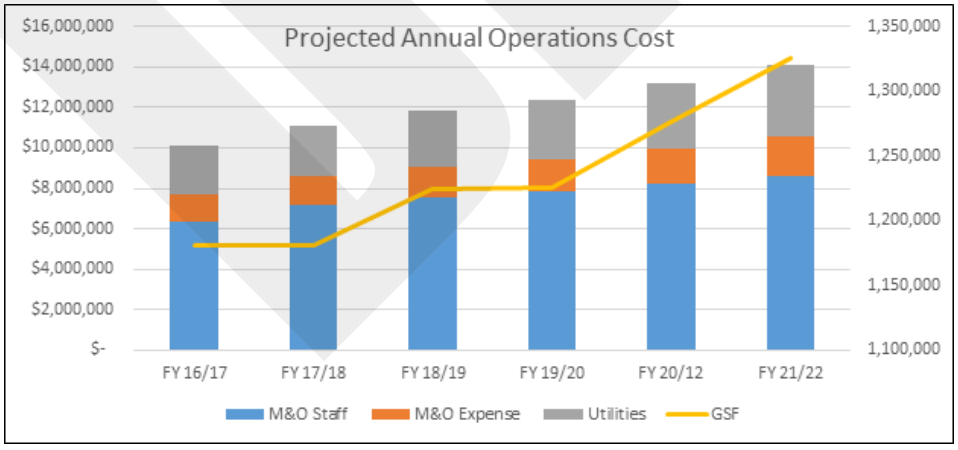
SECTION 4.2.5 - PROJECTED TOTAL ANNUAL OPERATING COSTS

The projected total Annual Cost of Operations combines M&O staffing, M&O operating expenses and utility costs for a total annual cost to operation and maintain the campus facilities, grounds and utility systems. The five year projection is based on budgets and staffing from the FY16/17 budget. The FY 18/19 projected budget incorporates M&O staffing adjustments to achieve the desired APPA Level 3 level of attention. The proposed staffing for custodial, maintenance and grounds staff is based on APPA Standards and each campus' configuration as described in Section 4.2.3 of this report. The future staffing is adjusted to reflect changes in the gross square feet of buildings and grounds that will be added as the Measure A bond program is being implemented. M&O expenses and utility costs are escalated 5% annually. Staff wages are increased by step increases only for new hires.

Table 4.2.5.A - Projected Total Annual Cost of Operations

District Wide	FY 16/17	FY 17/18	FY 18/19	FY 19/20	FY 20/21	FY 21/22
Gross SF	1,181,372	1,181,372	1,223,869	1,225,133	1,275,698	1,325,109
Total Staff	66.0	79.0	83.0	86.0	89.0	92.0
Maintenance	$1,665,879	$1,815,805	$1,934,889	$1,951,091	$2,109,566	$2,259,583
Custodial	$3,319,069	$3,761,022	$3,931,468	$3,969,288	$4,167,522	$4,382,012
Grounds	$944,381	$1,160,165	$1,239,710	$1,475,242	$1,501,632	$1,522,255
Management	$451,593	$469,940	$469,940	$469,940	$469,940	$469,940
Total Staff Cost	$6,380,922	$7,206,932	$7,576,007	$7,865,561	$8,248,660	$8,633,790
M&O Expense	$1,305,455	$1,370,728	$1,504,081	$1,580,565	$1,741,914	$1,904,105
Total M&O Cost	$7,686,377	$8,577,660	$9,080,088	$9,446,126	$9,990,574	$10,537,895
Utility Cost	$2,404,821	$2,525,062	$2,775,227	$2,916,232	$3,218,670	$3,519,812
Total Operations	$10,091,197	$11,102,722	$11,855,315	$12,362,358	$13,209,244	$14,057,707
Year/Year Increase	0.0%	10.0%	6.8%	4.3%	6.9%	6.4%

Chart 4.2.5.B - Projected Total M&O Annual Operations Cost



The District Budget Allocation Model funds Maintenance and Operations as a percentage of the total District Annual General funds available. For FY 2016/17, the allocation was established at 8.53% of total estimated revenue or $7,678,629. Utility expense was a separate line item budgeted at $2,500,000. The projected utility cost was adjusted downward to reflect prior year utility expenses.

The projected annual increases to operate and maintain the District assets are primarily a result of increases in building gross square footage rather than adjustments for inflation.

SECTION 4.3- LONG TERM MANAGEMENT COSTS

SECTION 4.3.1 MAJOR MAINTENANCE COSTS

Major Maintenance expense includes scheduled maintenance and deferred maintenance. This work involves projects or programs to restore damaged systems or replace worn out major systems such as roofing replacement or HVAC whole equipment replacement. The magnitude of the amount Deferred Maintenance is illustrated in the 2016 Facility Condition Index (FCI) report posted in the FUSION site. Las Positas College shows $14,152, 759 and Chabot shows $135,219,114.

However, after review of the Chabot building evaluation, the District is requesting a review of the assessment report to fully evaluate the building conditions after major remodeling performed during the Measure B program. The District believes the Deferred Maintenance amount at Chabot should be approximately $63,400,000.

All buildings with deferred maintenance work at both Las Positas and Chabot will be addressed during renovations or building replacements scheduled during the 2016 Measure A bond program. In addition the State has at least temporarily restored Scheduled Maintenance funding. The District was granted $1.5 M in FY 14/15 and $2.0 in FY 15/16.

The FCI percentage is a key performance indicator. According to the 2016 FCI report, LPC is 6.14% and the adjusted Chabot index is 16.48%.[23]

SECTION 4.3.2 RENOVATION AND REPLACEMENT

Maintenance programs by definition repair and maintain existing facilities over time. As the buildings age, multiple elements reach the end of their useful life and must be replaced rather than repaired through a major renovation or replacement of the entire building. Studies have determined that an institution should plan on investing 2 % of the Current Replacement Value (CRV) of the total assets per year for major renovation or replacement projects. The 2016 FCI report indicates a CRV of $230,500,618 for Las Positas and $385,058,909 for Chabot. Using 2% as a guideline, annual re-investment at Las Positas would be $4.6M and Chabot, $7.7M The District has been able to use 2004 Measure B Bond funds on an on-going program to renovate and/or replace aging facilities at both campuses. The 2016 Measure A bond program Facility Master Plan continues that process.

SECTION 4.3.3 REPURPOSE AND UPGRADES

Repurpose and upgrade project funding is needed to adapt facilities to new programs, improve performance and upgrade to meet new code mandated requirements. The District has included this type of work as part of a renovation project. In addition, the District developed campus wide specialized projects. Measure B included

23 Appendix-17-FUSION 2016-Facility Condition Reports

specialized projects such as the ADA improvements or the Safety and Security projects. Repurpose projects included the renovation of Building 700 at LPC from administration use to Visual Communications and Photography programs and renovation of Building 3400 at Chabot from Printing Technology to the BMW technician training program.

Sustainability projects are another example of upgrade projects. The Board of Trustees mandated that sustainability be a major consideration in the 2005 Facility Master Plan and 2004 Measure B funded projects. Major sustainability projects included the solar PV projects a both campuses, central plants with the conversion of stand-alone building heating and cooling systems to central heating/cooling loop fed and LEED certification of all new buildings. The District has leveraged bond funds to obtain outside funding for sustainability. Outside sources include the statewide 2010 Proposition 39 Energy Reduction funds, California Energy Commission grants, Bay Area Air Quality grants, and the California Community College/Investor Owned Utility Energy Incentive program.

SECTION 4.3.4 HISTORICAL LONG TERM INVESTMENT

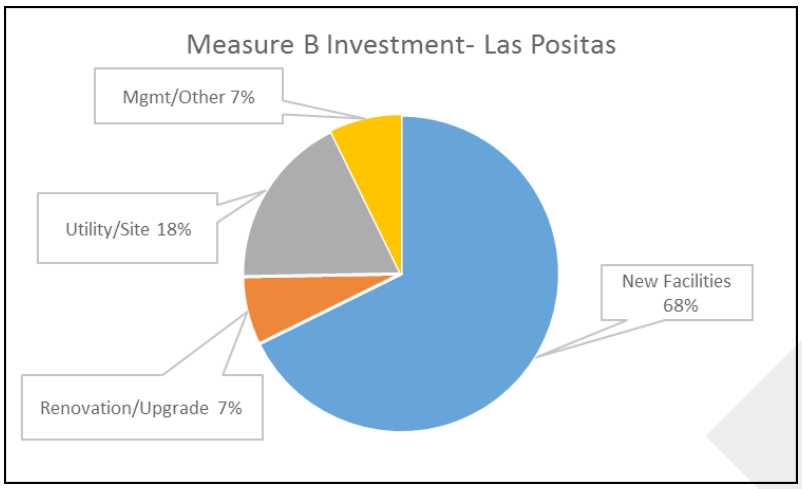
The Facilities Master Plan for the 2004 Measure B bond integrated Major Repair, Repurpose and Upgrade work into projects that modified existing projects. In addition the Measure B program developed campus wide upgrade projects such as new Fire/Life-Safety systems and energy improvements. The Measure B program also completed significant utility upgrade and improvements such as new central plant chilled and hot water systems, HVAC system replacements and storm water management systems.

The Las Positas program focused on expansion and replacement projects. The campus added eight new building, with the ninth currently under construction and removed nine buildings. All of the remaining campus buildings were modified through a major renovation of part of a campus wide upgrade project. Combining the Renovation/Repair projects and the Utility/Site/Campuswide projects, the District invested an average of $5.5M per year or 2.4% of the Current Replacement Value of $230M over the 10 year bond program. This investment rate matches industry averages for ongoing investment to maintain facilities for effective use.

