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ENVIRONMENTAL SCAN

# MEDICAL LABORATORY TECHNICIAN

Bay Region

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**CENTER OF EXCELLENCE**  
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**Mission:** The Centers of Excellence, in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development.

**Vision:** We aspire to be the premier source of regional economic and workforce information and insight for community colleges.

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**The demand for Medical Laboratory Technicians for the 12-county Bay Area is estimated to be 893 for the ten-year period 2008-2018. While hospitals are the major employers, jobs will grow faster in clinical and medical diagnostic laboratories; the biotechnology industry could also add employment fueled by personalized medicine trends.**

**Source: EMSI Employment, Fall 2008**

## **Executive Summary**

There is a new occupation emerging in California whose purpose is to alleviate the clinical laboratory workforce shortage, which by most estimates is in a crisis. Recently licensed by the state, the Medical Laboratory Technician (MLT) is being touted as the needed middle step in the clinical laboratory career ladder—bridging the gap between the lower rung jobs of Phlebotomist and Laboratory Assistant and the high rung job of Clinical Laboratory Scientist (CLS), which is most in demand.

This creates an opportunity for community colleges because Medical Laboratory Technicians require a two-year associate degree—their niche for training the state's workforce. However, this is a new occupation that did not exist before 2008 and there is not yet a wide use of this occupation in any industry that employs clinical laboratory personnel; few hospitals and diagnostic labs are hiring the technician, and biotechnology laboratories haven't quite figured out how to use them. In fact, there are currently only 72 licensed MLTs in the state. Colleges are cautious of creating new programs for technicians if there aren't enough jobs for their graduates. Another challenge for colleges is to develop sufficient partnerships with laboratories to offer clinical internships to accommodate students.

Healthcare employers are concerned about the lack of a pipeline of entrants to the profession—from high schools, community colleges and universities. Other factors that are driving the demand and supply of qualified clinical laboratory personnel are:

- Expansion of clinical laboratory services; more tests ordered with less complexity.
- Shortage of qualified applicants.
- Limited capacity for enrollments at college and university programs.
- Insufficient clinical laboratory internship sites to accommodate students.
- Replacement workers needed as mass retirements are imminent for CLSs.

But there are also obstacles to increased employment which include the following factors:

- Slowdown of hiring at hospitals due to the economy.
- Slow integration of MLTs into the laboratory workforce.
- Employment of MLTs is non-existent in related industries, like biotechnology.

While the need for Medical Laboratory Technicians is evident, the labor market data available is not providing a clear picture to guide new program development at this time. It is currently not possible to assess the gap between the current and future demand of MLTs and the needed supply of licensed candidates. This is because coding for Medical Laboratory Technician and Clinical Laboratory Scientist occupations

includes other job titles which may not be similar or which specify differing education and licensing requirements. The result is employment data that may not accurately represent the size of the current and future workforce.

Despite the imprecise labor market data, there are other industry changes that present a strong case for continuing growth in this occupation. Nevertheless, existing and developing MLT programs are forging ahead but are faced with challenges for funding, internship sites and jobs for graduates.

Colleges who are planning programs or are considering developing one would be best served by creating partnerships with their regional hospitals, reference laboratories and biotechnology firms to facilitate the faster transition of employing Medical Laboratory Technicians. Colleges can also benefit from developing connections with personnel at the Department of Public Health, Laboratory Field Services who can assist in clarifying program licensing requirements, among other issues.

Because of the dynamic nature of the laboratory industry workforce situation, it will require constant monitoring by college programs and workforce projects. Therefore, the Center of Excellence intends to revisit this topic in another two years to examine the impact of the economy, the integration of MLTs into the workforce, and to look at projected employment data for the next decade.

## Introduction

The California Community Colleges Economic & Workforce Development (EWD) Program has charged the Centers of Excellence with identifying industries and occupations that have unmet employee development needs and partnering potential for the colleges' programs. The Greater Silicon Valley Center of Excellence conducted an examination of Medical Laboratory Technician (MLT) and determined that it met the criteria for further research. Appendix A contains information on how to use this environmental scan report.

The need for this study came to the Center of Excellence from the Regional Health Occupational Resource Center (RHORC), South Bay hosted at Mission College. In 2008 several community colleges throughout the state indicated an interest in developing a MLT program. This was sparked by the reported shortage of medical laboratory personnel — for Medical Laboratory Technicians (MLT) and Clinical Laboratory Scientists (CLS) — plus the fact that Medical Laboratory Technician became a newly licensed occupation in California in December 2007. Therefore, the RHORC included college program expansion for MLT as a strategic workforce initiative.

Since there is only one college in the state that currently offers a Medical Laboratory Technician program, the RHORC requested that the Center of Excellence provide regional workforce research customized for the Bay Region that could inform colleges about program development and resource enhancement. While this report focuses on the 12-county Bay Region, sections of this report may be useful for colleges around the state.

The new MLT occupation in California now offers a middle step in the clinical laboratory workforce career ladder; it expands the employment opportunities for graduates of MLT programs with an associate degree to advance to Clinical Laboratory Scientist

after acquiring a bachelor's degree. Likewise, it provides opportunities for the Lab Assistant and Phlebotomist to advance to MLT with additional education and training at a community college program.

This report will look at the occupation of Medical Laboratory Technician within a career pathway and will present data on occupations at the lower rung and higher rung, and will discuss the industries within the region that provide possible employment.

The following questions will be examined:

- Is there a shortage of clinical laboratory workers?
- Do current and projected workforce needs in the laboratory services industry require a response from community colleges in the Bay Region?
- Which colleges and proprietary schools currently offer or are developing MLT programs?

## Industry Overview

The Medical Laboratory Technician is a new occupation in California which only became licensed in December, 2007. Prior to this date, employment for MLTs was non-existent. There is not yet a wide use of this occupation in any industry that employs clinical laboratory personnel. Because of the dynamic nature of the laboratory industry workforce situation, the MLT occupation is undergoing change prompted by three major factors: the number of tests to be conducted, the location where tests are conducted and the manner in which tests are conducted. Each of these factors will be explored in the sections that follow.

### Shortage of Medical Laboratory Technicians and Clinical Laboratory Scientists

A combination of events has created what has been termed a “workforce crisis” for laboratory personnel in the healthcare industry. The shortage of MLTs and CLSs has been widely addressed both nationally and in California by a number of organizations and associations, reported in numerous studies, papers and websites, and discussed at many conferences for well over a decade.<sup>1,2,3,4</sup>

Nationally, the numbers commonly used to explain the shortage are the following:

- 44% of laboratories currently report difficulty in hiring
- About 150,000 new technologists will be needed by 2014
  - ▶ 81,000 to replace retirees; 68,000 for new positions

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<sup>1</sup> “The Clinical Laboratory Workforce: The Changing Picture of Supply, Demand, Education and Practice,” U. S. Department of Health and Human Services, Bureau of Health Professions, found online at <http://bhpr.hrsa.gov/healthworkforce/reports/clinical/default.htm#exec>.

<sup>2</sup> “Fast Facts,” Coordinating Council on the Clinical Laboratory Workforce, found online at <http://ccclw.org/fastfacts.aspx>.

<sup>3</sup> “California’s Other Healthcare Crisis: The Clinical Laboratory Workforce Shortage,” Healthcare Laboratory Workforce Initiative, found online at [www.hospitalcouncil.net](http://www.hospitalcouncil.net).

<sup>4</sup> “ASCP Battles Workforce Shortage on Many Fronts,” Critical Values, Volume 1, Issue 4, October 2008, found online at <http://www.ascp.org/pdf/CVshortage.aspx>.

- A 67% drop in new CLS/MLT graduates since 1977
  - ▶ 6,519 graduates in 1977; 2,141 in 2005
- 40% of the current workers will retire in 10 years
- 71% decline in number of accredited training programs since 1975
  - ▶ 770 NACCLS accredited programs in 1975; 222 in 2007
- Average age of current workforce is 49.2 years

After rapid growth in the clinical laboratory workforce in the 1970's and 1980's, many of the CLSs and other lab personnel are now at or near the retirement age. Retirements have or will create numerous vacancies that will require job replacements. There have been insufficient new entrants to the profession to fill new jobs and to replace those who are leaving due to retirement or other reasons. Additionally, declining funding has resulted in limited enrollment capacity at both community college and university programs preparing both MLTs and CLS, who must turn away eligible applicants. This further worsens the workforce shortage.

To compound the situation, clinical affiliate training sites required for the internship for MLTs and CLS students are frequently difficult for education programs to obtain and maintain.<sup>5</sup> Without the clinical internship, program graduates are unable to obtain a license to work. The lack of clinical affiliate training sites is one of the major limitations for community colleges to expand the development of MLT programs.

