Total Cost of Ownership

February 21, 2017
WHAT IS TOTAL COST OF OWNERSHIP?
Total Cost of Ownership Definition

• The **total cost** of a building from start to end including:
  – Planning, Design and Construction
  – Annual Operations Cost
    • Custodial
    • Maintenance
    • Grounds
    • Utilities
  – Renovation, Repurpose, Demolition
WHY DO WE CARE ABOUT TOTAL COST OF OWNERSHIP?
Stewardship

• The District’s buildings and grounds are precious assets entrusted to our governing board, to be protected, maintained and optimized for future generations.

• Represents a high level and pervasive commitment to optimize our capital investment

• Effectively utilize our resources to ensure a healthy, comfortable, and sustainable learning environment.
Key Performance Indicator

Total Cost of Ownership is a Key Performance Indicator of how cost effective an organization

– Designs
– Constructs
– Operates
– Maintains
– Upgrades and Renovates

An indicator of accountability
Accreditation

Recognizing the imperative nature of Total Cost of Ownership (TCO) to the long term viability of our educational institutions, the Accrediting Commission for Community and Junior Colleges (ACCJC) has made TCO an essential and required standard:

**Standard III.B.4:**

*Long-range capital plans support institutional improvement goals and reflect projections of the total cost of ownership of new facilities and equipment.*
“Implementation of the District Facilities Master Plan will reflect projections of the total cost of ownership and be consistent with the District Total Cost of Ownership Plan which includes expenses associated with deploying, using, and retiring facilities and equipment, including operating costs for ongoing and deferred maintenance, and personnel costs, both administrative and direct staffing.”
Objective

To create a data driven approach to:

• Understanding
• Projecting
• Planning for
• Reducing

the Total Cost of Ownership
THE ELEMENTS OF TOTAL COST OF OWNERSHIP
The Building “Cycle of Life”

1. Programming
2. Design
3. Construction

- Capital Asset Management
- Project Delivery Management
- Operations Management
- Planned Maintenance
- Repairs
- Retrofits / Upgrades
- Improvements
- Replacements
1. Planning, Design, Construction

- One time costs
- Capital expense funded by Bonds, State, District Funds
- Facility Master Plan supports Educational Master Plan
- Projects support Program Review
- 5-Year Capital Improvement Plan
- District Standards
2. Annual Operations

- Ongoing expenses
- Custodial
- Maintenance
- Grounds
- Utilities
- Scheduled/Preventative Maintenance
- Repairs
3. Renovation, Upgrade, Demolition

- Repurpose of existing facilities
- Updating infrastructure/Technology
- Code changes
- Major Building Component Replacements
- Demolition of facility when no longer viable
APPA Levels of Cleaning

Level 1 – Orderly Spotlessness
Level 2 – Ordinary Tidiness
Level 3 – Casual Inattention
Level 4 – Moderate Dinginess
Level 5 – Unkempt Neglect

APPA – Association of Physical Plant Administrators now renamed Leadership in Educational Facilities
Districtwide GSF/Custodian

GSF – Gross Square Feet
### APPA Level Staffing Recommendations

<table>
<thead>
<tr>
<th>Las Positas</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
<th>Actual 15/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>10.5</td>
<td>7.5</td>
<td>6.0</td>
<td>4.0</td>
<td>3.0</td>
<td>5.5</td>
</tr>
<tr>
<td>Custodial</td>
<td>48.0</td>
<td>28.5</td>
<td>18.0</td>
<td>15.0</td>
<td>14.0</td>
<td>16.0</td>
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<tr>
<td>Grounds</td>
<td>17.5</td>
<td>11.5</td>
<td>5.5</td>
<td>4.5</td>
<td>2</td>
<td>4.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chabot</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
<th>Level 4</th>
<th>Level 5</th>
<th>Actual 15/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance</td>
<td>17.5</td>
<td>13.3</td>
<td>10.0</td>
<td>6.5</td>
<td>4.0</td>
<td>7.5</td>
</tr>
<tr>
<td>Custodial</td>
<td>83.0</td>
<td>49.0</td>
<td>28.0</td>
<td>24.0</td>
<td>20.5</td>
<td>22.0</td>
</tr>
<tr>
<td>Grounds</td>
<td>23.0</td>
<td>15.0</td>
<td>8.5</td>
<td>6.0</td>
<td>2.5</td>
<td>6.0</td>
</tr>
</tbody>
</table>

**Total**                   |         |         | 76      | 60      | 61      |

“88% of Higher Education Facilities maintain a Level 3 or better standard of cleaning”
# Projected M&O Staffing Costs

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

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

Energy Use Intensity MMBTU/GSF

Las Positas | Chabot | APPA National

- 110.27 | 104.20 | 109.81 | 95.35 | 115.93 | 121.35 | 99.93 | 121.36 | 119.554 | 129.78 | 99.05
- 98.88 | 98.27 | 85.09 | 86.08 | 82.17 | 77.18 | 84.69