Table 4.3.4.A- Las Positas Measure B Long Term Management Investment

New Facilities	$147,618,910
Renovation/Repairs	$15,254,870
Utility/Site/Campuswide	$39,249,946
Management/Other	$15,852,443
Total Bond Investment	$217,976,169

Chart 4.3.4.B- Las Positas Measure B Long Term Management Investment Distribution

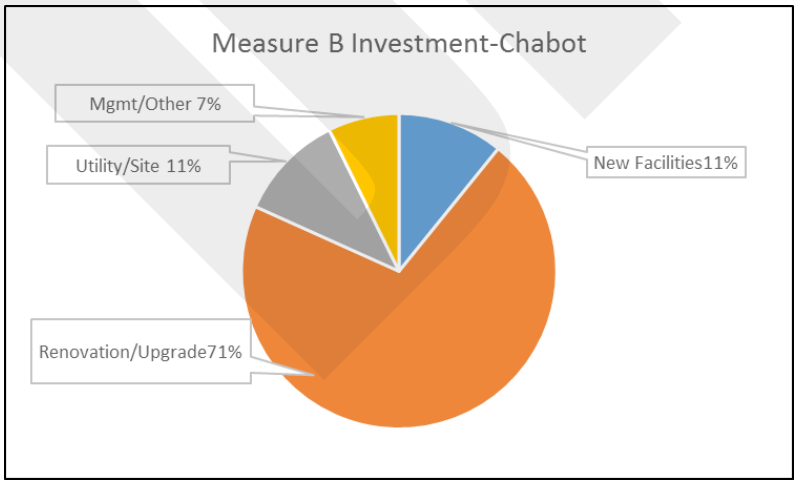


The Chabot Measure B program focused on major renovations to most of the campus buildings. There were three new buildings and a fourth currently under construction that provided expanded program space and replaced one building. Most of the remaining campus buildings underwent major renovations. Combining the Renovation/Repair projects and the Utility/Site/Campuswide projects, the District invested an average of $18.4M per year or 4.7% of the Current Replacement Value of $385MM over the 10 year bond program. This investment rate is almost double industry averages for ongoing investment to maintain facilities for effective use. The higher investment reflects the focus on eliminating most of the significant deferred maintenance and upgrading the campus buildings to current codes and technology standards.

Table 4.3.4.C- Chabot Measure B Long Term Management Investment

New Facilities	$24,306,333
Renovation/Repairs	$159,142,276
Utility/Site/Campuswide	$24,626,240
Management/Other	$16,390,543
Total Bond Investment	$224,465,392

Chart 4.3.4.D Chabot Measure B Long Term Management Investment Distribution



SECTION 5- PERFORMANCE REVIEW

SECTION 5.1.1 PERFORMANCE BENCHMARKS

The District will annually evaluate its performance against key performance indicators. They will compare against year over year performance and performance against benchmarks maintained by governmental agencies and performance from statewide and national peers. The follow table lists key FY 2015/16 Las Positas College and Chabot College statistics and benchmarks outside agencies.

Table 5.1.1 A - Key Performance Indicators

Benchmark	Las Positas	Chabot	Comparison	Data Source [24]
Energy Cost/GSF	$1.85	$1.16	$2.46	APPA Average
Energy Use Intensity (MMBTU/GSF	102.6	84.7	129.8	APPA Average
GSF/ Maintenance	111,477	106,119	72,929 SF 91,524	APPA- Level 3
GSF/ Custodial	33,443	36,081	35,049 SF29,000	APPA- Level 3
Acres/Grounds	36	16	18 Acres	APPA-Level 3
Facility Condition Index	6.14%	16.48%	<20%	CCCCO
Annual Re-Investment	2.4%	4.7%	2.0%	APPA
Cap Load Ratio- Lecture	141%	145%	100%	CCCCO
Cap Load Ratio- Lab	84%	104%	100%	CCCCO
Cap Load Ratio- Office	96%	123%	100%	CCCCO

Performance to Accreditation Section 3 Standards

Item 1- Develop and Maintain adequate safe and secure facilities to support the educational needs of the institution.

- The District has implemented safety and security projects to incorporate best practices for safe and secure facilities including a campus wide security system incorporating centralized lock/unlock and a campus wide video surveillance system and call boxes.
- The District planning process aligns Facilities development with the Educational Master plan and program review to provide adequate facilities

Item 2- Develop and Maintain facilities to assure effective utilization and continuing quality

- The CCCCO Capacity Load Ratio is evaluated with each project and in conjunction with the 5 year capital improvement plan to match facilities capacity with projected enrolment
- The District uses APPA recommended staffing levels for M&O staffing to achieve desired level care for facility maintenance
- The District re-invests in the facilities at or above the national recommended 2% per year.
- The District has adequate long term funding to continue that level of investment.

[24] APPA 2014 National Averages (Appendix 12) California Community College Chancellor's Office – Facilities Planning Unit

Item 3- Periodic re-evaluation to assure effectiveness of resources

- The District uses the CCCCO Facility Condition Assessment to identify deferred maintenance items.
- The development process for renovation projects requires evaluation and incorporation of code and technology updates and addressing any deferred maintenance items

Item 4- Long term capital plans using Total Cost of Ownership

- The District is implementing a Total Cost of Ownership program for all new and renovated building projects
- The District will use the APPA recommended staffing levels to establish annual M&O funding
- Every new project will complete a Life Cycle Cost Analysis to identify and plan for adequate long term operational funding.

SECTION 6- ACTION PLAN

The District is implementing a Total Cost of Ownership Program to better protect the investment in facilities. The Total Cost of Ownership establishes policy, data sources, benchmarks and goals for each of the three TCO elements.

Project Development-

Policy- The Facility Master Plan shall align with the Educational Master Plan and adjust with input from Program Reviews The CCCCO Cap Load Ratio shall be evaluated before any new facility space is developed in response to Educational Program changed space needs. Every project that adds space to a campus shall complete a Life Cycle Cost analysis. Life Cycle Cost analysis will help inform the decision to remodel or build new for new programs
Data Sources – CCCCO Cap Load Ratio, Life Cycle Cost, APPA Staffing Recommendations, APPA Key Performance Indicators

Benchmark Goals- Cap Ratio = 100% for Classroom, Laboratory and Office spaces
Life Cycle Cost= EUI match or exceed campus average
APPA Staffing Analysis=Align District Maintenance and Operations staffing and required budgets with projections of capital improvement plans
New Facilities= LEED Silver Certification minimum
District Standards=Expand and Update all District Standards
District 5 year Capital Plan=Align with Facilities Plan

Annual Operating Costs

Policy—the District shall maintain M&O staffing for maintenance, custodial and grounds staff to meet or exceed APPA Level 3 performance, adjusting staffing as facility configurations change. The District will develop and maintain a Preventative Maintenance Program. The District shall continue to invest in energy savings measures to reduce energy costs.
Data Sources- APPA Staffing Analysis, Annual Utility Costs, Annual M&O department Costs, Energy Star Regional Averages

Benchmark Goals= M&O Staffing= Maintain APPA Level 3 staffing levels
Energy Cost= Continue trending lower energy usage and costs per GSF
Water Cost= Continue trending lower water usage per GSF
M&O Expenses=Trend lower repair costs due to new preventative maintenance program
Annual Operating Costs= Trend lower

Long Term Management

Policy—The District will identify, track and incorporate deferred maintenance projects into either a State Deferred Maintenance funded project or incorporate into a 2016 Measure A Bond funded renovation project. The District will develop and maintain a Scheduled Maintenance program. The District will assemble campus wide projects to upgrade and update building and utility systems to address code and operation changes. The District will continue to pursue outside funding sources for sustainability related upgrades and improvements.

Data Sources- FCI reports and updates, State Deferred Maintenance Project List, Measure A project List, Facility Master Plan

Benchmark Goals- FCI Report= Deferred Maintenance amounts continue to trend downward
Scheduled Maintenance=Adequately fund annually
FCI Report= Campus FCI less than 20%
Project List= Renovation & Replacement Projects listed
Measure A= Renovation and Replacement expenditures equal or greater than 2% of the Current Replacement Value of District assets

CHABOT-LAS POSITAS

COMMUNITY COLLEGE DISTRICT

INFORMATION TECHNOLOGY PLAN

TOTAL COST OF OWNERSHIP

January 2017

TOTAL COST OF OWNERSHIP FOR INFORMATION TECHNOLOGY SYSTEMS AT CHABOT-LAS POSITAS COMMUNITY COLLEGE DISTRICT

Through the Measure B Bond program, Chabot-Las Positas Community College District (CLPCCD) has completed substantial improvements and growth in college facilities. The Information Technology improvements included upgrades to servers, desktop/laptop, audio-visual, network and cabling infrastructure. Where feasible, equipment support contracts for bond-funded equipment were also procured when available from vendors. The intent was to have a full-supported Information Technology infrastructure up to the end of 2017, and then the new Measure A would continue from where Measure B ended.

While elements of the Total Cost of Ownership have been included in equipment discussions and decision-making for a number of years for the technology implementations related to the Measure B bond program, a more formalized Total Cost of Ownership process will be instituted in the district's long range planning procedures for the new Measure A bond. The District Facilities Master Plan is the institutional long-range planning document that describes the results of the facilities planning process. The District Technology Plan addresses the technology aspects of facilities and equipment planning for the District and Colleges. The District Technology Plan is completed separately, but aligns with the Facilities Master Plan as well as the District Strategic Plan and the College Educational Master Plans. The District Technology Plan is developed from user inputs on the college and district technology requirements, in coordination with both Colleges' Technology Committees and the district-wide Technology Coordinating Committee. A new Technology plan will be developed in 2017, that will include Measure A bond projects and other Enterprise Technology initiatives. The current Technology Plans are posted on the district web site at http://www.clpccd.org/tech/TechnologyPlans.php.

For the Measure A bond, the Board Policy on Institutional Planning (BP 3250) has been revised to include Total Cost of Ownership in the implementation of the Facilities Master Plan. Related to the construction and maintenance of buildings is the ongoing operation and improvement of Information Technology equipment and services. In addition, a new Administrative Procedure AP3253 "Total Cost of Ownership" was created to define the total cost of ownership and its implementation.

Technology equipment must follow the same TCO guidelines like Facilities and includes various categories of equipment to support new buildings, facility renovations, and refresh upgrade cycles for existing equipment in older buildings not under construction. The Measure B bond provided funding for Information Technology improvements to servers (application systems), desktops/laptops, audio-visual (smart classrooms), network and cabling infrastructure (wired and wireless), and generators/UPS for data centers. While the Measure B Bond program was able to cover equipment and support, ongoing staffing and training costs were not included. As such, the expanded equipment and infrastructure provided through the Measure B Bond projects is being maintained by similar staffing levels and resources that have not changed since the start of

Measure B in 2005. Staffing increases were not covered by the Measure B Bond, and the CLPCCD General Funds were not available to fund staffing increases due to budget constraints. Beginning in the 2016-2017 year, budget has been made available for a limited amount of staff augmentation in the CLPCCD District ITS and College Technology departments.