## Industry Description and Trends

### ***MLT - New Licensed Occupation in California***

Employment in clinical laboratory occupations is highly regulated with requirements that specify education, training, licensing, and scope of practice. State regulations legislate the licensing of Medical Laboratory Technicians.<sup>6</sup> The California Department of Public Health, Laboratory Field Services Branch (LFS) is responsible for oversight of clinical laboratory operations and licensing of personnel who perform testing.<sup>7</sup>

In December 2007, Medical Laboratory Technician became a licensed occupation in California. The first license was issued in March, 2008. While there are currently only 72 licensed MLTs in the state,<sup>8</sup> MLT has been a recognized occupation in all other states within the U.S. for many years, including the military.

Prior to its licensing, the occupation of MLT did not exist in California. The new MLT occupation now adds to the clinical laboratory workforce career pathway. Until 2008,

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<sup>5</sup> "Clinical Affiliates: The Good, the Bad and the Ugly". Workshop and Powerpoint Presented at the Clinical Laboratory Educators' Conference (CLEC), Denver, CO, February 20, 2009.

<sup>6</sup> <https://secure.cps.ca.gov/clatreg/Forms/MLT-Reg.pdf>.

<sup>7</sup> Information about Medical Laboratory Technicians, Clinical Laboratory Scientists, Phlebotomists and other laboratory employment can be found on their website: <http://ww2.cdph.ca.gov/programs/lfs/Pages/default.aspx>.

<sup>8</sup> License search conducted on May 27, 2009 at

<http://ww2.cdph.ca.gov/programs/lfs/Pages/PersonnelWebsiteLookup.aspx>.

the career ladder went from Phlebotomist or Laboratory Assistant, requiring only a high school diploma and short-term training, to Clinical Laboratory Scientist requiring a bachelor’s degree and an additional 12 months of training, with nothing in between. Now a middle step in the career ladder is available and expands the employment opportunities for graduates of MLT programs with an associate degree to advance to Clinical Laboratory Scientist. Likewise, it provides opportunities for the Laboratory Assistant and Phlebotomist to advance to MLT with additional education and training at a community college program.

Because of the reported workforce shortages of CLSs in the state, there is now a demand for MLTs to fill part of the gap, as they can perform laboratory tests that are becoming increasingly less complex and automated.

**Occupational Titles – Clarification**

There are several different job titles used throughout the U.S and by public labor agencies to describe clinical laboratory occupations. To avoid confusion, Table 1 lists the three occupations covered in this report and the titles used in California.

**Table 1: Common Job Titles Used for Clinical Laboratory Occupations & Titles Used in California**

Occupation Title Used in California	Other Job Titles Used Nationally	Education Level/ License in California
Medical Laboratory Technician (MLT)	Clinical Laboratory Technician (CLT) Clinical and Medical Laboratory Technician (used by Bureau of Labor Statistics)	Associate Degree, plus license
Clinical Laboratory Scientist (CLS)	Medical Technologist (MT) Clinical and Medical Laboratory Technologist (used by Bureau of Labor Statistics)	Bachelor’s Degree, plus license
Phlebotomist (PBT)	Phlebotomist (blood drawing, venipuncture)	High School Graduate, plus license

**Area of study**

This study covers the 12 counties within the Bay Area which include the following: Alameda, Contra Costa, Marin, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Cruz, Santa Clara, Solano, and Sonoma. However, sections of this report may be useful for colleges around the state, accompanied by local confirmation of employer needs and challenges.

**Changes in the Industry Affecting Staffing**

Several factors contribute to the workforce shortage of laboratory personnel both in California and around the country.<sup>9, 10</sup> Job vacancies are high in some sectors of the

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<sup>9</sup> “California’s Other Healthcare Crisis: The Clinical Laboratory Workforce Shortage,” Healthcare Laboratory Workforce Initiative (HLWI), found online at <http://www.hospitalcouncil.net>.  
<sup>10</sup> Information obtained from industry validation interviews. Information is summarized in Employer Needs and Challenges section.

laboratory industry.<sup>11</sup> Healthcare employers are concerned about the lack of a pipeline of new entrants to the clinical laboratory profession—from high schools, community colleges and universities. In addition, the demand and supply of laboratory workers has been affected by the recent economic downturn—both from the industry side of employing workers to the education institutions that supply qualified graduates. Despite their new license, integration of MLTs into the laboratory workforce has been slow to take hold.

The following is a summary of changes that are affecting the demand and supply of laboratory personnel and the obstacles to increased employment. The changes are categorized by their driving factors: supply, demand and barriers.

### **Supply Drivers**

#### ***Insufficient new entrants to the profession***

- Lack of awareness about laboratory careers as these professionals work out of sight of the general public.
- Status of laboratory professionals and the value of their contribution to patient care have not kept pace with other allied health occupations, such as nursing.<sup>12</sup>
- Advancement within laboratory career pathways exists, but opportunities are few. Plus other allied health occupations can lure away potential advancers with higher wages and more support for benefits and recognition.
- Wages for laboratory professionals are lower than what science-interested jobseekers could earn in industries like biotechnology, biomedical manufacturing and biopharmaceuticals.

#### ***Shortage of qualified applicants.***

- Number of licensed MLTs are few, just 72 to date.<sup>13</sup>
- Limited capacity for new student enrollments at college and university programs.
- Fewer accredited programs exist to train CLSs and MLTs. Numerous programs have closed around the U.S., including a local college.<sup>14</sup>
- Insufficient number of clinical laboratory internship sites to accommodate students.
- The lack of clinical affiliate training sites is one of the major limitations for California Community Colleges to expand Medical Laboratory Technician programs.

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<sup>11</sup> “ASCP Wage and Vacancy Report: Workforce Shortage Reaches Crisis,” ASCP Wage and Vacancy Survey of U.S. Medical Laboratories, March 2009, found online at [www.ascp.org](http://www.ascp.org).

<sup>12</sup> Labs Are Vital Report, Abbott Diagnostics, 2008. [www.labsarevital.com](http://www.labsarevital.com).

<sup>13</sup> License search conducted on May 27, 2009 at <http://ww2.cdph.ca.gov/programs/lfs/Pages/PersonnelWebsiteLookup.aspx>.

<sup>14</sup> Hartnell College closed its MLT program in 2007 but is expected to reopen within a year. See College Response section for more information.

## **Demand Drivers**

### ***Replacement workers needed as mass retirements are imminent.***

- Regionally, one-third of current CLS employees in hospital laboratories will be eligible to retire in five years (current average age = 57). Nationally, an average of 13% of the current laboratory staff is likely to retire in the next five years.<sup>15</sup>

### ***Advances in laboratory science and technology are increasing the demand for qualified personnel with additional skill sets (described in next section)***

***The rationale to use lower-cost MLTs to cut laboratory personnel budgets is recognized but not widely used, but will assist to increase MLT employment in the long term.***

***Legislative advocacy is underway by biotechnology industry leaders to foster wider employment of MLTs in the biotechnology sector.***

***As tests are becoming more automated and less complex, they could be performed by an MLT now and in the near future.***

## **Barriers to Employment**

### ***Slowdown in hiring due to the economy.***

- Hospitals are cutting services and staff, and hospital employment is no longer growing.<sup>16</sup>
- Potential retirees are staying put for now and there is low personnel turnover in most jobs.

### ***Integration of MLTs into the laboratory workforce has been slow to take hold.***

- Employment of MLTs at some area hospitals is held up in union stalemate over pay.
- Diagnostic (reference) laboratories are especially slow to hire licensed MLTs.
- One-to-one internship training by CLSs has created the perception that it is too time-consuming to accept MLT students, leading some lab personnel to think that taking MLT students is a poor business decision.
- Internship openings for MLTs at clinical affiliates may be in competition for those set aside for CLSs.
- Employment of MLTs is non-existent in related industries, like biotechnology, as most tests are currently categorized as high-complexity and can be performed only by a CLS.
- Clinical internship requirements would need to be adapted for biotechnology sites, and this would take changes in the regulations that govern MLT licenses.

## **Expansion of the Clinical Laboratory Industry**

The following are advances in clinical laboratory services and technology that are affecting the demand for qualified clinical laboratory personnel with additional skill

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<sup>15</sup> "ASCP Wage and Vacancy Report: Workforce Shortage Reaches Crisis," ASCP Wage and Vacancy Survey of U.S. Medical Laboratories, March 2009, found online at [www.ascp.org](http://www.ascp.org).

<sup>16</sup> "Economic Downturn Taking Toll on Patients and Communities Hospitals Serve: New Survey Finds," American Hospital Association, April 27, 2009. Found online at [www.aha.org](http://www.aha.org). Survey cites data from Bureau of Labor Statistics that hospital employment is not growing over the period January 2008 through March 2009.

sets. Most factors are likely to increase the need for additional workers, although this need is offset somewhat by increasing automation of routine tests.