## Projected Total Annual Cost

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

*TCO Cost is primarily a function of Square Footage*
Projected Total Annual Cost

![Projected Annual Operations Cost Chart]

- M&O Staff
- M&O Expense
- Utilities
- GSF
The Action Plan

1. Funding for M&O functions must be proportional to facility square footage, not FTES (Full Time Equivalent Student)
2. Project Development to consider Educational Master Plan, Program Review, Facilities Master Plan, Cap/Load Ratio, District Standards and Lifecycle Cost Analysis
3. The District set a goal and fund M&O to achieve an APPA Level 3 standard of cleaning and operations
4. The District shall develop and maintain a Preventative Maintenance Program
The Action Plan

5. M&O shall implement an updated Work Order System tracking and reporting response data

6. Lower Energy Usage and Costs per GSF by implementing energy generation and conservation projects

7. Identify and integrate deferred maintenance projects into the state funded program or as a part of Measure A
TCO – Information Technology

- 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.
- Growth in certain technology areas was more than four (4) times from pre-bond 2005 levels.
- For Measure B, CLPCCD District ITS and College Technology departments did follow the TCO model for hardware and software purchases, installation, training, and maintenance support.
- Staffing support lagged the levels recommended by TCO analyses since the Measure B expansion is being supported by the same staff level since 2005.
TCO for IT – Industry Definition

• Total Cost of Ownership for Information Technology was first coined by Gartner Group in 1987. Gartner, Inc. is regarded as a leading information technology research and advisory group. From the Gartner IT Glossary of terms, TCO is defined as:
  “… a comprehensive assessment of information technology (IT) or other costs across enterprise boundaries over time... including hardware and software acquisition, management and support, communications, end-user expenses and the opportunity cost of downtime, training and other productivity losses.”

• These costs extend over the “life” of the Technology, which can vary depending on economic, service/functionality and depreciation factors. (CLPCCD uses the “service life” of the equipment).

• The Gartner model uses the IT Key Metrics Data (ITKMD) to calculate a price for infrastructure and operations with recommended IT staffing levels.

• Gartner is the TCO model that was used to do an IT analysis to see how CLPCCD compares to the TCO recommendations for staffing.
TCO IT – Life Cycle

• The Total Cost of Ownership Life Cycle encompasses all phases of technology’s usage from design, through procurement and deployment and through obsolescence.

• The various phases in the TCO Life Cycle include Planning, Procurement, Deployment, Management, Support, and Disposition.

• The ongoing costs of TCO include all expenses for staff, equipment, and support to execute these tasks.
TCO IT – What Costs are included?

Acquisition Costs

- System Design
- IT Hardware/Software Equipment
- Acquisition Process
- System Implementation
TCO IT – What Costs are included?

Hidden Acquisition Costs

- Diminished Performance
- Facility Improvements
- Network Upgrades
- Training (both IT and user training)
- Insurance
- Decommissioning (disposal old equipment)
TCO IT – What Costs are included?

Ongoing Costs

- System Maintenance
- System Upgrades
- User Changes (New requirements, customizations)
- System Management
- Staff Augmentation
- Ongoing Training (both IT and user training)
- System Downtime
- Audit
TCO IT – Service Life of IT Equipment

TCO costs will be based on the “service life” of the various equipment categories. The Typical Life Cycles of IT equipment at CLPCCD are:

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

Note: “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.
What IT projects were included in Measure B?

- Desktop refresh for 25% of desktops annual for a 4-year life cycle (11 refresh cycles completed from 2005-2016)
- Windows/Linux Server refreshes (2007, 2014) and new rollouts
- Wireless network rollout (beginning in 2009)
- As required by new buildings and user requirements
  - Network equipment installations
  - Desktop/laptop installations
  - Audio-Visual “Smart” classrooms
# TCO IT – Chabot IT Expansion

Chabot expansion during Measure B bond projects

## Chabot

<table>
<thead>
<tr>
<th>Resource</th>
<th>2005 Quantity</th>
<th>2016 Quantity</th>
<th>Growth Factor from 2005</th>
<th>Growth % from 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers</td>
<td>15</td>
<td>30</td>
<td>2 times</td>
<td>200%</td>
</tr>
<tr>
<td>Desktops</td>
<td>1600</td>
<td>2370</td>
<td>1.48 times</td>
<td>148%</td>
</tr>
<tr>
<td>AV (Smart classrooms)</td>
<td>47</td>
<td>161</td>
<td>2.46 times</td>
<td>246%</td>
</tr>
<tr>
<td>Network (wired)</td>
<td>&lt;1800</td>
<td>5520</td>
<td>3.06 times</td>
<td>306%</td>
</tr>
<tr>
<td>Network (wireless)</td>
<td>0</td>
<td>118</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>
# TCO IT – Las Positas IT Expansion