This document examines the industry approach for Total Cost of Ownership (TCO) for Information Technology systems and its application to CLPCCD District and College facilities. For TCO, CLPCCD will use the same model for Measure A as was used for Measure B. The TCO model did include hardware and software purchase costs, installation, initial training and maintenance, but it did not include staffing expansion costs. This document contains actions for ensuring that CLPCCD District and College Technology staff can acquire and maintain its resources as specified by Total Cost of Ownership recommendations for technology equipment. Staffing will be addressed as a critical part of effectively managing the total cost of ownership for the new Measure A technology improvements.

Information Technology Total Cost of Ownership

In the Information Technology industry, Gartner, Inc. is regarded as a leading information technology research and advisory company. The Gartner Group (now Gartner, Inc.) originally introduced the concept of **Total Cost of Ownership (TCO)** in 1987. The Gartner Group also worked with the California Community Colleges Chancellor's office in 2000 to provide input for the Technology II Strategic Plan for 2000-2005.

Gartner defines total cost of ownership (TCO) for Information Technology (IT), as including hardware and software acquisition, management and support, communications, end-user expenses and the opportunity cost of downtime, training and other productivity losses[1]. Total cost of ownership analysis attempts to define both the obvious costs for acquisition and ongoing support and the so-called "hidden" costs of ownership across the full ownership life or life cycle of the acquisition.

In defining ownership life[2], CLPCCD ITS takes into account the following areas influencing the useful lifespan of IT systems:

- **Economic life**. - The number of years for which the IT system provides more value to CLPCCD than it costs to own, operate, and maintain. When ongoing costs exceed returns, the IT system is considered to be beyond its economic life.
- **Service life**. - The number of years the IT system is actually in service providing appropriate functionality and performance for the requirements at CLPCCD sites.
- **Depreciation life -** The number of years over which financial systems charge depreciation expense.

[1] Gartner IT Glossary 2016. http://www.gartner.com/it-glossary/total-cost-of-ownership-tco/
[2] Total Cost of Ownership TCO Explained, Business Encyclopedia, ISBN 978-1-929500-10-9. https://www.business-case-analysis.com/total-cost-of-ownership.html

While the economic life may be a factor in which upgrades should be planned, the service life is more often the defining factor. CLPCDD District ITS and College Technology uses the service life for determination of equipment life. In IT, discrete systems and technologies present different life cycles to analyze. For example, tablets and laptops exceed their service life in functionality and usefulness faster than Enterprise server systems. If a computer can no longer do the job needed by the staff, faculty or student, then upgrades are mandatory because the device has reached the end of its useful service life.

Costs of ownership span beyond the procurement process itself. In the life cycle graphic shown, an IT system or technology requires different types of IT effort, as it moves from a new deployment to an aging service. The various phases include Planning, Procurement, Deployment, Management, Support and Disposition. Each phase requires IT to provide specific IT knowledge and task execution. The ongoing cost of ownership incorporates all expenses for staff, equipment and support to execute those tasks.

More specifically, the factors contributing to the Total Cost of Ownership for IT Technology include:[3]

Acquisition Costs - These are the costs that contribute to the original procurement of the technology:

- System Design: The new technology will require design by internal resources or external partners/consultants, which include the following tasks that could be iterative.
  - Analysis and inventory of the current environment's capabilities and limitations
  - Design of new environment
  - Research of the possible solutions
  - Documentation of solution, management presentation and approvals
  - Creation of the bill of materials for the new solution
- IT Hardware/Software Equipment: This can include:
  - Server hardware and software
  - Workstation hardware and software
  - Network hardware and software
  - Warranties, ongoing hardware/software support and licenses
- Acquisition Process: In working with the procurement department, the following tasks would need to be executed:
  - Development of the bid package
  - Advertisement to potential bidders
  - Execution of the bid process/bidder management

[3] How to Determine TCO, ShoreTel, 2016. http://www.lantelligence.com/wp-content/uploads/2016/06/How-to_Determine-TCO-for-IP-Telephone-Systems.pdf

    - Funding allocation or financing options
    - Ordering, receiving, inventorying and processing payment for the IT technology solution.
- System Implementation: This includes all tasks with bringing the new technology into production.
    - Equipment configuration
    - Migration from existing hardware and software platforms
    - Conversion of data from existing environment
    - Testing and functionality acceptance
    - Corrections to new environment as needed
    - Downtime during conversion to the new system.

Hidden Acquisition Costs may include:

- Diminished Performance:
    - Old system performance issues before new system is brought online.
    - Conversion from manual processes which may result in work slowdowns or performance as the new system is being learned.
    - First day/week/month implementation issues that need to be corrected.
    - Functionality changes that make the new technology different or more difficult to use.
- Facility Improvements: These are changes that might be needed in order to accommodate the new technology.
    - Room/Floor space construction or refurbishment
    - HVAC/power improvements
    - Rack/cabinet changes or additions
    - Space reallocation or equipment rearrangement
    - Security costs: building locks, secure entry doors, CCTV, security staffing, electronic security (card readers, motion detectors, alerting to security personnel)
- Network Upgrades:
    - Additional copper/fiber cabling
    - Network ports and bandwidth increases required to support new equipment connections
    - Patching.
- Training:
    - Administrative and operational training for IT support staff.
    - End-user training on features, functions and operations of the technology.
- Insurance: Equipment damage/theft and replacement costs.
- Decommissioning: These are costs associated with the disposal of the old equipment.
    - Recycle fees for disposal of old electronics. Environmental compliance reporting.
    - Disassembly and transport fees of equipment
    - Termination of support agreements/partnerships, including late termination fees or contract buy-outs

Ongoing Costs – These are costs associated with keeping the new technology running.

- System Maintenance:
  - Maintenance including backups, logfile analysis, storage restructuring, security procedures, etc.
- System Upgrades:
  - Assessment of upgrades to enable performance enhancements or correct issues.
  - Design of expanded system.
  - Procurement of additional items such as software licenses, memory, disk, CPU expansion.
  - Configuration, testing and implementation
- User Changes:
  - Ongoing modifications of the technology to address changing user requirements
  - Application customization/additions
  - Password, access or location changes.
- System Management:
  - Daily/weekly/monthly management of each system is required to maintain peak performance
  - Identification of impending problems
  - Optimizing performance and operations.
- Staff Augmentation: hiring of additional staff or consultants to provide expertise required for new or advance systems deployment.
- Ongoing Training:
  - Administrative training for IT staff on new or modified processes and functionality.
  - Development and distribution of user training and updates.
- System Downtime: Scheduled or unscheduled downtime that creates a disruption of service to CLPCCD students and staff.
- Audit: Internal or external audit procedures for new technology.

IT systems are in a constant state of upgrade, change and improvement. As well, IT equipment life cycles are typically shorter than other capital items, ranging from four to ten years, with extended life spans depending on the technology. The anticipated life cycle of CLPCCD Technology equipment is as follows:

- Desktop/laptop computers: 4 years
- Servers: 5-7 years
- Printers: 5 years
- Network equipment: 7-10 years
- Network cabling: 20-25 years
- Audio-Visual equipment: 7 years
- Telephony systems: 8-12 years
- UPS: 15-20 years
- Generator: 20-30 years

CLPCCD ITS and College Technology staffing assess equipment usefulness to determine life span. Innovative technology that does not exist in the industry as of yet will make the current equipment obsolete and will reduce the service life when available.

Coupling these items with the growth of IT systems made possible by the Measure B bond, CLPCCD ITS and College Technology departments have been presented with a significant impact to ongoing costs and a constant state of rapid change for the CLPCCD ITS staff.

To reduce TCO in IT organizations, a number of Best Practices have been identified, some of which include[4]:

- Stable IS Organization: A stable staff keeps deployments consistent and focused. CLPCCD ITS has been fortunate to maintain talented staff who have worked in the District for 10+ years. This provides a "braintrust" of experience to draw on for upgrades and new installations.
- Vendor Standardization: With vendor standardization, CLPCCD ITS can gain purchasing leverage and reduce incompatibility issues, support issues, administrative costs and have access to new technology for prototyping. For the Measure B Bond program, CLPCCD standardized on all IT equipment for switches, routers, network infrastructure, desktops/laptops, servers, audio-visual equipment and cabling.
- Training: Professional training for CLPCCD ITS staff allows for confident knowledge in all support tasks ranging from planning new deployments to resolving end-user issues. Self-training performed as time permits may gain knowledge, but without a thorough and consistent understanding. Focused classes through vendor offerings reduce the net amount of time spent learning, and result in more effective implementation and troubleshooting.

To quantify the ongoing cost of operations, Gartner has released a Total Cost of Infrastructure and Operations (TCIO) model in 2016[5]. This model addresses "Technology Domains" including Data Center, Networking, Client computing and Service Desk. Costs in each domain including operating and capital expenditures, generate an annualized TCIO.

In this document, the TCO for each of the following IT Systems will be examined in detail:

- Server technology, including Enterprise, standalone and blade servers, and their operating environments.
- Data Center facilities at Chabot, Las Positas and the District Office.
- Desktop computing environment, including PCs/Macs, laptops and tablets and their software.
- Network infrastructure, including wired and wireless data equipment and cabling plant.
- Audio-Visual technology, including smart classroom, conference room and lecture halls.

[4] Reducing TCO in Higher Education: Best Practices. Gartner, 1999.
[5] Using Gartner's TCIO model to Optimize Costs, 2016. https://www.gartner.com/doc/3229020/using-gartners-tcio-model-optimize

- Telephony systems, including telephone systems and voicemail.

Where applicable, TCIO models are applied and discussed for each technology.

CLPCCD ITS and College Technology departments have made operational and architecture choices to minimize the ongoing costs of ownership and better position the available staff to support the technology expansion and increased sophistication. The TCO approach for each specific area is documented in the following sections.

CLPCCD SERVERS

A key responsibility for CLPCCD ITS and College Technology staff is the ongoing operations and maintenance of application servers. Centralized server applications with near 99.99% uptime are mission-critical for the support of functions at the Colleges and the District. With ongoing changes in academic and student needs, there is a continued expansion for the deployment and support of administrative and instructional applications.

The expansion of servers and applications has presented an increasing workload for District and College Technology staff. CLPCCD has made several choices to optimize the way that servers are installed and maintained. These choices have lessened the cost of ongoing ownership and support.