### ***Point of Care Testing***

Point of care testing (POCT) refers to laboratory tests performed where patient care is dispensed which can decrease the time required for diagnosis and treatment.<sup>17</sup> Locations can include nontraditional testing sites such as community counseling centers, pharmacies, nursing homes and health fairs. Typically, tests are simple but accurate, like glucose and cholesterol. Point of care testing can improve patient care diagnosis and treatment without increasing costs.

### ***Aging Population and Greater Ability to Diagnose Disease***

The demand for more laboratory tests is increasing as the population ages. Because more tests are being developed to help diagnose diseases, physicians often order multiple tests for the patient because of the availability of the tests. This has increased the volume of tests in many laboratories requiring more personnel.

### ***Personalized Medicine and Genetics Technology***

Advances in laboratory testing that can predict individuals at risk for diseases such as cancer, diabetes and heart disease has led to personalized prevention medicine. Using a patients' genetic material (DNA, RNA, or chromosomes), molecular tests can find diseases that are inherited or acquired.<sup>18, 19</sup> There are over 1,000 disorders for which genetics testing can indicate a low to high risk of developing a condition.<sup>20</sup> Test results can give patients and their families' critical information about treatment options, genetic counseling and future medical interventions.

Genomic advances in pharmacy—pharmacogenics—is also fueling the personalized medicine industry by offering individuals optimal drug treatments based on their genetic makeup. These genetic tests can help ensure the best treatment with minimal adverse drug reactions.<sup>21</sup>

The rapid commercialization of a range of diagnostic tests designed for personalized medicine versus tests that are offered to the general population will dramatically increase testing volume in the near term.

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<sup>17</sup> Point of Care Position Paper, prepared by the American Society for Clinical Laboratory Science, found online at <http://www.ascls.org/position/point.asp>.

<sup>18</sup> Boone, Joe D., Ph.D., "The Role of CLIA in the Oversight of Genetic Testing," Office of Genetic Testing, Centers of Disease Control, <http://www.phppo.cdc.gov/dls.genetics>, found online at [http://wwwn.cdc.gov/dls/pdf/genetics/NSGC\\_%20CLIA\\_110501m.ppt](http://wwwn.cdc.gov/dls/pdf/genetics/NSGC_%20CLIA_110501m.ppt).

<sup>19</sup> Murphy, Juli and Javitt, Gail, et al, "Creating a Genetic Testing Specialty Under CLIA: What Are We Waiting For?," Genetics and Public Policy Center, Johns Hopkins University, found online at <http://www.dnapolicy.org/resources/McClellanpaper.pdf>.

<sup>20</sup> "How Genes Make Us the Same, But Different," Human Genetic Variation Fact Sheet, found online at [http://www.nigms.nih.gov/publications/factsheet\\_geneticvariation.htm](http://www.nigms.nih.gov/publications/factsheet_geneticvariation.htm).

<sup>21</sup> "Role of the Genomic Revolution in Pharmaceuticals," *LabMedicine*, May 2009, found online at <http://labmed.ascpjournals.org/content/40/5/261.full>

***Laboratory Equipment Technologies Increase Efficiency***

The use of new automated laboratory equipment has increased efficiency by enabling more tests to be done by fewer laboratory personnel and with greater accuracy. Several Bay Area hospital laboratories have now incorporated automated lines which tests a blood sample in 20 minutes. After barcodes are applied, tracking software monitors the specimen through the automated system, and then produces test verification with results.<sup>22</sup>

According to a Bay Area hospital using this automated equipment, fewer CLSs are now required to conduct testing, since automation reduces the time required for manual processing of specimens—receiving, sample processing, aliquoting, and delivering, etc. The work of the CLS using this equipment is now focused on producing critical results and quality control.<sup>23</sup>

***Medical Informatics and Computer Technology***

Because laboratories are in the information business, a major task for any hospital is to manage the medical data and records generated from patient testing. Those laboratory personnel who are skilled in medical and bio informatics can integrate various databases to assess for quality control and assurance measures among other indicators, which are becoming more complex. Employment opportunities also exist for staff that can maintain and oversee computer equipment interfaces.

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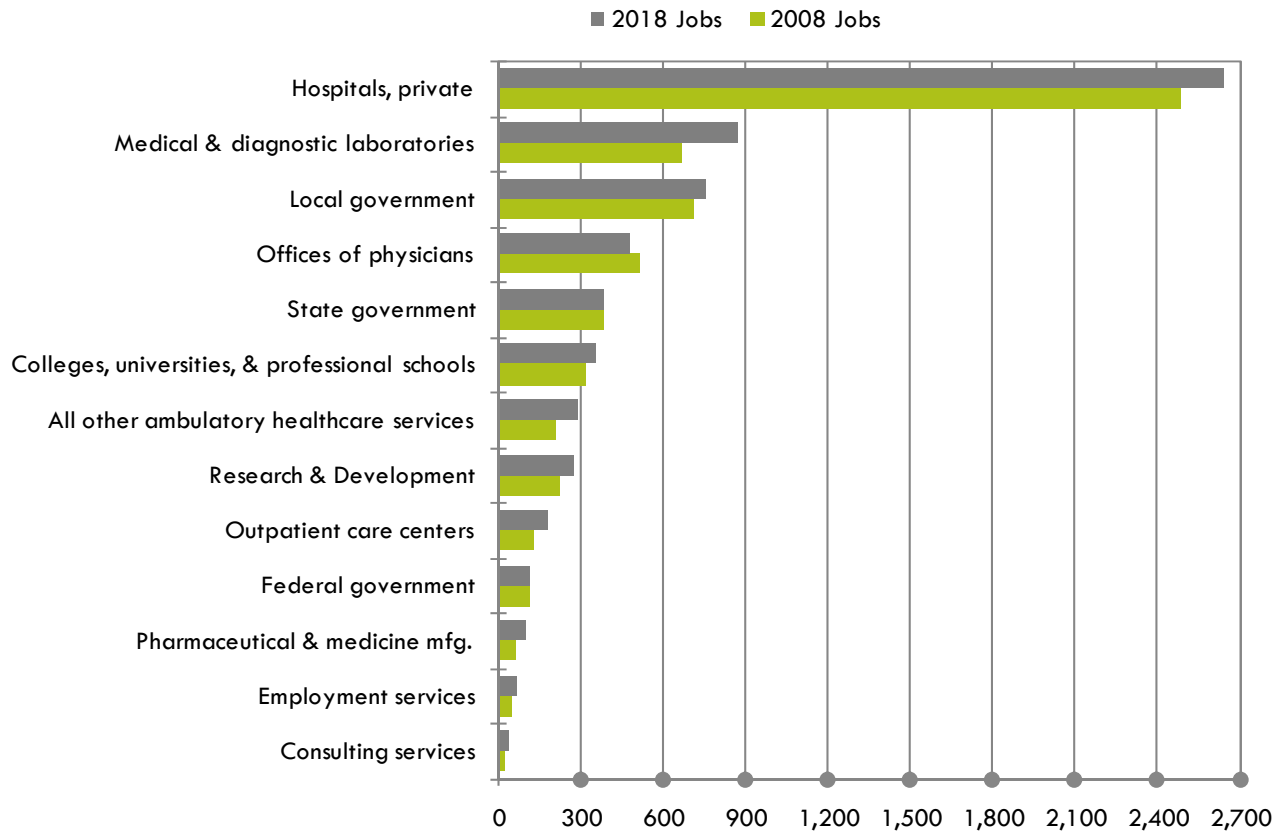
<sup>22</sup> Power Processor developed by Beckman Coulter. [www.beckmancoulter.com](http://www.beckmancoulter.com). Data obtained from John Muir Healthcare.

<sup>23</sup> Email conversation with Bunny Fisher, Manager of Education, Lab Services, John Muir Healthcare, on April 30, 2009.

**Employers**

As presented in Exhibit 1 and Table 2, approximately 42 percent of all CLS and MLT employees in the Bay Region work in hospital laboratories. Other industries that employ these professional are also indicated.

**Exhibit 1: CLS and MLT Employment by Setting - Bay Region**



**Table 2: CLS and MLT Employment by Setting – Bay Region**

NAICS Code <sup>24</sup>	NAICS Description	2008 Jobs	2018 Jobs	Change	% Change
622100	Hospitals, private	2,484	2,642	158	6%
930000	Local government	716	753	37	5%
621500	Medical & diagnostic laboratories	669	870	201	30%
621100	Offices of physicians	513	481	(32)	(6%)
920000	State government	381	384	3	1%
611300	Colleges, universities, & professional schools	319	356	37	12%

<sup>24</sup> North American Industry Classification System.

