Measure C Computer Refresh Program Analysis
September 2009

Executive Summary

ETS conducted an analysis of Measure C expenditures and deployment rates for computers to determine:

- What is the average cost of computers being replaced on Measure C refresh funds?
- Will existing Measure C funds for computer refresh allow computer replacement to continue through the end of the 15-year Measure C Bond project timeframe?
- What Measure C budget shortfalls exist to achieving the stated computer refresh program objective of a four-year refresh cycle?
- What options exist for managing the computer refresh cycle?

Each of these questions is addressed below:

A. WHAT IS THE AVERAGE COST OF COMPUTERS BEING REPLACED ON MEASURE C REFRESH FUNDS?

The average cost of acquisition for a computer purchased under Measure C funding for Foothill is $1,433 as compared to the planned cost of $1,800. The average cost of a computer purchased for the district (colleges and Central Services) overall is $1,438. The total cost for acquisition and labor to install and dispose of computers is $2,039 for Foothill College and $2,040 for the district overall.

B. WILL EXISTING MEASURE C FUNDS FOR COMPUTER REFRESH ALLOW COMPUTER REPLACEMENT TO CONTINUE THROUGH THE END OF THE 15-YEAR MEASURE C BOND PROJECT TIMEFRAME?

Yes and No.

When looking at the district as a whole there are enough acquisition and labor funds to support the current average rate at which we are replacing computers considering all known costs.[1] However, when looking at the numbers for Foothill College alone, Foothill College's current average replacement rate exceeds the maximum sustainable rate possible through Measure C. Foothill funds will be exhausted in 11 more years if they continue with the same annual replacement rate.

This is good news considering that the computer inventory for the district has grown from the 5,127 computers used in Measure C project planning to the current inventory of 6,082 computers. Foothill College / Central Services' inventory has grown by 20% and De Anza College's inventory has grown by 18%. (Central Services' inventory cannot be broken out separately from Foothill College with the data available, but we believe that the most if not all of the 20% growth is due to Foothill College.) Further expansion of the inventory may reduce our capability to provide timely replacements of older computers.

However, if some acquisition funds are not used to supplement labor funding, the Measure C funding dedicated to providing labor for replacing and disposing of obsolete computers is insufficient to sustain the current replacement rate. Measure C Bond funds for labor will support only 185 computer replacements per year district wide versus the current rate of 436 computers per year for Foothill College.

[1] Based on the amount of remaining (unexpended) Measure C funds (acquisition and labor). Assumes both funding accounts are combined to jointly fund purchase and implementation costs.

C. WHAT MEASURE C BUDGET SHORTFALLS EXIST TO ACHIEVING THE STATED COMPUTER REFRESH PROGRAM OBJECTIVE OF A FOUR-YEAR REFRESH CYCLE[2]?

Using only the existing Measure C funds over the life of the bond (for both acquisition and labor costs) to refresh all 6,082 computers in the inventory will extend the original desired replacement cycle of **four** years to more than **six** years.

The Measure C budget is short $578,514 for acquisition and labor costs on an annual basis to provide a four-year refresh cycle for Foothill College. The Measure C budget is short $1,282,120 annually for the whole district.[3]

If we extend the original replacement cycle from four to five years then the Measure C budget is only short **$313,901** for acquisition and labor costs to allow a five-year refresh cycle for Foothill College and **$661,641** for the whole district (annual costs). To provide a five-year refresh cycle, we would also need to add an additional .9 FTE of an ETS technician to the staff who are already assigned to Measure C deployments, to sustain this rate.

Any further increase in the computer inventory will exacerbate the budget problem.

D. WHAT OPTIONS EXIST FOR MANAGING THE COMPUTER REFRESH CYCLE?

Continue as is (e.g. change nothing)

Measure C funding available for computer purchase will be sufficient to sustain current replacement rates for most of the duration of the Measure C Bond term. However, It is likely that De Anza College will increase the number of computers replaced per year because their replacement rate (as used in this analysis) has been lower than Foothill's while De Anza College has more computers in their inventory. Increasing the rate of replacement will expend Measure C funds faster.

Notwithstanding, Measure C funding for labor is insufficient to fund all associated costs with the purchase and disposal of computers through the Measure C Bond. We will need to continue to use non-Measure C funds for labor costs in addition to designated Measure C funds.

We will have a refresh cycle of more than six years for computers and this cycle time will grow if the amount in inventory continues to increase.