College Application Servers

Prior to 2005, the server environment at CLPCCD sites was composed of many kinds of "home-grown" disparate systems, often assembled by hand, and maintained by in-house staff. This led to variations in performance and stability, a lack of interchangeability of parts, and a requirement for custom knowledge for maintenance and repair. Downtime was unpredictable because of the availability of parts and skills when a server failed. The College servers consisted of the following:

2005 College Server Statistics

Location	**2005**	**Operating System**
Chabot	11	Windows
Chabot	1	Linux
Chabot	3	MacOS
Chabot Totals	**15**	
Las Positas	6	Window
Las Positas	2	Linux
Las Positas	0	MacOS
LPC Totals	**8**	

As the number of servers continued to grow, the disparate hardware and operating environment led to an unacceptable support situation for mission-critical College and District applications.

At the beginning of the Measure B bond, a committee of District and College technical staff was formed to analyze and define a common approach for servers across CLPCCD locations. The following items were addressed:

- Establishment of Server Standards – One of the first tasks performed was the selection and establishment of a standard for server hardware. An assessment of the mainstream suppliers resulted in the selection of Hewlett-Packard servers for the hardware platform. Specific models of Hewlett-Packard (HP) DL servers were chosen, with standardized disk, memory and CPU.
- Acquisition of Support Contracts – Servers were purchased with supplier/manufacturer support. This increased the availability of parts, skilled technicians for repair and timeliness of repairs.

These decisions were key in improving the ongoing cost of ownership, through optimized CLPCCD maintenance efforts, less failures and faster return to operations than were previously possible. These approaches were effective in reducing the Total Cost of Ownership for acquisition and ongoing support costs, but did not address staffing support.

Early in the Measure B bond (2007), CLPCCD ITS and College Technology staff migrated the servers from the existing platforms and onto the standalone HP servers, thereby enabling a robust server environment. Since the life cycle of a server system is typically 5-7 years, a number of replacement migrations were undertaken from 2013-2015. This has allowed CLPCCD to also take advantage of recent technology migrations, including:

- Upgrades in disk technology from iSCSI to SSD storage, and individual disks per system to shared SAN arrays.
- Upgrades in backup technology for more reliable and efficient storage.
- Migration of server architecture from standalone servers to blade chassis systems.
- Change in server management environments from individual OS to VMWare/Hyper-V virtualized management running multiple OS instances.

The move to the blade/SAN technology with virtualized environments has been demonstrated to lessen the ongoing cost of support and maintenance in many ways[6]:

- Better resource use: Since virtualized servers share CPU/memory/disk, the hardware is more closely used to its maximum capacity, rather than in standalone servers where capacity may sit idle.
- Lower power consumption: Blade chasses support many servers with a consolidated power source, significantly reducing the number of 100v or 208v power connections and net power consumption by 20-40%.
- Faster server set up: Instead of a several week set up time for configuring, buying, receiving and setting up a new server, a virtualized server can be installed and working in a matter of hours.

[6] 5 Reasons to Switch to Virtual Servers, University Business 2009 https://www.universitybusiness.com/article/5-reasons-switch-virtual-servers

- Easier recovery from failure: Management utilities provide automatic or administrator-initialized recovery from hardware/software failures. This moved servers across chasses and virtualized environments, so repairs on failing components can be done with a minimum of downtime.

College Technology has begun the migration to virtualized servers. Now supporting 30+ standalone servers, future purchases for Chabot funded by the Measure A bond will include blade/SANS architectures for applications compatible with a virtualized environment. LPC Technology similarly supports 22 servers and is planning to move towards blade/SANS architectures as part of their strategy to optimizing the LPC server environment.

2016 College Server Statistics

Location	Quantity	Operating System	Growth Factor from 2005	Growth % from 2005
Chabot	28	Windows		
Chabot	1	Linux		
Chabot	1	MacOS		
Chabot Totals	**30**		**2 times**	**200%**
Las Positas	19	Window		
Las Positas	2	Linux		
Las Positas	1	MacOS		
Las Positas Totals	**22**		**2.75 times**	**275%**

District Servers

Like the College servers, the application server environment at CLPCCD District was composed of "home-grown" disparate systems, often assembled by hand, and maintained by in-house staff. Similar performance and stability issues occurred as was described above for the College servers. At the start of the Measure B Bond in 2005, the server distribution was:

2005 District Server Statistics

Location	Quantity	Operating System
District	6	AIX
District	2	Linux
District	18	NetWare
District	5	Windows 2000
District Totals	**31**	

For Enterprise applications, CLPCCD ITS has standardized on the Ellucian Banner application as the ERP system for CLPCCD. Running on IBM AIX servers, CLPCCD ITS has been able to leverage staff experience and knowledge to maintain efficient operations and execute substantial upgrades.

Initially housed in the Chabot Computer room, CLPCCD ITS procured a replacement IBM pSeries 570 systems in 2007. This system was configured with primary and failover hosts to increase the reliability and business continuity in the event of a failure of the primary server. The District Data Center was relocated to the Administrative Computer Room in the LPC IT Building in 2009, where these servers were provided with optimal power, HVAC and humidity control to ensure maximum uptime.

As the number of applications increased, the performance of the IBM p570 systems was exceeded. Within the standard server life cycle and as the technology advanced, new IBM S822 systems were procured in 2012.

CLPCCD District ITS was able to optimize the ongoing cost of ownership through the following methods:

- Staff Expertise – Leveraging the long-time, experienced staff, the knowledge base for deployment of these new systems was comprehensive and thorough.
- Standardized Hardware and Software – Each deployment of the CLPCCD Enterprise servers have been based on IBM hardware with AIX operating systems and Oracle databases. This immediately gives staff a familiarity and confidence for new implementations.

In the past two years, CLPCCD District ITS has begun the migration to blade/SANS hardware with virtualized servers, now supporting approximately 106 servers in virtual environments. An additional 30 standalone servers currently exist, many of which will be migrated to virtual. Because of unique architectural requirement that prevent a virtualized instance, there will still be a few servers that will remain on standalone hardware.

The current distribution of servers for District applications is:

2016 District Server Statistics

Location	***Quantity***	***Operating System***	**Growth Factor from 2005**	**Growth % from 2005**
District	19	Enterprise		
District	22	UNIX (AIX)		
District	44	Linux		
District	51	Windows		
District Totals	**136**		**4.38 times**	**438%**

Cost of Ownership Calculations for Servers

The Gartner TCIO model calculates a price for infrastructure and operations based on IT staffing and investment levels, and technology cost and performance metrics. The price is derived from the Gartner's IT Key Metrics Data (ITKMD) which is refreshed annually and based on surveys and discussions with the customer base and industry sources.

Using the 2016 Gartner TCIO model, the ongoing costs for the servers maintained at the campuses are shown below. Refer to Appendix A for more description on how these calculations are derived:

Ongoing TCIO costs for CLPCCD Servers

Location	Number of Servers	TCIO per year
Chabot College	30	$182,944.00
Las Positas College	22	$133,848.00
District	136	$1,984,369.00
Total		**$2,301,161.00**

CLPCCD DATA CENTERS

Through new building construction and modernization provided by the Measure B bond, CLPCCD ITS has improved the Data Center environments at CLPCCD Sites. In 2005, the only space designated as a Computer Room was a small and crowded space in Building 300 at the Chabot College campus. This housed the Enterprise Server system and some smaller District servers, but was inadequate for the targeted growth.

Likewise, in 2005 and earlier, College campus servers were distributed across various buildings, in department offices, classrooms and telecom rooms. This caused very inefficient operations since College Technology staff had to go to various locations on campus for operational tasks. Servers were dedicated to single functions/applications and leveraging compute resources was not possible. In addition, the computer environment was not well controlled leading to variations in operational temperatures and power fluctuations.

As a result of an analysis of space, resources and operational stability, a decision was made to build a new IT Building on the Las Positas campus. This building houses an Administrative Computer room for the District Enterprise servers and provides a dedicated computer room for the Las Positas servers. During the renovation of Building 300 at Chabot, the previous Computer Room was renovated to provide up-to-date Server room functionality for a centralized housing of the Chabot Campus servers.

TCO costs for the new IT Building and Data Center spaces include:

Acquisition Costs

- Design: architect and engineering services
- Build: construction costs
- Real Estate: LPC campus location, housing both District ITS and LPC Technology departments. Chabot campus location, housing limited District ITS and Chabot Technology Staff. District office location in Dublin, housing limited District ITS staff.

Ongoing Costs

- Data Center-specific Infrastructure maintenance and upgrades: Support contracts for specialized infrastructure including UPSes, ATS/Generator, HVAC/Chiller, Security and other custom mechanical/electrical components.
- Utilities: Power, water for operations, included as part of the campus building TCO.
- Building maintenance and upgrades: included as part of the campus building TCO.

With the centralized server room spaces, the ongoing maintenance and operations have become more efficient than previously. Reliability of operation has also improved with backup systems and power protection systems.

Large-scale UPSes (30kW+) and site Generators at both the LPC IT building and Chabot B300 server room now support centralized server rooms, providing more efficiency for power usage and improved uptime. Ongoing costs for these components include:

- Generator: fuel, ongoing preventative maintenance, repairs.
- UPS: ongoing preventative maintenance, repairs, battery replacement.

With regular maintenance, generators used for standby emergency power can last 20 to 30 years. UPS systems can last between 15 and 20 years.[7] Thorough and regular preventative maintenance programs are key to equipment longevity.

Cloud Hosting Model

While CLPCCD has largely deployed an in-house private hosting model, there is a perception of cost reduction as one of the primary benefits of adopting a cloud hosting model. In particular the comparison of capital expenses (TCO Acquisition costs) versus operational expenses (TCO Ongoing costs) often must be analyzed thoroughly in order to make the proper decision between outsourcing versus in-house solutions for each specific application.