541710	Research & development	222	271	49	22%
621990	All other ambulatory healthcare services	210	292	82	39%
6214XX	Outpatient care centers	126	178	52	41%
911000	Federal government	116	114	(2)	(1%)
325400	Pharmaceutical & medicine mfg	66	97	31	48%
561300	Employment services	51	68	17	33%
541600	Consulting services	27	38	11	40%

Source: EMSI Complete Employment, Fall 2008

The second largest industry employing laboratory personnel after general and surgical hospitals are local government agencies, which can include city and county public health department laboratories, forensic laboratories, research and teaching laboratories, among others. The third largest industry is medical and diagnostic laboratories, known as “reference labs”, as many hospitals contract with them to refer specimens for testing. State government employment can include state prison hospital laboratories. Colleges, universities and professional schools include laboratories which operate student health centers.

Research and development in the physical, engineering and life sciences (NAICS 541710) includes laboratory testing employment in industries within agriculture, environmental, biology, chemistry, food, health, medicine, pharmacy, genetic, veterinary, fisheries. However, the testing would not necessary be on human specimens.

In addition to pharmaceutical and medical manufacturing listed in the table above, employment can also be found in two related industries: analytical laboratory instrument manufacturing (NAICS 334516) and laboratory apparatus and furniture manufacturing (NAICS 339111). These industries provide additional opportunities for laboratory workers in technical service departments or sales at diagnostic manufacturing companies such as Abbott Diagnostics or Beckman Coulter.

Physician Office Laboratories (POLs) shows a 6% decline in employment over the 10-year period. This could be a result of a physician not being able to supervise a MLT through their oversight alone. To employ an MTL, there would also need to be a CLS onsite to supervise the MLT if moderate complexity testing is performed. The decline can also be explained by the increase in reference lab employment as more POLs are using them for their testing services.

**Employment in Clinical Laboratories**

A clinical laboratory is defined as “any facility which performs laboratory testing on specimens derived from humans for the purpose of providing information for the diagnosis, prevention, treatment of disease, or impairment of, or assessment of health.”<sup>25</sup> Laboratories are located in hospitals, city and county public health

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<sup>25</sup> Clinical Laboratory Improvement Amendments (CLIA) Program Description, found online at [www.cms.hhs.gov/CLIA/07\\_Program\\_Descriptions\\_Projects.asp](http://www.cms.hhs.gov/CLIA/07_Program_Descriptions_Projects.asp).

departments, research and teaching education facilities, student health centers, outpatient care centers, and biotechnology firms, among other locations.

***About CLIA and Requirements***

Clinical Laboratory Improvement Amendments (CLIA) of 1988 was enacted by Congress to ensure that clinical laboratories perform tests consistently, validly and reliably by regulating laboratory facilities, levels of personnel and standards for quality testing. All laboratories that perform human testing, no matter which industry they are in, must be CLIA certified. And in California, the labs must be also be licensed by the California Department of Public Health, Laboratory Field Services Branch.

Laboratories certified by CLIA offer the most relevant employment situations for clinical laboratory program graduates and are potential locations for clinical student internships that can be developed by MLT and CLS education programs.

Currently, there are 366 CLIA certified and California licensed laboratories in the 12-county Bay Area.<sup>26</sup> The highest concentration of CLIA labs are in Alameda, San Francisco and Santa Clara Counties. For a table of the number of certified CLIA labs by county, see Appendix L. See Appendix M for maps showing the location of these laboratories by county, and in relation to the 26 Bay Area community colleges in the Bay Region, plus Hartnell College located in Monterey County.

***CLIA Approved Tests: Scope of Practice for Laboratory Personnel***

For each laboratory test, its complexity to produce valid and reliable results has been categorized by the Centers of Disease Control and Prevention under three main complexities: waived, moderately complex and highly complex. Each category specifies the knowledge and training required for personnel to perform the test, the requirements for accuracy in reporting results and quality control procedures, as well as the director or supervising personnel required.<sup>27</sup>

In California, test complexity limits the scope of practice for laboratory personnel. For Medical Laboratory Technicians, they are eligible to perform waived complexity tests without direct supervision and perform moderately complexity tests under the supervision of a Clinical Laboratory Scientist. Table 3 below shows the three complexity categories and the licensed laboratory professional eligible to perform the test.

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<sup>26</sup> Laboratory information obtained through request from California Public Health, Laboratory Field Services (LFS). Search conducted by LFS on April 13, 2009.

<sup>27</sup> CLIA Clinical Laboratory Improvement Amendments, U.S. Food and Drug Administration, Department of Health and Human Services, found online at [www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCLIA/search.cfm](http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfCLIA/search.cfm).

**Table 3: CLIA Approved Tests with Corresponding Limitations for Laboratory Professionals in California**

Clinical Laboratory Scientist		
Medical Laboratory Technician		Clinical Laboratory Scientist, Specialized CLS or Master's & Doctoral - Level Scientist
Waived Complexity Test	Moderate Complexity Test	High Complexity Test
<p>Simple, accurate tests performed according to the test manufacturer approved by the FDA, and pose no risk of harm if performed incorrectly.<sup>28, 29</sup> Performed using a test kit, compact or hand-held device.</p> <p><b>Types of Tests:</b> Cholesterol, glucose, pregnancy and other tests approved for home use. Performed by personnel with limited experience/training</p>	<p>Approximately 80% of medical lab tests are moderately complex. Most tests are performed on automated analyzers that are easy to use. Technology provides consistency and standardization.<sup>30</sup> Testing can also be performed using a microscope under this complexity.</p> <p><b>Types of Tests:</b> Hematology, Diagnostic Immunology, Routine Chemistry &amp; Toxicology, Immunohematology, Microbiology If performed by Medical Laboratory Technician, test must be supervised by Clinical Laboratory Scientist</p>	<p>Test requires more stringent quality control standards, and testers need to employ critical judgment and interpretation to perform the test.</p> <p><b>Types of Tests:</b> Commercially available genetics testing, new drug clinical trials, employee drug testing, forensic tests.</p> <p>Performed by Clinical Laboratory Scientist or other sub-specialty, or Master's and Doctorate-level biologists, chemists, and microbiologists.</p>

**Lowering Test Complexity: Increased Employment for Medical Laboratory Technicians**

Currently, there is development underway to take high complexity tests and get them categorized as moderate complexity, or even waived complexity, which would include point of care (POC) testing. Tests can be lowered in complexity if they can be made accurate using good quality control standards and analytic methodologies. An example of this is rapid HIV testing, which use to be categorized as high complexity but which now is considered waived complexity.<sup>31</sup> The result of lowering test complexity would be that more tests could be performed by the Medical Laboratory Technician, and would be a basis of their increased employment.

<sup>28</sup> "Good Laboratory Practices for Waived Testing Sites," *Morbidity and Mortality Weekly Report*, November 11, 2005, Vol. 54/No.RR-13, found online at [www.cdc.gov/mmwr/preview/mmwrhtm/rrs413q1.htm](http://www.cdc.gov/mmwr/preview/mmwrhtm/rrs413q1.htm).

<sup>29</sup> "CLIA Waived and PPM Tests Defined," American Academy of Family Physicians found online at [www.aafp.org/online/en/home/practicemgt/pt/clia/cliawaiveddefined.html](http://www.aafp.org/online/en/home/practicemgt/pt/clia/cliawaiveddefined.html).

<sup>30</sup> Email conversation with JoDe Smith, Administrative Director, Department of Pathology and Laboratory Medicine, Santa Clara Valley Medical Center, May 13, 2009.

<sup>31</sup> "How to Obtain a CLIA Certificate of Waiver Fact Sheet," Centers for Disease Control and Prevention. Found online at: [www.cdc.gov/hiv/topics/testing/resources/factsheets/roltCLIA.htm](http://www.cdc.gov/hiv/topics/testing/resources/factsheets/roltCLIA.htm).

### ***Employment Opportunities in Biotechnology***

A number of biotechnology firms conduct clinical laboratory testing, but the tests are usually in the research and development phase, so tests are categorized as high complexity. Those firms that have already manufactured drugs and offering personalized medicine testing, might have more ability to hire MLTs as the level of test complexity might be lowered if it becomes automated.

## **Occupational Overview**

The work of clinical laboratory personnel is to collect, prepare, examine and analyze specimens like blood, urine and tissue samples that can help to diagnose, treat or monitor diseases, or make predictions about future risk for disease. Clinical laboratory professionals perform a variety of tests and procedures using a microscope, manual instruments, automated analyzers and computerized equipment.<sup>32</sup>

The key personnel in a laboratory include the Clinical Laboratory Scientist (CLS) who has a bachelor's degree and the Medical Laboratory Technician (MLT) who has an associate degree. Both are licensed in the state of California. There are other workers in the clinical laboratory such as Laboratory Assistants and Phlebotomists on the lower rung; at the higher rung, there are supervisors and directors who require additional education, training and licenses.