Finally, if computer purchases are not evenly spread across the refresh cycle, we may create peaks and valleys in funding requirements for future computer replacements as well as uneven demands on technicians involved in installation and disposal.

Spread computer purchases over the refresh cycle

The intent is to spread the purchases of computers across the term of the refresh cycle so that an equal number of computers are replaced at each college and Central Services per year.

One method of doing this is to divide the Measure C computer acquisition funds into equal annual amounts that can only be spent in designated years.

This also ensures that Measure C funds for replacing computers will be available on a consistent basis throughout the life of the Bond program.

---

[2] Another assumption in the Bond planning was to have three (3) refresh cycles in the 15 years of the Bond term. Note that this assumption is consistent with a five-year refresh cycle.

[3] Considering just acquisition costs alone, the Measure C budget is short $232,736 annually for Foothill College and $477,719 annually for the whole district.

Fully fund all associated labor costs through Measure C funds

To fully fund labor costs, we would combine the assets of acquisition and labor project funding for the replacement of computers to fund the purchase, disposition, and installation of replacement computers. Some acquisition funds will be used for labor costs. At Foothill College, maximizing the replacement rate while paying for all costs through Measure C funding (without augmentation) would result in 25% of acquisition funds being used for labor costs. The replacement rate would drop 16% from the current rate of replacement.

Fully fund all labor costs and implement a five-year refresh cycle

To implement a five year refresh cycle, we would dedicate approximately **$662,000**[4] annually in new funds to the existing Measure C Bond project for the replacement of computers and acquire an additional FTE in ETS to handle replacement / disposal tasks.[5] The additional FTE can be acquired either through the hiring of an additional technician or through the reassignment of an existing technician (which would slow down work in other areas.)

[4] If Measure C Bond funds are shifted from another project then this number will be approximately 5 to 6% higher due to the need to deduct project management costs associated with Gilbane – Maas' management of the contract.

[5] A nominal amount of funding would be provided to other departments (purchasing, facilities, etc.) to pay for their labor costs.

Additional Details of the Analysis

A. GROWTH OF THE INFRASTRUCTURE

When the Measure C Bond Program was originally planned, we had 5,127 computers in our inventory. We now have a total of 6,082 computers in inventory, an increase of 19%. 27% of these computers are now over 4 years old.

B. COST OF REPLACEMENT

Table 1 defines the cost of replacing a single computer based on our experience on the Measure C project to date.

Table 1: Cost to Replace a Single Computer in dollars

		A	B	C	D
		Foothill College	**De Anza College**	**Central Services**	**Average**
1	Original Measure C Planned Cost	1,800	1,800	1,800	1,800
2	Actual (Acquisition cost)	1,433	*1,433*	1,643	*1,438*
3	Actual (All costs)	2,039	*2,039*	2,106	*2,040*

The actual acquisition cost of replacing a computer ($1,433 for Foothill College, overall average of $1,438) is considerably less than the planned value of $1,800. (Row 2 vs Row 1)

Table 2 defines the cost of replacing all computers in current inventory.

Table 2: Cost to Replace all Computers in the Current Inventory in dollars

		A	B	C	D
		Foothill College	**De Anza College**	**Central Services**	**Total**
1	Acquisition cost	3,719,434	*4,766,778*	261,277	*8,747,489*
2	All costs	5,292,267	*6,782,502*	334,808	*12,409,577*

The total cost, including acquisition and labor, to replace all computers one time in the current inventory is over $5M for Foothill College and over $12M overall.

C. CAPABILITY TO INSTALL

Annual computer replacement rates (based on our experience to date) are listed in Table 3.

Table 3: Annual Computer Replacement Rates

		A	B	C	D
		Foothill College	**De Anza College**	**Central Services**	**Total**
1	Current Average Replacement Rate	436	*350*	43	*829*
2	Max Rate using only Measure C Funds[6]	396	*554*	36	*986*
3	To Replace Meas C Inventory (5,127) in 4 yrs[7]	575	707	Inc[8]	1,282
4	To Replace Total Inventory (6,082) in 4 yrs[9]	649	832	40	1,521
5	To Replace Total Inventory (6,082) in 5 yrs[10]	519	665	32	1,216
6	To Replace Total Inventory (6,082) in 6 yrs[11]	433	555	27	1,014
7	To Replace Total Inventory (6,082) in 7 yrs[12]	371	475	23	869

Requests completed by ETS for the deployment of computers purchased under Measure C accounts (611, 711) has been on average about 436 computers per year for Foothill College (829 computer per year for the entire district). (A1, D1) Note that colleges purchase computers under other Measure C accounts as well as non-Measure C accounts that are not included in these calculations. In some cases, colleges may have requested a higher install rate that was limited by the capacity of ETS staff. Refer to Appendix A for ETS Deployment Guidelines that may have limited the number of computer deployments.