Application outsourcing can be of several models:

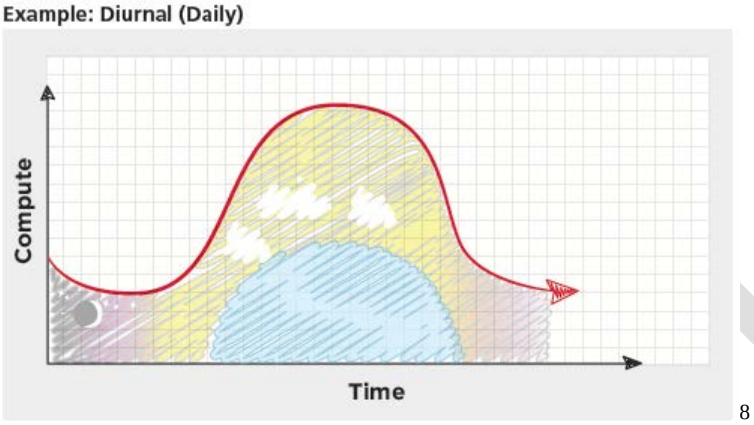
- IaaS – Infrastructure as a Service whereby the processing, storage, networks and other fundamental computing resources is provided by the hosting service and CLPCCD would deploy and run the custom applications for student and college support. CLPCCD would have control over selected processing, storage, deployed applications and some network components.
- PaaS – Platform as a Service whereby CLPCCD would deploy on a cloud infrastructure using services and tools provided by the hosting service, but not have management or control over the server infrastructure.
- SaaS – Software as a Service where CLPCCD uses the hosting service's applications running in the cloud.

CLPCCD has invested in SaaS options for selected vendor products for course management and other third party products that interface with Banner. Specific applications for Distance Learning were well provisioned using the SaaS model provided now by Blackboard, and in the future by

[7] UPS Service Plans: How to Maximize Your Returns, Eaton, May 2010, Life Cycle Checklist, Eaton 2016

Canvas. More recent progress to outsourcing College web services took advantage of the Microsoft Azure PaaS services and the Omni update SaaS software. Other enterprise cloud systems using the SaaS model include services for Counseling (Cranium Café), Student Learning Outcomes (Elumen) and Student Tutoring (Nettutor).

A benefit of cloud applications is the 24x7 access. Computer and application usage for CLPCCD Enterprise and college servers is typically daytime, with peaks when the college campuses are in session with classes and student activity.



[8]

Round-the-clock access to applications as provided by a 24x7 hosting service is not as beneficial, since peak activity of CLPCCD access is usually at the same time each day.

CLPCCD ITS and College Technology departments maintain custom applications for the instruction and student administration. This reduces the possible options for the SaaS model. Ongoing staffing and training costs for either of the IaaS and PaaS models does not vary substantially with those of the in-house computing model. The cost of outsourcing for these applications would balance or outweigh the ongoing maintenance contracts in place for the CLPCCD in-house servers.

The specific outsourced applications described above, coupled with the in-house services available from the CLPCCD District ITS and College Technology servers provide an optimal operating environment for CLPCCD applications.

NETWORK CABLING AND EQUIPMENT INFRASTRUCTURE

CLPCCD District ITS is responsible for the network equipment and cabling infrastructure used for telecommunications at all CLPCCD sites.

Network Equipment

[8] Cloud Economics, Rackspace 2012
`http://c1776742.cdn.cloudfiles.rackspacecloud.com/downloads/pdfs/WhitePaper_CloudEconomics.pdf

In 2005, at the beginning of the Measure B bond, the network infrastructure consisted of Cisco core routers and switches in the network core, and a minimal distribution of 10Mb unmanaged hubs throughout the buildings. While this was a very low-cost approach to implementing data connectivity, it provided limited performance and visibility into troubleshooting problems. The installed network ports were approximately:

2005 Active Network Ports

Location	# of ports
Chabot	<1800
Las Positas	<1200
District	<48

Measure B bond expansion has grown connectivity of devices at each of the Chabot and Las Positas College campuses, plus additional connectivity at the District Office and Tri-Valley One-Stop (TVOS) sites in Dublin. In addition, the rollout of wireless technology, beginning in 2007, has increased the number of network users by approximately 2000 per day. Network speeds have increased from a shared 10 Mbps transmission to 1 Gbps transmission, with 10Gbps uplinks supported between buildings.

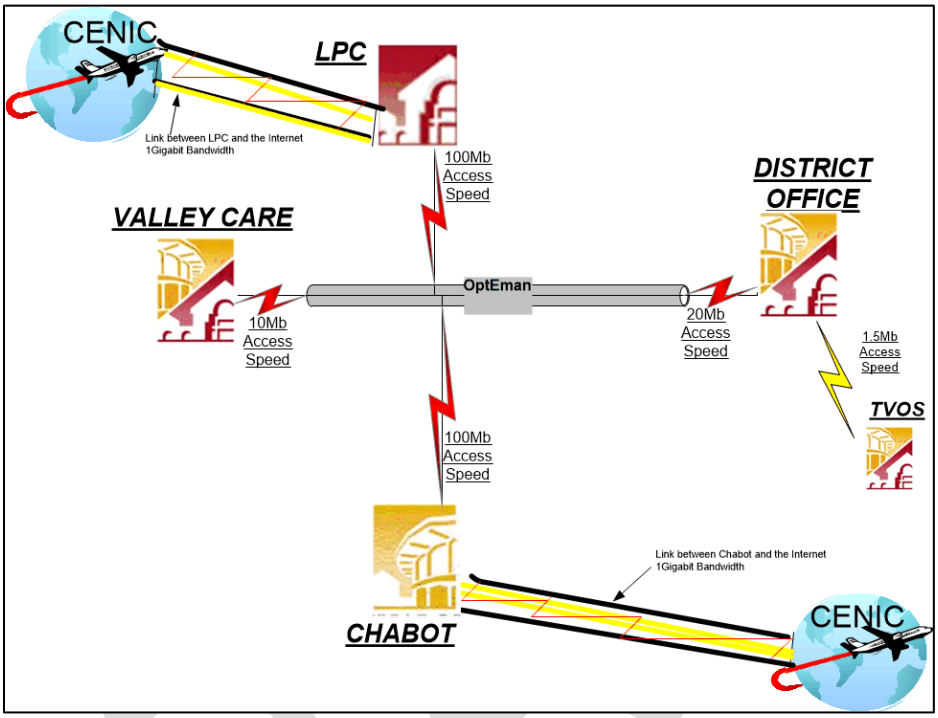
2016 Active Network Ports

Location	# of ports	Growth Factor from 2005	Growth % from 2005
Chabot	5520	3.06 times	306%
Las Positas	4720	3.93 times	3.93%
District	384	8 times	800%

CLPCCD ITS initially supported limited bandwidth site-to-site connectivity determined by the T-1 speed. As network activity increased at each site, CLPCCD ITS was able to incrementally add connections and redundancy to the WAN topology.

Connection	2005	2007	2016	Growth from 2005
Chabot to LPC	3 x T-1 (4.5 Mbps)		100 Mbps	22 times
Chabot to District	1 x T-1 (1.5 Mbps)	2 x T-1 (3 Mbps)	20 Mbps	13 times
District to LPC (redundant link to Chabot)	1 x T-1 (1.5 Mbps)		20 Mbps	13 times

In 2008, CLPCCD ITS upgraded the WAN router infrastructure to be able to support the AT&T OPT-E-MAN Ethernet service. These connections far exceed the bandwidth offered by multiple T-1 connections, with a simplicity of operation and upgrade.



CLPCCD District ITS maintains the network equipment operation using the equivalent of one full-time staff member. This has not increased since the 2005 and it is expected that another staff person will be added during the Measure A expansion. Through the following methods that increase operating efficiency, CLPCCD District ITS is able to achieve stable network operations and near 100% uptime:

- Cisco Equipment Standard – Using Cisco switching, routing and firewalls. Through the common IOS command set across equipment models, CLPCCD is able to leverage its staff knowledge for new deployments and ongoing operation of the network infrastructure.
- Standardized Configurations – CLPCCD District ITS has developed templates for each class of equipment. This includes base configuration, VLAN architecture, IP addressing, feature set deployment and cabling connectivity.
- 24x7 Monitoring – Using simple network management tools that actively probe and monitor equipment function, CLPCCD District ITS can be immediately alerted to unusual activity and outages, so restorative action can be quickly executed.
- Network Upgrades – Through the Measure B bond funding, CLPCCD has been able to procure equipment for network growth and to replace aging/obsolete equipment. This

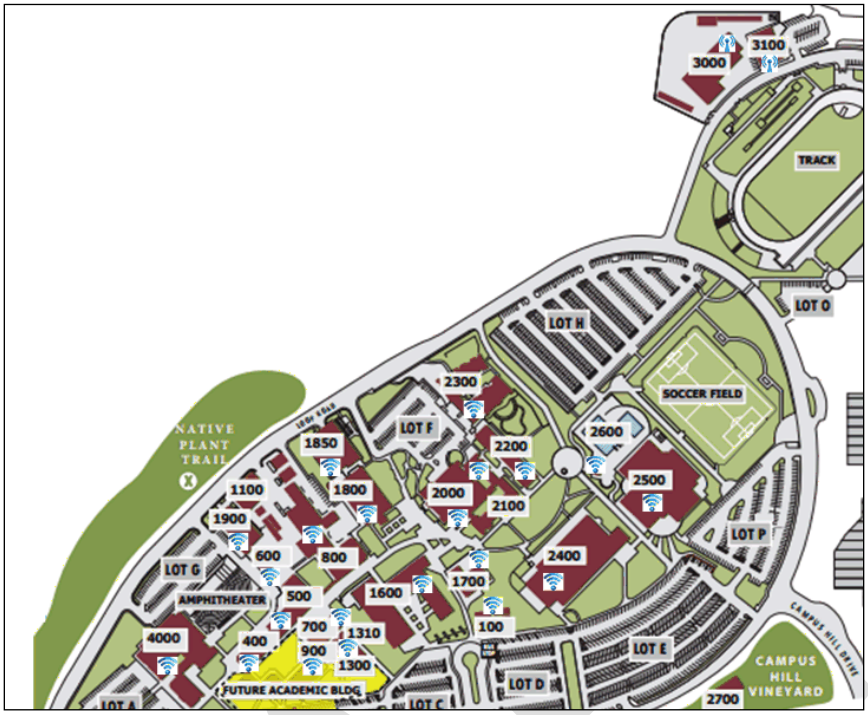
keeps the network at the top of performance, with little day-to-day effort. Network equipment upgrades are necessary every 7-10 years to keep up with performance requirements. However, the actual replacement cycle may be accelerated and determined by security breaches or manufacturers' obsolescence schedules.

- Manufacturer Support – For the network core and high density equipment, CLPCCD District ITS has budgeted for Cisco SmartNet support. During troubleshooting and failure, this provides CLPCCD with up to 4 hour response time on equipment failure requiring replacements. Access to Cisco engineering resources as needed 24x7 is essential to restoring business continuity as quickly as possible.