While CLSs perform complex tests, the MLT performs less complex tests and works under the supervision of a CLS. While the Centers of Disease Control and Prevention classify the complexity levels of all tests, each state regulates the scope of practice for the MLTs and CLSs who perform the tests. California has highly regulated and limited the scope of practice for the MLT, compared to other states. MLTs in California can only perform waived and moderately complex tests under the supervision of a CLS with a supervision ratio of 1 CLS to 4 MLTs. MLTs are not allowed to perform tests in blood banks or conduct microscopy (use a microscope).

Because the MLT is a newly licensed occupation in California, there is not yet a wide use of this occupation in any industry that employs clinical laboratory personnel. In fact, according to LFS, there are currently only 72 licensed MLTs in the state.<sup>33</sup> In contrast, there are approximately 16,000 licensed CLSs in California.<sup>34,35</sup>

### ***Sample Job Description and FAQ Fact Sheet***

A sample job description for the Medical Laboratory Technician in California has been created by the Healthcare Laboratory Workforce Initiative (HLWI) and can be found in

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<sup>32</sup>Bureau of Labor Statistics, U. S. Department of Labor, Occupational Handbook, 2008-09 Edition, found online at <http://www.bls.gov.oco/ocos096.htm>.

<sup>33</sup>License search conducted on May 27, 2009 at <http://ww2.cdph.ca.gov/programs/lfs/Pages/PersonnelWebsiteLookup.aspx>.

<sup>34</sup>Number of licensed CLSs was presented at a workshop held at the Statewide Meeting of CLS Educators, hosted by the Healthcare Laboratory Workforce Initiative and the California Association for Medical Laboratory Technology on September 19, 2008 in Pasadena, CA.

<sup>35</sup>The exact number of licensed CLSs could not be verified with Laboratory Field Services at the time this report was published.

Appendix C. The HLWI has also developed a Frequently Asked Questions (FAQ) fact sheet presented in Appendix D.

**MTL Training and License Information**

Training requirements for the MLT have been set forth by the Department of Health Services, Laboratory Field Services. Education institutions must provide both didactic and clinical training according to the minimum standards. The MLT training requirements in California can be found in Appendix E.

California regulations require all MLT candidates to pass one of the national MLT examinations to qualify for a MLT license. Appendix F contains a list of Frequently Asked Questions (FAQs) prepared by Laboratory Field Services related to MLT licensing and certification.

There are two routes to take to pass the examination and apply for licensure. The approved exams are either through the American Society for Clinical Pathology (ASCP) Board of Registry or the American Association of Bioanalysts Board of Registry (AAB). See Appendix G for a chart of the California MLT Licensing Exam Routes prepared by the California Association for Medical Laboratory Technology (CAMLT).

Because MLTs are recognized throughout the United States and in military organizations, the California regulations and licensing have provisions for individuals from out-of-state or the military with work experience as an MLT who are now applying for MLT license in this state.

**Projected Job Growth**

According to the Bureau of Labor Statistics, laboratory personnel occupations are expected to have faster than average growth with excellent opportunities for employment in a variety of clinical and laboratory settings over the next ten years.

Tables 4 and 5 show the current and projected jobs for Medical Laboratory Technicians, Clinical Laboratory Scientists, and Phlebotomists, both for the State of California and the 12-county Bay Area.

**Table 4: Current and Projected Jobs in California, 2008-2018**

Description	2008 Jobs	2018 Jobs	Change	% Change	New Jobs & Replacements	% Change	2007 Hourly Wage Range*
Medical & Clinical Laboratory Technologists (SOC 29-2011)	13,612	15,682	2,070	15%	4,087	30%	\$28.42 - \$37.47
Medical & Clinical Laboratory Technicians (SOC 29-2012)	13,309	15,479	2,170	16%	4,144	31%	\$13.91 - \$22.12
Healthcare Support Workers, All Other, includes Phlebotomists (SOC 31-9099)	29,015	33,304	4,289	15%	7,841	27%	\$11.98 - \$18.25

\*2007 Hourly Wage Range represents the 26<sup>th</sup> and 75<sup>th</sup> percentile wages, EMSI Complete Employment, Fall 2008.

**Table 5: Current and Projected Jobs in Bay Region, 2008-2018**

Description	2008 Jobs	2018 Jobs	Change	% Change	New Jobs & Replacements	% Change	2007 Hourly Wage Range*
Medical & Clinical Laboratory Technologists (SOC 29-2011)	2,860	3,088	228	8%	656	23%	\$29.40 - \$41.54
Medical & Clinical Laboratory Technicians (SOC 29-2012)	3,222	3,636	414	13%	893	28%	\$16.48 - 28.62
Healthcare Support Workers, All Other, includes Phlebotomists (SOC 31-9099)	7,096	7,769	673	9%	1,549	22%	\$13.67 - 21.14

\*2007 Hourly Wage Range represents the 26<sup>th</sup> and 75<sup>th</sup> percentile wages, EMSI Complete Employment, Fall 2008.

Looking at the New and Replacement Jobs data for the state, the projected numbers are almost equal for CLSs (4,087) and MLTs (4,144), an average of around 4,100 for each occupation over the next ten years, or just over 400 new workers per year for each occupation.

In the 12-county Bay Region, the New and Replacement Jobs data show the projected need for MLTs (893) at over 200 more than for CLSs (656), or 90 MLTs and 66 CLSs needed annually over the ten-year period.

**Data Limitation Analysis: SOC Coding Affects Current & Projected Employment**

Unfortunately, the current and projected employment data using the SOC code alone cannot be used to accurately assess the demand for CLS and MLT jobs shown in each of the tables above. **In fact, the current and projected employment numbers must be considered unreliable as each occupation reported is lumped in with other jobs which may not be similar or which require differing education and licensing requirements.**

When analyzing the current and projected employment data presented for each of the three occupations listed in the tables above, it's important to understand the process used by the Bureau of Labor Statistics to code the occupations, and by which employers have reported and projected employment data.<sup>36</sup> The BLS can include other job titles within a SOC code. To be included in a SOC code, there needs to be some common tasks among jobs titles, however, some of those jobs may be unregulated or may have different training and licensing requirements.

Table 6 below shows the job titles that are contained in each of the three SOC codes for occupations discussed in this report:

<sup>36</sup>[www.Onetcodeconnector.org](http://www.Onetcodeconnector.org)

**Table 6: Job Titles Included in SOC Codes for Laboratory Occupations**

SOC Code	Occupation	All Job Titles Included
29-2011	Medical and Clinical Laboratory Technologist	Biochemistry Technologist Cytogenetic Technologist Cytotechnologist Histotechnologist Immunohematologist <b>Medical Technologist</b> Medical Technologist, Chief Medical Technologist, Teaching Supervisor Microbiology Technologist
29-2012	Medical and Clinical Laboratory Technician	Laboratory Assistant, Blood and Plasma Laboratory Technician, Pharmaceutical <b>Medical Laboratory Technician</b> Specimen Processor
31-9099	Healthcare Support Workers, All Other	Birth Attendant Morgue Attendant <b>Phlebotomist</b> Transporter, Patients

Source: [www.onetcodeconnector.org/ccreport/29-2013](http://www.onetcodeconnector.org/ccreport/29-2013).

The SOC code for Clinical Laboratory Technologist includes a list of similar occupations, but these jobs have differing educational and licensing requirements.

The SOC code for Medical Laboratory Technician includes jobs that are unregulated and don't require an associate degree and MLT license, such as Specimen Processor and Laboratory Technicians - Pharmaceuticals.

Similarly, Phlebotomists currently do not have their own SOC code, but are lumped into "Healthcare Support Workers, All Other" (SOC 31-9099). This code includes other jobs like Birth and Morgue Attendants, and Patient Transporters, which do not require a CPT-1 license or specific training.

Because Phlebotomist is such a common occupation and deserves its own SOC code, recent information obtained from the California Employment Development Department, Labor Market Information Division indicates the Bureau of Labor Statistics will be creating a new code (31-9097) effective 2010.

This report concludes that SOC coding might cause inflated current and projected employment numbers for the MLT occupation specifically, but also for the CLS and Phlebotomist. **This may have impacted the current and projected employment data used in many reports cited to indicate a workforce shortage.** To address the potential discrepancy, one of the recommendations in this report will be for the Center of Excellence to revisit this revisit this topic in another two years to examine the current and projected employment data for the next decade.