Las Positas expansion during Measure B bond projects

<table>
<thead>
<tr>
<th>Resource</th>
<th>2005 Quantity</th>
<th>2016 Quantity</th>
<th>Growth Factor from 2005</th>
<th>Growth % from 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers</td>
<td>8</td>
<td>22</td>
<td>2.75 times</td>
<td>275%</td>
</tr>
<tr>
<td>Desktops</td>
<td>1175</td>
<td>1955</td>
<td>1.66 times</td>
<td>166%</td>
</tr>
<tr>
<td>AV (Smart classrooms)</td>
<td>21</td>
<td>114</td>
<td>5.42 times</td>
<td>542%</td>
</tr>
<tr>
<td>Network (wired)</td>
<td>&lt;1200</td>
<td>4720</td>
<td>3.93 times</td>
<td>393%</td>
</tr>
<tr>
<td>Network (wireless)</td>
<td>0</td>
<td>80</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>
**TCO IT – District IT Expansion**

District expansion during Measure B bond projects

<table>
<thead>
<tr>
<th>Resource</th>
<th>Quantity</th>
<th>Quantity</th>
<th>Growth Factor from 2005</th>
<th>Growth % from 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers</td>
<td>31</td>
<td>136</td>
<td>4.38 times</td>
<td>438%</td>
</tr>
<tr>
<td>Desktops</td>
<td>74</td>
<td>205</td>
<td>2.77 times</td>
<td>277%</td>
</tr>
<tr>
<td>Network (wired)</td>
<td>&lt;48</td>
<td>384</td>
<td>8.0 times</td>
<td>800%</td>
</tr>
<tr>
<td>Network (wireless)</td>
<td>0</td>
<td>6</td>
<td>+</td>
<td></td>
</tr>
</tbody>
</table>
CLPCCD ITS expanded the Wide Area Network (WAN) bandwidth from the 2005 T-1 speed to the current Opt-E-Man Ethernet which was up to 22 times faster.

<table>
<thead>
<tr>
<th>Connection</th>
<th>2005</th>
<th>2007</th>
<th>2016</th>
<th>Growth Factor from 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chabot to LPC</td>
<td>3 x T-1 (4.5 Mbps)</td>
<td></td>
<td>100 Mbps</td>
<td>22 times</td>
</tr>
<tr>
<td>Chabot to District</td>
<td>1 x T-1 (1.5 Mbps)</td>
<td>2 x T-1 (3 Mbps)</td>
<td>20 Mbps</td>
<td>13 times</td>
</tr>
<tr>
<td>District to LPC (redundant link to Chabot)</td>
<td>1 x T-1 (1.5 Mbps)</td>
<td></td>
<td>20 Mbps</td>
<td>13 times</td>
</tr>
</tbody>
</table>
TCO IT – Under Measure B

Actions CLPCCD IT did to handle TCO for the Measure B expansion to reduce TCO costs and achieve productivity gains:

• **Vendor Standardization**: reduced incompatibility issues, support issues, administrative costs.

• **Product Selection** to provide the greatest performance and life cycle: Hewlett-Packard and IBM servers, Hewlett-Packard desktops, Cisco networking hardware and Commscope SYSTIMAX Category 6A cabling standards.

• **Multi-Year Support Contracts** with vendors for maintenance which provided increased availability of parts, skilled technicians for repair and timeliness of repairs.

• **Stable IT Organization**: long-time, experienced staff to keep deployments consistent and focused.
What needs to be addressed for Measure A Bond projects?

- Develop 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.
- Follow guidelines for the TCO IT model for Acquisitions and Ongoing Support as did for Measure B.
- Addition of equipment to support Facilities Master Plan.
- Ongoing replacements for equipment life cycle and end of service life.
- Ongoing support with vendor maintenance and expertise for quick problem resolution.
- Staffing requirements: staff additions to reach Gartner and peer California Community Colleges staffing ratios.
**TCO IT – Summary IT Staffing**

Summary IT Staffing to Meet TCO Guidelines

<table>
<thead>
<tr>
<th>Location</th>
<th>Actual Staff Count</th>
<th>Recommended Staff Count</th>
<th>Proposed Growth for 2017-2018</th>
<th>Future Growth for Measure A Phase 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chabot</td>
<td>6 (4 desktop/server, 2 AV)</td>
<td>9</td>
<td>+3</td>
<td>+2</td>
</tr>
<tr>
<td>Las Positas</td>
<td>5.5 (3 desktop/server, 2.5 AV)</td>
<td>7.5</td>
<td>+2.5</td>
<td>+3</td>
</tr>
<tr>
<td>District</td>
<td>5 (1 desktop, 3 server, 1 network)</td>
<td>8</td>
<td>+3</td>
<td>+1</td>
</tr>
</tbody>
</table>