Wireless Network

A completely separate network environment that was installed during the Measure B bond is the wireless infrastructure. At the beginning of the Measure B bond, wireless did not exist. CLPCCD ITS first began deployments of 802.11a/b/g infrastructure in 2009. This was upgraded in performance and functionality to the current 802.11n network in 2011.

Chabot: 118 access points in 39 buildings



LPC: 80 access points in 28 buildings

Wireless technology has continued to develop in areas of increased bandwidth, with the 802.11ac, Wave 2 version now readily available in the industry. The wireless significantly expands the network connectivity to Bring Your Own Device (BYOD) laptop, tablet and cellular devices, with 1000s of users. The CLPCCD staff who maintains the wired network also maintains the wireless connectivity. All of the wireless installations were new to the Bond Measure B since 2005, so the growth factor is also the current installation of 118 access points at Chabot and 80 access points at Las Positas.

Reviewing Gartner's TCIO for networking, the cost estimates are typically based on the number of employees at a company. However, CLPCCD employees make up a fraction of the network usage, since student computer labs increase the number of connections significantly. Therefore, CLPCCD uses the number of connections to desktop PCs, which is a better representation of network usage. TCIO costs include:

Location	2016 Average TCIO/Unit/Year	Number of Active Connections *	TCIO per Year
Chabot	$100	2780	$278,000
Las Positas	$100	1,955	$195,550
District & TVOS	$100	200	$20,000
Total TCIO			**$493,550.00**

* Note that this is wired and wireless connectivity for CLPCCD-owned devices. BYOD devices are not included.

Network Cabling

In 2005, the network cabling connectivity used multi-mode 62.5 fiber and Category 3 and Category 5 cabling, usually installed by CLPCCD M&O and ITS staff. This allowed a piecemeal growth of the network connectivity as cabling could be added in rooms in an ad hoc fashion. However, this also led to the usage of low-end cabling, small and inadequate IDFs located on shelves in custodial spaces and mechanical rooms and many troubleshooting and operational issues.

Beginning with the Measure B bond, CLPCCD District ITS created a Cabling Infrastructure Standard that has been used for the new and modernized building construction. This standard has provided the following:

- Consistency – With a defined set of design guidelines, engineers and designers were able to produce drawings that clearly defined cabling standards, IDF size, power and HVAC requirements and layouts. This resulted in the construction of robust cabling infrastructure that had a minimum of variations, and could easily be maintained by staff.
- High Performance - Based on Commscope Systimax Category 6A station cabling with single mode fiber backbones, this standard established a state-of-the-art cabling infrastructure. The life cycle of cabling infrastructure is expected to be 20-25 years. While Category 6A cabling was considered leading edge at the beginning of the Measure B bond construction in 2005, the TIA-4966 standard for Educational Institutions now embraces Category 6A as the cabling standard needed for 802.11ac and future wireless connections, DAS, POE+, AV solutions and other infrastructures that require high-performance (1Gb+) network connections. As such, this forward-looking approach has well served CLPCCD ITS in being able to support current and future technologies that were not even in design when CLPCCD did its first building renovations.

With the Measure A bond construction, the Cabling Standards will be updated as needed, and will continue to provide a robust, standard cabling infrastructure for CLPCCD buildings.

DESKTOP AND LAPTOP SYSTEMS

Maintenance and ongoing operation of the desktop and laptop computing environment is one of the most important functions of the Chabot Computer Systems and LPC Technology departments. The efficient operation of computer systems used for instruction, labs and department functions is key in making sure student instruction is high quality.

Prior to 2005, the desktop systems in use varied in CPU, disk, memory and manufacturer. PCs varied from Intel P2 through P4, using Windows XP operating systems. Apple G3/G4 systems were used for specific applications, and few laptops/tablets were present. Equipment was acquired through direct purchase or at the LPC campus, lease-to-own. Campuses and the District operated independently in their procurement processes. While attempts were made to standardize, there was still a huge variance in hardware. Maintenance of failed systems

consisted of in-house staff swapping components to restore the PC back to service. The installed base of computers is shown below:

Measure B Desktop/Laptop Growth

Location	2005	2016	Growth Factor from 2005	Growth % from 2005
Chabot	1600	2370	1.48 times	148%
Las Positas	1175	1955	1.66 times	166%
District	74	205	2.77 times	277%

As described for the servers, the committee of District and College technical staff defined a common approach for desktops across CLPCCD locations. The following items were addressed:

- Establishment of Desktop Standards – The selection and establishment of a standard for PC hardware enabled CLPCCD ITS and College Technology staff to provide a consistent functionality across the sites.
- Joint Bidding – Colleges and the District joined together in issuing bids that represented the multi-year purchasing requirements. Volume purchases resulted in more attractive pricing through larger discounts. CLPCCD also received custom service and delivery options through the dedicated supplier.
- Support Contracts – Desktops were purchased with supplier/manufacturer support. This increased the availability of parts, skilled technicians for repair and timeliness of repairs.
- 4-year life cycle –Assessing the bond funding, PC growth and viable service life, a 4-year life cycle was established at the beginning of the Measure B bond. In the years between 2005-2016, eleven (11) refreshes occurred, each refresh including 25% of the installed base of desktops/laptops.

These decisions were key in improving the ongoing cost of ownership, through optimized manageable equipment rollouts, effective maintenance efforts, less failures and faster return to operations than were previously possible. The current environment uses state-of-the-art HP or Apple PCs. Laptops and tablets are provisioned as dictated by purpose, and are primarily Microsoft Surface, HP laptop and Apple iPad devices.

Using Gartner's TCIO model for Client Computing, the following costs are calculated:

Site	2016 Average TCI/per unit/per year	Number of Units	TCIO per Year
Chabot	$1,015	2370	$2,405,550
Las Positas	$1,015	1955	$1,984,325
District	$1,015	205	$208,075
Total			**$4,602,480.00**

Note that these calculations do not differentiate between desktop and laptops. There is a higher degree of support required with laptops because the systems are prone to damage. Likewise the desktop count includes computer labs which have a static image, refreshed in between teaching sessions. These computer lab machines are more stable, but require more support between class sessions for refresh and reconfiguration. Balancing these inputs, the TCIO calculations shown above continue to use Gartner's standard model.

TELEPHONES

Through the Measure B bond, new construction and building growth at Chabot and Las Positas College have expanded the number of new classrooms, offices and staff. An increase in the connectivity requirements to the current telephone systems had paralleled this building growth, requiring the addition of telephone extensions, voicemail boxes and cabling. The Measure A bond will continue that growth.

At Chabot, a Fujitsu telephone system was in production at the start of the Measure B bond. This system was configured as two separate components, one housed in the main telephone room (MPOE) in Building 200, and the other located in the Building 1400 IDF. Since the Fujitsu systems were not expandable and nearing the end-of-life, in 2007, CLPCCD ITS and Chabot Technology worked with the current telephony maintenance organization, Altura CS, to implement a minimal upgrade whereby the Fujitsu systems were gatewayed to an Avaya Communications Manager S8300 system. This upgrade positioned Chabot to begin a gradual transition of the telephone services off the obsolete Fujitsu, and onto a current Avaya platform, and allowed deployment of Avaya telephone service to new buildings such as the IOB and CSSC. During the renovation of Building 1400 in 2011, the replacement of the Fujitsu system in the B1400 IDF, was performed. This upgraded the system in B200 to an S8500, and allowed the connectivity of Building 3500, 3400, 1400, 1600, 1700, 1800 and smaller buildings which had been connected to the old B1400 Fujitsu. The remaining Fujitsu system in B200 was also removed.

The District Office telephone system was linked to the Chabot Fujitsu system for voicemail. As Chabot gradually migrated off the Fujitsu system, it became clear that the District Office system similarly needed to be replaced. When the District Office moved to the current Dublin location in 2013, its Fujitsu system was decommissioned, and replaced with an Avaya S8300 system. While using separate calling through its own in/outbound PRI service, the District Office system currently connects to the Chabot system for voicemail storage.

Chabot and the District partner with Altura CS for ongoing maintenance, upgrades and configuration changes. Moves of the telephones from one office to another in the same building can be done by the Chabot or District staff.

Another District site, the Tri-Valley One STOP (TVOS) uses a Centrex system which is also completely independent of the other CLPCCD systems. Services are limited, and require a

separate support contract with AT&T. An analysis will need to be performed to determine if the TVOS system can be connected to the District system in a cost-effective manner.

Many years ago, Las Positas purchased a Siemens HiCom 300 system, and at the start of the Measure B bond expansion, it was running at 50% of its capacity. This has been a discontinued product for Siemens for several years although support and refurbished parts have been available. The system is now expanded to its maximum capacity and a full system replacement is needed. LPC has a full-time telephone administrator who looks after onsite moves. For more complex system administration and configuration changes, this system is supported by an outside service organization, contracted as-needed basis.

AUDIO-VISUAL TECHNOLOGY

In 2005, prior to the Measure B bond, College Technology staff provided AV to classrooms on demand by pushing TVs, overhead projectors, VCRs and slide projectors on carts around to the classrooms as requested by the instructors. At the beginning of the Measure B bond, College Technology departments individually developed AV Technology standards for the "smart" classrooms at each campus. Beginning with the renovation of the first classrooms on each campus, the "smart" classroom was installed in every teaching room providing:

- Drop-down screens (3x4 or 9x10)
- Projectors (LED)
- Push-button SP input controllers using AV sources including document cameras, VCRs, and laptops
- Speakers
- Assisted listening devices

When buildings were constructed or modernized, AV designers were engaged as part of the architect and engineering team, to design the AV infrastructure and produce a set of drawings for the classroom construction. The construction projects included:

Year	Chabot Building	Rooms	LPC Building	Rooms
Pre-2008	B1300 B1500 B1600 B2000 B2100 B2200 B3100 B3900	2 classrooms 3 rooms 10 classrooms 2 classrooms 8 classrooms 5 classrooms 3 classrooms 14 classrooms	B2200 B800 B2500 PE	6 classrooms 8 classrooms 7 classrooms
2008	B900	5 classrooms	M&O	2 rooms
2009	B2200 Health B800 B3500	1 classroom 18 classroom 1 classroom	B2400 MD Aquatics	12 classrooms - none
2010	B700 CSSC B400 IOB	4 rooms 2 classrooms	B2300 CDC B4000 CCA	2 classroom 11 classrooms

	B1900 Planet. B500	2 classrooms 17 classrooms	B1900 IT B900	1 room 1 classroom
2011			B400/500/600	13 classrooms
2012	B4000 B300 B1400/B1600	- none 14 classrooms 4 classrooms	B1800/1850 B1700	19 classrooms 1 room
2013	B1800 B2500, 2600, 2700, 2800, 2900 B3400 B1200	9 classrooms 12 classrooms 2 classrooms 5 classrooms	B1600 SSA	17 classrooms
2014	B1700	13 classrooms	B1310/1320 Temp 100	1 room 6 classrooms
2015	B100	5 classrooms	B2000	7 classrooms
2016			B700	2 classrooms
Totals		**161 classrooms**		**114 classrooms**

Throughout the span of the Measure B projects, the growth of smart classrooms has been:

Location	**Pre-2008**	**2016**	**Growth Factor**	**Growth %**
Chabot	47	161	2.46 times	246%
Las Positas	21	114	5.42 times	542%

As buildings were completed, the "smart" classroom AV equipment introduced an additional level of technology sophistication to be supported by College Technology staff. In addition, the AV industry has matured and enhanced their products, and newer products have been installed in more recent building remodels. This results in a similar but heterogeneous set of equipment to be supported by College Technology staff.