**Wages**

The 2007 wage data used in Tables 5 and 6 above is the latest available from the BLS. Because of the occupational coding issue described above, the wages presented

should be considered lower than what is typically earned as unregulated and unlicensed jobs are included. The general formula that is used to estimate the earnings for a MLT is approximately 75-80% of a starting CLS salary, or between \$24 and \$27 per hour.<sup>37</sup>

### ***Career Ladder***

A detailed career ladder can be found in Appendix H. The career ladder presented shows a pathway related to laboratory personnel working in hospitals and diagnostic laboratories, the largest industries that employ. Pathways within other industries may differ depending on the type of industry and the size of the organization.

## **Employer Needs and Challenges**

### **Validation of Workforce Needs with Regional Employers and Industry Experts**

#### ***Method***

MLT is considered “emerging” in California as it is a new occupation with few current licensed professionals, and there is not yet a wide use of this occupation in any industry that employs clinical laboratory personnel.

A validation study was based on this premise.

To validate the workforce needs and challenges of regional employers, qualitative information was obtained through executive interviews with industry professionals at hospitals and laboratories. This study did not consider conducting primary research through surveys to obtain quantitative data about current and projected jobs and other workforce data for MLTs.

#### ***Interviews with Employers***

Interviews were conducted with representative from large medical center laboratories, community hospitals, reference labs and other entities. See Appendix I for a list of the employers and participants in this study.

Additional information was provided by industry professionals, organizations and clinical laboratory educators who participated via email and other correspondence. These participants are also presented in Appendix I.

### **Summary of Key Findings**

Through conversations with industry leaders, the following workforce issues and challenges were identified.

#### **For hospital and reference labs**

##### ***Overview***

Low laboratory staff turnover and the slow growth of employment for the new MLT occupation offer challenges to community colleges wanting to develop a program.

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<sup>37</sup>“Frequently Asked Questions Medical Laboratory Technicians in California,” Healthcare Laboratory Workforce Initiative, found online at [www.hospitalcouncil.net](http://www.hospitalcouncil.net).

While regional hospitals and reference labs indicate some difficulty hiring qualified CLSs due to insufficient qualified applicants, and no difficulty hiring Phlebotomists due to an oversupply, there is a slow integration of MLTs into the laboratory workforce.

The slow integration of MLTs can be explained partly by recent economic conditions—hospitals are cutting back on personnel costs and potential CLS retirees are staying put. However, there are other factors that some hospitals are confronting to assimilate the new MLTs into their workforce—union issues over pay and acceptance by other laboratory personnel.

***Training of laboratory personnel***

Currently hospital labs train or could train 1 to 4 MLT student interns per year, most being 1 to 2 at each location. Currently hospital labs train 1 to 12 CLS student interns per year, most around 4 per year.

Clinical training for the MLT student is more intensive than for nursing, since it has to be one-on-one with the CLS trainer for them to perform tests. This has created the perception that it's too time-consuming to accept MLT students for training and leading some lab personnel to think that taking MLT students is a poor business decision.

- Few reference labs train MLT students although they have the ability. More reference labs could step up to partner with community colleges to provide clinical sites for MLT student training.

***Opportunities for colleges***

- Colleges could target the growing number of reference laboratories as potential clinical affiliates. The list of CLIA certified labs in the Bay Area is available through the Center of Excellence.
- Colleges can partner with employers to assist them with developing a cost-benefit analysis to show top management good ways to save money—that it is cheaper to train MLTs in the lab for future employment.
- The oversupply of Phlebotomists in the region could become potential MLT students. Marketing strategies implemented could identify potential students who desire to advance in the laboratory industry. They could continue to work and earn a living while attending school.
- A lack of continuing education training for Phlebotomists has been identified, such as medical language Spanish. Colleges could assess the need for specific continuing education and offer classes through partnerships with their local hospitals and reference labs.
- Reference labs report the need for continuing education for all levels of their employees, such as a refresher on theory. They are looking for training providers and can offer employee training stipends.

***For Biotechnology Laboratories***

- No employer in this industry has yet to hire an MLT, though some would like to. This is because they may be unfamiliar with the recent MLT license, and as a highly-regulated lab, may not yet have the flexibility to hire them.

- Firms who are currently manufacturing drugs would perhaps have more ability to hire MLTs for testing versus firms who are doing research and development, i.e. clinical trials, because of the level of test complexity. Most laboratory tests in biotechnology firms are currently categorized as high-complexity and can only be performed by a CLS. However, as tests are becoming more automated and less complex, some could be performed by an MLT now and more in the future.
- Additionally, biotechnology firms are innovative on the scientific, clinical discovery side, but not with changing hiring practices as they are heavily regulated. So the larger firms like Genentech or Amgen would be more likely to use MLTs sooner than smaller firms.
- Most jobs in biotechnology laboratories require a minimum of a bachelor's degree and the entry-level position is a Research Assistant. Biotechnology firms indicate no difficulty hiring Research Assistants as there is a good supply of potential qualified workers with science degrees in the region.

Legislative advocacy at the state level to change the scope of practice of MLTs is currently underway by the biotechnology industry leaders to foster the wider employment and training of MLTs.<sup>38</sup> They are working with legislators to make needed modifications in state regulations which would allow for the internship and employment of MLTs in biotechnology laboratories.

#### ***Training of laboratory personnel***

The traditional internship at a hospital laboratory may not be the right kind of training for those MLTs who desire to work in a biotechnology/personalized medicine lab. In addition, hospitals may be reluctant to provide MLT clinical training and investment to those who might leave to go into another industry, such as biotechnology. Therefore, changes to the current internship requirements need modification for the biotechnology industry to begin to accept training of MLT students.

#### ***Opportunities for colleges***

Community colleges desiring to develop MLT programs that include a wider employment base for their graduates have an opportunity to expand to the biotechnology industry through their involvement with the legislative advocacy currently underway by BayBio Institute.

## **Community Support and Resources**

Community Colleges in the Bay Region have many resources available to assist in addressing program development in the laboratory services field.

#### ***Regional Health Occupations Resource Centers (RHORC)***

A primary resource for allied health workforce information is the Regional Health Occupations Resource Centers (RHORC), funded by the California Community College Economic and Workforce Development Program. In the Bay Region there are two

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<sup>38</sup> <http://www.baybio.org/institute>

RHORCs— located at Mission College in Santa Clara and City College of San Francisco.<sup>39</sup>

The purpose of the RHORC is to promote the advancement of the region's health and economic growth through quality education and services focusing on workforce development and continuous workforce improvement in healthcare delivery. The role of the RHORC is to facilitate collaboration between the education segments and the healthcare delivery system to respond to identified needs.

***California Applied Biotechnology Centers Initiative (CalABC - BIOTECH)***

CalABC serves the workforce needs of the biotechnology and biotechnologists community in California. CalABC partners with local and regional industries to design skill-based instruction to meet the needs of employers. They also work with legislative, governmental and economic development agencies related to biotechnology workforce issues. CalABC is funded by the California Community College Economic and Workforce Development Program. In the Bay Region there are two CalABC centers—located at City College of San Francisco and Ohlone College, in Fremont.<sup>40</sup>

***Local Workforce Investment Boards (WIBs)***

The local Workforce Investment Boards in the Bay Region have taken an active interest in healthcare workforce issues over the past few years. Partnerships have been formed with regional colleges and employers to address training and retraining of the workforce into high-demand occupations within allied health.

Currently, the Department of Labor's Community-Based Job Training Grants (CBJTG) program offers funding through the federal stimulus bill— the American Recovery and Reinvestment Act of 2009. According to ASCP, the stimulus bill provides \$250 million for high demand jobs in the healthcare sector to higher education institutions.<sup>41</sup> ASCP is recommending that laboratory education programs work with their local WIBs to implement contracts for training MLTs and CLS due to the foreseen labor shortages.

***Healthcare Laboratory Workforce Initiative (HLWI)***

HLWI was formed by the Hospital Council of Northern and Central California in partnership with the California Hospital Association (CHA) to address the laboratory workforce shortage. The HLWI convened stakeholders from industry, professional associations, government, and education to create an advisory group for this initiative.

Sponsored by the Hospital Council of Northern and Central California,<sup>42</sup> the HLWI offers annual training grants up to \$50K to CLS and MLT training programs to support projects that will increase the number of new entrants, or keep a training program operational.

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<sup>39</sup> <http://www.healthoccupations.org>

<sup>40</sup> <http://www.cccbitech.org>

<sup>41</sup> "ASCP Enhances Efforts to Tackle Lab Professional Workforce Issues: Stimulus Money Available But Will Require Community-Based Efforts," ePolicy News, American Society for Clinical Pathology, April 1, 2009, found online at:

<http://www.ascp.org/HomePageContent/ePolicyNews/ePolicy-News--April-1-2009.aspx>.