We will not be able to sustain the *Current Average Replacement Rate* through the end of the Measure C Bond Program for Foothill College using only Measure C funds. (A2 vs A1) Using estimates for De Anza College, we might be able to sustain our C*urrent Average Replacement Rate* through the end of the Measure C Bond Program considering the district as a whole. (D2 vs D1)

However, the computer replacement rate necessary to replace the current inventory on the desired **four**-year cycle is 49% larger than the rate that can be sustained under existing Measure C Funds (average replacement rates) for Foothill College. (A4 / A1)

Using only the existing Measure C funds over the life of the bond to refresh all 6,082 computers in inventory will push the original desired replacement cycle of **four** years to more than **six** years. (D2 vs D5, D6) Continuing to grow the size of computer inventories at both colleges will exacerbate the problem.

---

[6] Maximum sustainable rate if total cost (including labor) is paid for with Measure C Bond Funds. Calculated from the beginning of the Bond program without taking in account expenditures to date.
[7] With a four year refresh cycle
[8] Included in Foothill College's count
[9] With a four year refresh cycle
[10] With a five year refresh cycle
[11] With a six year refresh cycle
[12] With a seven year refresh cycle

D. BUDGET REQUIREMENTS

Budgets required for the replacement of computers are defined in Tables 4 and 5 below.

Table 4: 4 year Refresh Cycle Fund Distribution (Annual $)

		A	B	C	D
		Foothill College	**De Anza College**	**Central Services**	**Total**
1	Acquisition Costs	929,858	1,191,695	65,319	2,186,872
2	Measure C Acquisition Funds Available	697,122	943,084	68,946	1,709,153
3	Augmentation Needed for Acquisition Costs	232,736	248,610	-3,627	477,719
4	Labor, etc. Costs	393,208	503,931	18,383	915,522
5	Measure C ETS Labor Funds Available	47,430	60,786	2,905	111,121
6	Augmentation Needed for Labor, etc. Costs	345,778	443,145	15,478	804,401
7	Total Annual Augmentation Needed	578,514	691,755	11,851	1,282,120

Table 5: 5 year Refresh Cycle Fund Distribution (Annual $)

		A	B	C	D
		Foothill College	**De Anza College**	**Central Services**	**Total**
1	Acquisition Costs	743,887	953,356	52,255	1,749,498
2	Measure C Acquisition Funds Available	697,122	943,084	68,946	1,709,153
3	Augmentation Needed for Acquisition Costs	46,764	10,271	-16,691	40,345
4	Labor, etc. Costs	314,567	403,145	14,706	732,418
5	Measure C ETS Labor Funds Available	47,430	60,786	2,905	111,121
6	Augmentation Needed for Labor, etc. Costs	267,137	342,359	11,801	621,296
7	Total Annual Augmentation Needed	313,901	352,630	-4,890	661,641

The Measure C budget is short $313,901 for acquisition and labor costs annually to provide a five-year refresh cycle for Foothill College. (A7) Overall the district budget is short $661,641. (D7)

TCO is the annual "Total Cost of Ownership" cost for all computers in the current inventory. TCO includes acquisition, support, and replacement costs. This is the true cost of ownership for computers computed on an annual basis.

Table 6 illustrates different values of TCO given by different sources.

Table 6: Total Cost of Ownership (TCO) per Computer

Source	TCO (Annual cost)
Gartner Group	$7,000 to $13,000
Fortune / Economist Magazines	$4,000 to $10,000
University of Washington (2008)	$2,000 to $3,500
CCCCO, Tech II Plan (2000)	$2,929

E. LABOR REQUIREMENTS

Table 7 defines the amount of FTE required to sustain the replacements rates of four and five years. (The cost of labor is included in the calculations in Table 5.)