The life cycle of AV equipment can be as long as 7 years, depending on the robustness of the hardware. Items that fail frequently are project bulbs and occasionally the projectors themselves. These require regular replacement for the classrooms to continue functioning. Even if equipment continues to function, AV technology is particularly susceptible to a short service life.

Ongoing support of the new AV technology was absorbed by College Technology departments. Limited training and documentation on the equipment was provided by AV contractors. College Technology staff was frequently in a position to figure out the functionality on their own, through on-the-job training. While the AV technology advanced the complexity significantly, the staffing and training in the College Technology departments did not change appreciably.

Classrooms are demanding increased resolutions, digital technologies, support of new AV sources, and access to conferencing/collaborative tools so students can present and interact with the instructor during the lectures. AV Technology is moving towards an IT type of infrastructure with cabling, electronics, software and programming becoming increasingly similar to computer

systems. Given the rising costs and the mission-critical nature of today's AV systems on campuses, utilizing a TCO approach is required.[9]

The Gartner TCIO studies do not include an assessment of Audio-Visual technologies or staffing. Recommended staffing for AV is shown below.

Industry standards for university/college level AV staffing vary. The complexity of the AV systems in the classrooms vary from simple projection to complex collaboration, video capture and conferencing tools.

In an AV survey conducted in 2014[10], the following items were compared: 1) school size, 2) AV technology sophistication and 3) number of AV classroom/conference rooms per school. A broad set of responses was received. The results of this survey were published in a number of online journals pertaining to educational support. While there was a wide variety of responses, the results of the survey indicate an average support ratio of one staff for 43 AV installations.

This is applied to CLPCCD's staffing as shown below:

Location	**No of classrooms**	**Current No. of support staff at Colleges**	**Recommended Staffing Levels**
Chabot	161	2	3.7
Las Positas	114	2.5	2.65

Since much of the smart classroom technology is reaching or exceeding its useful life, a significant project for the Measure A bond will be to design and contract the refresh of the AV in the classrooms. College Technology departments will work with AV designers in establishing new standards to refresh existing classrooms, and become the basis of design for Measure A building projects. This will put increasing pressure on College Technology staff as they work as designers while maintaining the current installations. However, it will also allow them to become more educated on the solutions for the next generation AV installations in advance of the production environment.

[9] AV/IT Infrastructure Guidelines for Higher Education, Infocomm, 2014.
https://www.infocomm.org/cps/rde/xbcr/infocomm/InfoComm_AVITHighEd_Dec14.pdf
[10] A Benchmark for AV Support Staff, Campus Technology, 2016.
https://campustechnology.com/articles/2016/09/21/a-benchmark-for-av-support-staff.aspx

STAFFING

As mentioned in earlier sections of this document, staff expansion has not kept pace with growth of the IT infrastructure and servers. As such, the current staff provides "best effort" response for support and project rollouts.

Gartner's TCIO model provides staffing metrics that are calculated as part of the TCIO costs.

Resource	TCIO cost per year	Staffing Cost Allocation	Average Annual Salary
Windows servers	$5,662	45%	$126,336
Linux Server	$8,454	50%	$142,335
Unix Server	$27,483	35%	$136,020
Storage	$2,009	26%	$131,836
Client Computing (Desktops)	$1,015	40%	$105,455
Data Network	$100	43%	$131,500
Voice Network	$622	37%	$122,529

The details as to how the staffing proportion of TCIO are calculated are described in more detail in Appendix A. These calculations and data from peer California Colleges have been analyzed for applicability to CLPCCD.

College Staffing

Applying the Gartner TCIO for staffing to the College Technology departments, the following staffing is recommended:

Resource	TCIO cost per year	Gartner Recommended Staff count	Actual College Technology Staff Count
Chabot Desktop	$2,405,550	9	3
Chabot Server	$182,994	.6	1
Chabot Total		**10**	**4**
LPC Desktop	$1,984,325	7.5	2.5
LPC Server	$133,848	.5 person	.5
LPC Total		**8**	**3**

CLPCCD also reviewed the comparable colleges in the 2016 survey of California Community College Staffing level for desktop computer counts. The colleges in the survey with a similar count range for Chabot and LPC include Merced (275), Ohlone (228.7), Irvine Valley (236), Glendale (262.5), Cuesta (250) and Shasta (226.7) The average desktop count from the CCCD survey for the comparable colleges was 233, ranging from 226 to 275 units per IT Staff member. Prior to the Measure B Bond, the per unit ratio for Chabot was 266 and for LPC was 235. Both colleges were within the CCCD range from the 2016 survey.

With the Measure B expansion, the per unit support ratio at Chabot increased from 266 to 395 per IT staff. To return to the acceptable 266 unit ratio, the Chabot staff would need to increase to 8.9 staff, or a net increase of three (3) staff. This unit ratio is consistent with the same staffing level of nine (9) that is recommended by the Gartner TCIO model.

With the Measure B expansion at LPC, the LPC desktop ratio increased from 235 units per IT staff to 355 units per IT staff. To return to the same 266 unit ratio as Chabot, the staff for LPC would need to increase to 7.4 staff, or a net increase of two (2) staff. This unit ratio is also confirmed by the level of 7.5 that is recommended by the Gartner TCIO model.

Summarizing for desktop support, both Chabot and LPC technology departments should be increased by three (3) staff at Chabot and two (2) staff at LPC to support the college desktop expansion based on the Measure B bond growth.

For the colleges, the server increase count was not as significant as the District server count since most of the Enterprise systems are centralized through the District servers that service all locations. For both colleges, the Gartner TCIO model staffing recommendations was .5 to .6 staff, which is a shared IT resource with desktop support staff. An additional .5 IT resource is expected to become warranted during the Measure A expansion when more virtualized servers with redundancy are added to the college server pool as has already been implemented at district locations.

District Staffing

At the District level, the server count is significantly higher, leading to the following staffing calculations:

Resource	TCIO cost per year	Gartner Recommended Staff count	Actual District Staff Count
Desktops	$208,075	.78	1
Windows Server	$288,762	1	.75
Linux Server	$371,976	1.3	1
AIX Server	$1,126,803	3	1
Storage	$184,828	.4	.25
Networking	$493,550	1.6	1
District Total		**8.08**	**5**

For the District, staffing for desktop support went from .5 person to one (1) person to support 205 desktops since the Measure B bond expansion. No additional staffing increases are needed for the district support of desktops.

With the expansion of servers during the Measure B bond technology improvements, the primary increase was in the District servers which went from 31 to 136 servers, due to the increase in new application systems, Enterprise servers and redundant servers to maximize system availability. With this substantial increase in systems and servers, the Gartner TCIO model

recommends 5.7 IT staff required, which is an increase of three (3) IT staff members for Enterprise systems/servers.

The network growth resulting from Measure B includes 1) expanding the services for students and staff , 2) increasing the available bandwidth and 3) an increase in network ports by a factor of three to eight times depending on the site. In all three locations, the total port count has increased from 3,048 to 10,624, which is 3.5 times the network capability. The Gartner TCIO model recommends at least 1.6 staffing compared to the current 1.0 staff for network support. Thus, due to the anticipated expansion under the new Measure A Bond, an increase of one (1) network staff is recommended to maintain the network for 24x7 coverage.

SUMMARY OF TOTAL COST OF OWNERSHIP AT CLPCCD

Through the Measure B Bond program, the Information Technology infrastructure at Chabot-Las Positas Community College District (CLPCCD) has grown substantially. The Information Technology improvements included upgrades to servers, desktop/laptop, audio-visual, wired and wireless networking and cabling infrastructure. Likewise, the Total Cost of Ownership for the expanded infrastructure has been significant.

CLPCCD District ITS and College Technology departments have been able to accommodate the infrastructure and TCO growth through a number of operational approaches:

- Vendor Standardization: With vendor standardization, CLPCCD District ITS reduced incompatibility issues, support issues, administrative costs and have access to new technology for prototyping. For the Measure B Bond program, CLPCCD standardized on all IT equipment for switches, routers, network infrastructure, desktops/laptops, servers, audio-visual equipment and cabling. With vendor standardization, CLPCCD also gained purchasing leverage, which resulted in attractive pricing from partners who worked with CLPCCD for a successful infrastructure implementation.
- Product Selection – CLPCCD District ITS and College Technology staff analyzed and selected products that would provide the greatest performance and life cycle. This includes Hewlett-Packard and IBM servers, Hewlett-Packard desktops, Cisco networking hardware and Commscope SYSTIMAX Category 6A cabling standards. This has allowed CLPCCD to extend the longevity of the equipment and maximize its investment of Measure B funds.
- Support Contracts – Servers, desktops and network equipment were purchased with supplier/manufacturer support. This increased the availability of parts, skilled technicians for repair and timeliness of repairs. Where available, support contracts were purchased to the end of 2017 at the end of Measure B.
- Stable IS Organization: CLPCCD ITS has been fortunate to maintain talented staff, many of whom have worked in the District for 10+ years. Leveraging the long-time, experienced staff, the knowledge base for deployment of new systems was comprehensive and thorough. A stable staff kept deployments consistent and focused.