<sup>42</sup> <http://www.hospitalcouncil.net/cgi-bin/default.asp?AID=144>

### **BayBio**

The BayBio Institute is an affiliate of BayBio (Bay Area Biotechnology Association).<sup>43</sup> The Institute serves the Life Science community in the Bay Region primarily through activities in four major areas: 1) Best Practice Dialogues, 2) Entrepreneurship Services, 3) Science Education, and 4) Workforce Development. The Workforce Development Committee focuses on resources for job seekers and Life Science companies. At the Institute's website job seekers can access a directory of job categories in the Life Sciences, connect to links to search for job openings or to post resumes for review by employers. Companies can access a *Guide to Staffing Practices and Organizational Resources*, which includes resources for specific disciplines within the industry such as research associates, clinical trials specialists, legal, finance, IT and sales.

### **Career Website**

[www.labsrc.org](http://www.labsrc.org) – a student resource center website for careers in the laboratory professions in California. Content is targeted towards high school counselors and students.

## **College Response and Issues**

In 2008 several community colleges throughout the state indicated an interest in developing a MLT program. This was sparked by the reported shortage of medical laboratory personnel— for Medical Laboratory Technicians and Clinical Laboratory Scientists—plus the fact that Medical Laboratory Technician had just become a newly licensed occupation. Therefore, the RHORC included college program expansion for MLT as a strategic workforce initiative and created a listserve to inform colleges of updates on training, licensing and other aspects of the occupation.

From the list of colleges maintained by the RHORC South Bay, program information was obtained by the Center of Excellence through email and telephone. College program information is presented for both the Bay Region colleges and for other colleges in the state.

Across the country, trends in clinical laboratory education include more distance education courses for both CLS and MLT education. And diversity education is now being integrated into all courses.

### **Medical Laboratory Technician Programs in Bay Region**

To offer a program for Medical Laboratory Technician in the state, a community college must obtain accreditation through the National Accrediting Agency for Clinical Laboratory Science (NAACLS),<sup>44</sup> and/or obtain approval from Laboratory Field Services.<sup>45</sup>

There is only one college in California that currently offers a program for Medical Laboratory Technician—DeAnza College in Cupertino. It was started in 2004 has been a pioneer in clinical laboratory education for MLTs in the state as it was able to

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<sup>43</sup> BayBio Institute(Bay Area Biotechnology Association) is an independent, nonprofit trade association serving the life science industry in Northern California, <http://www.baybio.org/institute>

<sup>44</sup> <http://www.naacls.org>

<sup>45</sup> <http://ww2.cdph.ca.gov/programs/lfs/Pages/default.aspx>

weather the new licensing process and requirements, develop funding support and implement innovative enrollment strategies that ensured the program’s survival. The DeAnza College MLT program is truly a statewide model of best practices. See Appendix J for program description and coursework required.

**Table 7: DeAnza College MLT Program Information**

<b>Contact Information</b>	Debbie Wagner wagnerdebbie@fhda.edu (408) 864-8790 www.deanza.edu/mlt
<b>Accreditation</b>	NAACLS
<b>Student Enrollment/Capacity</b>	36 in lecture; 2 sessions of lab, 18 each
<b>Challenges</b>	Getting enough clinical sites for internships; this has limited enrollments. Current waitlist =35
<b>Innovative Enrollment Strategy</b>	Courses are approved by LFS as meeting CLS prerequisite requirements
<b>Retention Rate</b>	70%, which is above average compared to other MLT programs around the country

Hartnell College in Salinas used to offer a MLT program which started in 1999 but closed in 2007 due to low enrollments and insufficient clinical internship sites for students. Challenges to this program were many including the fact that the MLT occupation had not yet become licensed in the state. Jobs for students upon completion were non-existent and only available at the lower-rung like Phlebotomists or Laboratory Assistants.

**Other MLT Training Providers**

The only other training provider within the 12-county Bay Area is a proprietary school.

**Table 8: Institute for Medical Education MLT Program**

<b>Education Program</b>	Institute for Medical Education 130 Park Center Plaza, San Jose, CA 95113 (408) 534-0714 www.imededu.com
<b>Accreditation</b>	NAACLS
<b>Start Date</b>	June, 2009
<b># of Planned Enrollment/Capacity</b>	10 students

<b>Program Length and Prerequisites</b>	1200 hours (Theory = 560 Hrs. & Clinical/Lab = 640 Hrs. Associates Degree or 60 completed college units; CA Phlebotomy Technician I or II certification; Anatomy & Physiology, and Chemistry with Lab
<b>Admission Cycle</b>	New cohort will start every 7 months.
<b>Challenges</b>	Potential clinical affiliate sites say they are too busy to train/supervise MLTs.

An up-to-date list of approved MLT training programs in the state can be found at: <http://ww2.cdph.ca.gov/programs/lfs/Documents/P-List-of-MLT-Schools.pdf>.

### Bay Region Community Colleges Developing MLT Programs

The following two colleges in the Bay Region, which includes Monterey County, have expressed an interest to develop a MLT program:

**Table 9: Bay Area Colleges Interested in Developing MLT Program**

Bay Area Colleges			
College	Program Development Status	Start Date	Contact
<b>Diablo Valley</b>	Program development underway; curriculum going to committee in Fall 2009; program approval not yet submitted to LFS; not obtaining NAACLS accreditation; John Muir Hospital will be primary clinical affiliate for student internships.	Fall 2009 for Pre-requisites; Fall 2010 for first cohort in core classes	Kim Schenk, Dean CTE and Economic Development kschenk@dvc.edu (925) 685-1230 x2216
<b>Hartnell</b>	Program already has NAACLS accreditation, but currently inactive. Approved curriculum exists. Will soon determine exact start date, student capacity, among other program details	Spring 2010	Karen Carmon Interim Director kjcmlt@yahoo.com  Catherine Ryan cryan@hartnell.edu (831) 770-6146

### Other California Community Colleges Developing Programs

Several other colleges around the state have expressed an interest to develop a MLT program. They are listed in Appendix K along with development status of their program and start dates. Information was obtained from each college by the Center of Excellence through email and telephone.

### Clinical Laboratory Scientist Programs

#### Bay Region Programs

Currently, two universities in the Bay Region offer a Clinical Laboratory Scientist program— San Jose State University and San Francisco State University. A complete list of CLS programs in the Bay Region and elsewhere in California including program

contact information, and the clinical affiliates with which they have partnered, can be found at: <http://www.cdph.ca.gov/programs/lfs/Pages/default.aspx>.

**Table 10: Bay Area Schools Offering CLS Training Programs**

Program	Annual Applicants	Annual Enrolled Students/Capacity	Program Status
San Jose State University	180 with 120 meeting eligibility requirements for admission	30-35 Enrollments limited due to limited clinical placement sites	Program will likely drop by 25% to only 20-25 students accepted annually due to overall enrollment decreases expected at the CSUs.
San Francisco State University	120 -180 with 80-90 meeting requirements for admission	32	Not expecting to have to downsize program. All graduates are finding jobs within 6 months. Unique program has pre-clinical semester on campus prior to internship.

**Phlebotomy Training Programs**

**Bay Region Programs**

Currently, eight community colleges within the Bay Region offer Phlebotomy training. There are an additional 19 proprietary schools that also offer training. A complete list of all Phlebotomy training programs in the Bay Region and throughout California can be found at: <http://www.cdph.ca.gov/programs/lfs/Pages/default.aspx>.

**Conclusion and Recommendations**

While the evidence of need for Medical Laboratory Technicians is unclear based strictly on labor market data, there are other industry changes that present a strong case for continuing growth in this occupation. Therefore, existing and developing MLT programs are forging ahead but are faced with challenges for funding, internship sites and jobs for graduates.

Colleges who are planning programs or are considering developing one would be best served by creating partnerships with their regional hospitals, reference laboratories and biotechnology firms to facilitate the faster transition of employing Medical Laboratory Technicians. This might be accomplished in part by the RHORC establishing a regional workforce forum in partnership with the California Applied Biotechnology Centers Initiative to assist colleges to work together with industry and learn from each other. Colleges can also benefit from developing connections with personnel at Laboratory Field Services who can assist in clarifying program licensing requirements, among other issues.

It is highly recommended that colleges, who are currently developing a MLT program or plan to, work with model programs like DeAnza College for best practices, especially to look at how the college employs innovative enrollment strategies and an articulation agreement with San Jose State University.

The geographical clustering of laboratory employment in the metropolitan areas of the Bay region is more supportive to the development of partnerships by college programs

in terms of clinical affiliates and jobs. However, for colleges located in more rural areas where there are fewer laboratories, the challenge will be great. Colleges in rural areas are advised to critically assess their base for student internships and jobs for graduates.

Because of the dynamic nature of the laboratory industry workforce situation, it will require constant monitoring by college programs and workforce projects. Therefore, it is recommended that this study should be revisited in another two years to examine the impact of the economy, the integration of MLTs into the workforce, and to look at projected employment data for the next decade.