Table 7: ETS FTE Required to Maintain Replacement Rates

		A	B	C	D
		Foothill College	**De Anza College**	**Central Services**	**Total**
1	Current Actual Replacement Rate	1.5	*2.0*	.1	*3.6*
2	To Replace Total Inventory (6,082) in 4 yrs	2.4	3.1	.1	5.6
3	To Replace Total Inventory (6,082) in 5 yrs	1.9	2.5	.1	4.5

We have used on average 3.6 FTE of ETS technicians to support Measure C installation of computers. D1 This does not include other staff such as purchasing personnel, Plant Services personnel, etc who are involved in the life cycle of computer refresh. To allow a five-year replacement refresh cycle, we would need an additional .9 FTE of ETS technicians to sustain this rate. (D3 – D1)

ETS computer technicians perform a variety of other functions in addition to deploying computers purchased under Measure C accounts (#611, #711, CS):

- Deploying computers purchased through other funds or acquired from donations
- Troubleshooting hardware problems (computers and multimedia)
- Troubleshooting application problems
- Quarter term prep (3x / yr) image development, testing, deployment
- Summer break preventative maintenance for multimedia equipment
- In classroom Emergency Response
- Installing additional software
- Re-deploying computers after moves
- Removing viruses and malware
- First on site response for all computing issues including wireless
- Attending meetings

Also, ETS computer technicians work in teams, with each member providing different specialties to deploy groups of computers.

F. ASSUMPTIONS AND NOTES

1. All calculations in this report are derived from a more extensive analysis contained in the "15 Year Computer Replacement Calculations vx.xls" spreadsheet.
2. Data for this analysis was collected during May and June of 2009.
3. Purchase data for computers purchased under Measure C funds for De Anza College was not available at the time that this analysis was completed. Results for DeAnza College were estimated by assuming that their average purchase price of Measure C computers was equivalent to that of Foothill College. Other values for De Anza College were then calculated using this assumption. The estimated values for De Anza College have a significant effect on the results for the district overall as well because of aggregation. To identify those results, all values in this analysis that are affected by the estimated average purchase price for De Anza College computers are depicted in red font.
4. Labor data for work associated with departments outside of ETS was not available and was estimated at a nominal amount for this study. As a result this analysis may have underestimated the amount of labor that is dedicated to computer replacement and disposal by other departments. The aggregated amount of hours spent per computer for ordering, disposal, etc. was estimated at 4 hours at $50 per hour.
5. The analysis assumed a static number of computers in inventory over the life of the Bond project.
6. The Measure C Program officially began for accountability purposes on January 1, 2007
7. The colleges and to a lesser extent, Central Services, use other sources than Measure C to purchase computers for replacement or augmentation. While this analysis did take into account the entire known inventory of computers of the district, the analysis did not consider the impact (positive or negative) of using other sources of funding to purchase or acquire computers.

Appendix A: ETS Computer Deployment Guidelines (Excerpts)

Academic Desktops / Laptops
Labs / Classrooms
Computers / Printers

Assumptions:

- 36 days available during Quarter Breaks to deploy in academic classrooms and labs
- **Average 40 computers per Room**
- Time to Deploy averages 2.5 days when use in-house staff (imaged, inventoried and surpluses using in-house staff)
- Vendor imaging (Factory Imaging - agreement under negotiation)
- 4 Techs dedicated to installs at DA
- 3 Techs dedicated to installs at FH
- Deploy printers at same time lab or classroom computers deployed
- Purchase process of new equipment takes place two terms prior to the 'in use' term.

Example: Want to have new computer equipment for Spring Term: Procurement process of new equipment in Fall Term; Receive equipment at start of Winter Term; Winter Term create and deploy image on new computers. Use computers start of Spring Term.

	Number of Rooms
Summer Break	
Foothill College	3
De Anza College	4
Winter Break	
Foothill College	1
De Anza College	2
Spring Break	
Foothill College	1
De Anza College	1

Faculty and Staff Desktops / Laptops
Open Access Student Areas
Computers / Printers

Assumptions:

- Deploy During the Quarter Sessions
- Computers for new Faculty and staff take priority
- At De Anza there is a buffer inventory of new computers in order to avoid delays in delivery of computers for new faculty and staff.
- Deployment only performed by In-House staff - cost prohibitive to out-source: data transfer, custom software installation and configuration
- Vendor imaging (Factory Imaging - agreement under negotiation)
- Average 2.5 days per Computer Refresh
- Install includes Printer Set up
- Do not deploy First TWO weeks of each Quarter and Finals week
- New computer installs are performed post Office Shuffle
- 4 Techs dedicated to installs at DA
- 3 Techs dedicated to installs at FH

Number of Computers

	Foothill / District	De Anza
Summer Term 20 days (4 weeks)	30/10	40
Fall Term 40 days (8 weeks)	35/15	65
Winter Term 40 days (8 weeks)	35/15	65
Spring Term 40 days (8 weeks)	35/15	65