While CLPCCD District ITS and College Technology departments have been very successful in the approaches documented above, the TCO impact has not been addressed in areas of staff levels and training. Supported by Gartner TCIO analysis and peer California Community colleges, the following staff expansion is required to support the ***current*** infrastructure acquired through the Measure B bond projects to satisfy the gap for TCO staffing:

Staffing Expansion for Desktops and Servers

Location	Actual Staff Count	Gartner Recommended Staff Count	Increase Required
Chabot	6	9	+3
Las Positas	5.5	7.5	+2
District	4	7	+3

Staffing Expansion for Networking

Location	Actual Staff Count	Gartner Recommended Staff Count	Increase Required
District	1	1.6	+1

Staffing Expansion for AV

Location	Actual Staff Count	Consultant Recommended Staff Count	Increase Required
Chabot	2	3.7	+2
Las Positas	2.5	2.65	0

In addition to the staff expansion, appropriate training is required to ensure effectiveness of support to staff and students.

As the Measure A projects occur, CLPCCD plans to leverage the successful approaches for equipment selection, deployment and support. Further analysis of staffing levels must be performed on a regular basis to ensure there is adequate technology support to implement the new Measure A Bond projects as additional technology expansions continue.

IT ACTION PLAN

Information Technology projects include the Measure A bond building modernization projects and other district wide Enterprise technology initiatives. This includes the development of an updated district-wide Technology Plan that addresses the technology aspects of facilities and equipment planning and aligns with the Facilities Master Plan, the College Educational Master Plans, and the District Strategic Plan.

Key items addressed in Phase 1 of the Measure A projects will include:

- Upgrade of campus data and cellular wireless networking. This project will replace the current infrastructure with the 802.11ac Wave 2 technology, allowing for high-bandwidth and more pervasive data connectivity on campus. DAS technology will be deployed to enhance cellular reception within buildings, in conjunction to carrier tower transmission.
- Addition of equipment to support Facilities Master Plan: As buildings are modernized or renovated, new desktop/laptops and network infrastructure will be procured and deployed.
- Ongoing replacements for equipment life cycle and end of service life. Using the four-year life cycle, refreshes each year will replace 25% of the installed desktop/laptop equipment. Additional equipment needed for the building modernizations will be rolled into the four-year life cycle refreshes. Network and server expansion and replacements will be designed and procured as needed.
- Ongoing support with vendor maintenance. To provide quick problem resolution and return-to-service, support contracts for equipment will provide expertise for quick problem resolution and efficiency of operations for CLPCCD District ITS and College Technology staff.
- Replacement of Help Desk software. To provide enhanced service to the user community, new Help Desk software will be implemented, providing a searchable knowledge base to assist with rapid problem resolution.
- Staff additions to reach Gartner and peer California Community Colleges staffing ratios. The chart below projects the addition growth as needed to meet near-term (Phase 1) Measure A projects.

Location	Actual Staff Count	Recommended Staff Count	Proposed Growth for 2017-2018	Future Growth for Measure A Phase 1
Chabot	6	9	+3	+2
Las Positas	5.5	7.5	+2.5 *	+3
District	4	7	+3	+1

* Additional .5 staff head count increase is already in progress.

As implemented for Measure B, CLPCCD District ITS and College Technology will continue to follow and enhance the guidelines for Acquisition and Ongoing support described by the Total Cost of Ownership (TCO) for Information Technology (IT) to provide high-performing technology solutions for staff and students.

APPENDIX A - CALCULATING ANNUAL TCIO FOR CLPCCD INFORMATION TECHNOLOGY

Each year Gartner develops a new Total Cost of Infrastructure and Operations (TCIO) report based its Information Technology Key Metrics Data. ITKMD is part of the Gartner Benchmark Analytics range of solutions, and offers macro level and platform-level looks at Gartner's global database of comprehensive cost and performance measures. The annually published ITKMD reports contain relevant database averages and other statistics from a subset of metrics and prescriptive engagements available through Gartner Benchmark Analytics. ITKMD consists of more than 2,000 IT cost and performance statistics.

In 2015, Gartner collected ITKMD from over 2,000 enterprises worldwide. The data collected through 2015 formed the basis of the 2016 ITKMD series of reports. ITKMD provides immediate access to authoritative data on IT staffing and investment levels, as well as key technology cost and performance metrics. ITKMD is multilevel: from macrostatistics (such as IT expenditures/employee) to platform-level statistics. These metrics support improved budget and investment decisions with regard to the changing environments of business and IT. ITKMD is collected year-round through direct fact finding in benchmarking and consulting engagements, and through surveys of the Gartner customers and at Gartner events, in addition to surveys of non-Gartner-based customers.

Gartner's TCIO model for 2016 assigns the following costs:

Platform	**Unit**	**2016 Average TCIO/Unit/Year**
Windows Server	No. of OS instances (installed)	$5,662
Linux Server	No. of OS instances (installed)	$8,454
UNIX Server	No. of OS instances (installed)	$27,483
Storage	No. of TB (raw configured)	$2,009
LAN	No. of ports (active)	$100
Voice Network	No. of users	$622
Client Computing	No. of end-user devices	$1,015

These values have been used to quantify funding costs for the CLPCCD District and College Technology TCIO.

Note that the total TCIO for a system at CLPCCD would include the years of service available from that system. The anticipated life cycle of CLPCCD technology equipment is as follows:

- Desktop/laptop computers: 4 years
- Servers: 5-7 years
- Printers: 5 years
- Network equipment: 7-10 years
- Network cabling: 20-25 years
- Audio-Visual equipment: 7 years
- Telephony systems: 8-12 years
- UPS: 15-20 years
- Generator: 20-30 years

CLPCCD ITS and College Technology staffing assess equipment usefulness to determine life span. Innovative technology that does not exist in the industry as of yet will make the current equipment obsolete and will reduce the service life when available.

TCIO calculations shown below are an **annual cost** based on Gartner's model.

Chabot College Servers

Chabot College has 30 servers, divided up as: twenty-eight (28) Windows servers and two (2) Linux servers. As such, the TCIO for those servers is:

Platform	2016 Average TCIO/Unit/Year	Quantity	Net Cost
Windows Server	$5,662	28	$158,536
Linux Server	$8,454	2	$16,908
LAN ports	$100	75	$7,500
Total TCIO			**$182,944.00**

Las Positas College Servers

Las Positas College has 22 servers, configured as: twenty (20) Windows servers and two (2) Linux servers. As such, the TCIO for those servers is:

Platform	2016 Average TCIO/Unit/Year	Quantity	Net Cost
Windows Server	$5,662	20	$113,240
Linux Server	$8,454	2	$16,908
LAN ports	$100	37	$3,700
Total TCIO			**$133,848**

District Servers

The TCIO for the Enterprise Banner server, and application servers directly related to Banner access is:

Platform	2016 Average TCIO/Unit/Year	Quantity	Net Cost
UNIX (AIX)	$27,483	41	$1,126,803
Linux Servers	$8,454	44	$371,976
Windows Servers	$5,662	51	$288,762
Storage (TB)	$2,009	92	$184,828
LAN ports	$100	120	$12,000
Total TCIO			**$1,984,369.00**

Network Infrastructure

LAN connections in the Data Center are already included in the Server TCIO cost model. Using the Gartner mode for Data Networks, the following TCIO calculations apply:

Platform	2016 Average TCIO/Unit/Year	Number of Active Connections *	Net Cost
Chabot	$100	2780	$278,000
Las Positas	$100	1,955	$195,500
District & TVOS	$100	200	$20,000
Total TCIO			**$493,500.00**

* Based on 2016 campus desktop and laptop counts. Does not include BYOD wireless users.

Staffing TCIO Calculations

Garner surveys the industry and compiles specific data on staffing levels and costs. These are documented as part of the ITKMD Toolkit, which is published annually. Key metrics are shown below:

Resource	TCIO cost per year	Staffing Cost Allocation	Average Annual Salary
Windows servers	$5,662	45%	$126,336
Linux Server	$8,454	50%	$142,335
Unix Server	$27,483	35%	$136,020
Storage	$2,009	26%	$131,836
Client Computing (Desktops)	$1,015	40%	$105,455
Data Network	$100	43%	$131,500
Voice Network	$622	37%	$122,529

Applying the Gartner recommendations to CLPCCD, the staffing calculations are:

Chabot College

Platform	2016 Average TCIO/Unit/Year	No of Units	Salary	% TCIO cost	Net Staffing Recommended
Windows Server	$5,662	28	$126,336	45	.56
Linux Server	$8,454	2	$142,335	50	.05
Desktop	$1,015	2370	$105,445	40	9
Total Staffing TCIO					**10**

Las Positas College

Platform	2016 Average TCIO/Unit/Year	No. of Units	Salary	% TCIO cost	Net Staffing Recommended
Windows Server	$5,662	20	$126,336	45	.40
Linux Server	$8,454	2	$142,335	50	.05
Desktop	$1,015	1955	$105,445	40	7.5
Total Staffing TCIO					**8**

CLPCCD District

Platform	TCIO cost per year	Gartner Recommended Staff count	Actual District Staff Count
Desktops	$208,075	.78	1
Windows Server	$288,762	1	.75
Linux Server	$371,976	1.3	1
AIX Server	$1,126,803	3	1
Storage	$184,828	.4	.25
District Systems/Servers Total		**6.48**	**4**

Platform	TCIO cost per year	Gartner Recommended Staff count	Actual District Staff Count
Networking	$493,550	1.6	1
District Network Total		**1.6**	**1**

APPENDIX B - SURVEY OF CALIFORNIA COMMUNITY COLLEGE STAFFING LEVELS

A request was made to peer groups at Community Colleges in California in 2016 to share the staffing levels for desktop and server administration. The data in the chart was reviewed by CLPCCD to compare staffing levels for computer and server support to other comparable colleges.

The following data was received:

No.	College	No. Of Techs	No. of Computers	No. of Servers
1	Santa Rosa Junior College	22	3500	150
2	Merced Community College	7	1925	190
3	Ohlone CCD	11	2059	170
4	Long Beach	10	4200	250
5	Irvine Valley	5.5	1300	110
6	Glendale	8	2100	125
7	Fresno	11	3300	111
8	El Camino	8 Computer Support Techs,	3200	150
		3 Help Desk Techs,		
		1 Lab support tech.		
i9	Cuesta	5	2000	130
10	Shasta	7	1589	227

No.	College	No. Of Techs	No. of Computers	No. of Servers
11	Siskiyous	3	380	30
12	Southwestern	18	4000	180
13	Chabot	6	2370	30
13	Las Positas	5.5	1955	22
13	CLPCCD District	4	205	136