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National Institute of General Medical Sciences, found online at  
[http://www.nigms.nih.gov/publications/factsheet\\_geneticvariation.htm](http://www.nigms.nih.gov/publications/factsheet_geneticvariation.htm)
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and Prevention. Found online at:  
[www.cdc.gov/hiv/topics/testing/resources/factsheets/roltCLIA.htm](http://www.cdc.gov/hiv/topics/testing/resources/factsheets/roltCLIA.htm)
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Laboratory Science, October, 1996 found online at  
<http://www.ascls.org/position/point.asp>
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## Appendix A: How to Utilize this Report

This report is designed to provide current industry data to:

- Define potential strategic opportunities relative to an industry's emerging trends and workforce needs;
- Influence and inform local college program planning and resource development;
- Promote a future-oriented and market responsive way of thinking among stakeholders; and,
- Assist faculty, Economic Development and CTE administrators, and Community and Contract Education programs in connecting with industry partners.

The information in this report has been validated by employers and also includes a listing of what programs are already being offered by colleges to address those workforce needs. In some instances, the labor market information and industry validation will suggest that colleges might not want to begin or add programs, thereby avoiding needless replication and low enrollments.

### ***About the Centers of Excellence***

The Centers of Excellence (COE), in partnership with business and industry, deliver regional workforce research customized for community college decision making and resource development. This information has proven valuable to colleges in beginning, revising, or updating economic development and Career Technical Education (CTE) programs, strengthening grant applications, assisting in the accreditation process, and in supporting strategic planning efforts.

The Centers of Excellence Initiative is funded in part by the Chancellor's Office, California Community Colleges, Economic and Workforce Development Program. The total grant amount (grant number 08-305-015 for \$205,000) represents funding for multiple projects and written reports through the Center of Excellence. The Centers aspire to be the premier source of regional economic and workforce information and insight for California's community colleges.

More information about the Centers of Excellence is available at [www.coecc.net](http://www.coecc.net).

### ***Important Disclaimer***

All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

## **Appendix B: Industry Associations and Resources**

### **Industry Associations**

American Association of Bioanalysts (AAB), [www.aab.org](http://www.aab.org)

American Medical Technologists (AMT), [www.amt1.com](http://www.amt1.com)

American Society for Clinical Pathology (ASCP), [www.ascp.org](http://www.ascp.org)

American Society of Clinical Laboratory Science (ASCLS), [www.ascls.org](http://www.ascls.org)

California Association for Medical Laboratory Technology (CAMLT), [www.camlt.org](http://www.camlt.org)

California Laboratory Management Association (CLMA), [www.clma.org](http://www.clma.org)

National Phlebotomy Association (NPA), [www.nationalphlebotomy.org](http://www.nationalphlebotomy.org)

### **Resources**

American Medical Association, [www.ama-assoc.org](http://www.ama-assoc.org)

American Hospital Association, [www.aha.org](http://www.aha.org)

California Department of Public Health, Laboratory Field Services,  
[www.dhs.ca.gov/ps/lb/lfsb](http://www.dhs.ca.gov/ps/lb/lfsb)

California Hospital Association (CHA), [www.cha.org](http://www.cha.org)

Clinical Laboratory Improvement Amendments (CLIA), [www.cms.hhs.gov/clia](http://www.cms.hhs.gov/clia)

Coordinating Council on the Clinical Laboratory Workforce (CCCLW), [www.ccclw.org](http://www.ccclw.org)

Labs are Vital, [www.labsarevital.com](http://www.labsarevital.com)

National Accrediting Agency for Clinical Laboratory Science (NAACLS), [www.naacls.org](http://www.naacls.org)

National Credentialing Agency for Laboratory Personnel (NCA), [www.nca-info.org](http://www.nca-info.org)

Hospital Council of Northern California, [www.hospitalcouncil.net](http://www.hospitalcouncil.net)

## Appendix C: Medical Laboratory Technician Job Description

The following job description was created by the Healthcare Laboratory Workforce Initiative and can be found online at [www.hospitalcouncil.net](http://www.hospitalcouncil.net)

### ***Job Overview***

Performs waived and moderately complex laboratory tests as defined by state and federal regulations.

### ***Job Tasks***

- Performs, verifies, and reports results of moderately complex laboratory tests including but not limited to: blood gas analyses; approved mononucleosis testing; complete blood counts; negative urine cultures; activated clotting times; other moderately complex microbiology tests; basic metabolic panels.
- Performs moderately complex therapeutic drug monitoring.
- Performs required quality control and quality assurance assessment.
- Performs testing completely, accurately, within established timeframes and according to established policies and procedures.
- Enters quality control and test results into information systems accurately and within established timeframes.

### ***Education and Licensing***

Associate degree from an accredited program (NAACLS) or approved program (LFS) which includes six months of clinical internship; pass a national certification exam and CA state law exam; and possession of a valid Medical Laboratory Technician license issued by the State of California, Department of Public Health, and Laboratory Field Services Branch. Also, must have 24 hours of Continuing Education every two years.

## Appendix D: Frequently Asked Questions about Medical Laboratory Technicians in California

Prepared by the Healthcare Laboratory Workforce Initiative (10/08)

### ***What is a Medical Laboratory Technician (MLT)?***

A MLT is mid-level laboratory professional who has obtained an associate degree and completed a NAACLS accredited MLT training program, a California approved MLT training program or United States of America military program.

### ***What can MLTs do in the Laboratory?***

In California, MLTs can perform waived and moderately complex testing with the exception of moderately complex microscopy and immunohematology. They can also perform phlebotomy, supervise LPT's and CPT1's, and report patient test results.

For example, MLTs can:

- Prepare, perform and accept calibrations and QC for moderately complex test procedures
- Analyze and report patient test results on waived and moderately complex test procedures
- Conduct maintenance
- Method Validations

### ***What is the training for MLTs?***

MLT training includes didactic courses in clinical chemistry, clinical hematology, coagulation and urinalysis, clinical microbiology and clinical immunology, followed by a 6 month clinical externship in CLIAA certified laboratories.

General academic requirements are an associate degree, including 36 semester units of physical and biological sciences of which 6 semester units are in chemistry and 6 semester units are in biology.

### ***How much do MLTs earn?***

The entry level salary range for a MLT is approximately 75-80% of a starting CLS salary or an estimated \$24-27/hour.

### ***Do MLTs have to be Supervised?***

Yes. Under California law clinical laboratories must maintain a CLS to MLT ratio of 1:4; onsite supervision is required when moderately complex testing is being done by a MLT.

### ***Are MLTs Licensed?***

Yes. In California, MLTs must obtain a license and pass the MLT certifying organization exam administered by the American Association of Bioanalysts (AAB) or American Society of Clinical Pathologists (ASCP), and the self-administered exam on California clinical laboratory law.

***How do MLTs become licensed?***

Applications for licensure are available online at <https://secure.cps.ca.gov/cltreg/>. Information on fees, requirements, official documents needed, and timing are also posted here.

***How do I verify MLT licensure for current and prospective employees?***

MLT licenses may be verified on the Laboratory Field Services website at: <http://www.cdph.ca.gov/programs/lfs/Pages/PersonnelWEbsiteLookup.aspx>.

***Does out-of-state training or work experience count for MLT licensure?***

Yes, with restrictions. Please carefully review the information posted by Laboratory Field Services on their website at <http://ww2.cdph.ca.gov/programs/lfs/Documents/MLT%20FAQ-07.pdf>

***Do MLTs have continuing education requirements?***

Yes, MLTs must complete 12 contact hours of CE/year or 24 hours/2 years to maintain licensure.

***Additional Questions?***

For further information regarding MLT licensure or requirements, please consult the Laboratory Field Services website at: <http://ww2.cdph.ca.gov/programs/lfs/Pages/default.aspx>.

More information about the Healthcare Laboratory Workforce Initiative (HLWI) is available on the Hospital Council's website at [www.hospitalcouncil.net](http://www.hospitalcouncil.net).

## Appendix E: MLT Training Requirements in California

Training requirements for the Medical Laboratory Technician have been set forth by the Department of Health Services, Laboratory Field Services.<sup>46</sup> Education institutions must provide at a minimum the following didactic and clinical training.

### Overall Training Requirements

A minimum of 26 weeks (at least 160 hours of practical clinical experience) in each of the following area (for a total of 640 hours) at a CLIA certified laboratory:

- Chemistry, including routine chemistry, urinalysis, endocrinology and toxicology
- Hematology and coagulation
- Microbiology, including bacteriology, mycobacteriology, mycology, parasitology, and virology
- Immunology, including syphilis serology and general immunology

### *Didactic Training in the following four areas:*

- Pre-analytical skills to perform the following:
  - ▶ Phlebotomy
  - ▶ Specimen processing
  - ▶ Reagent preparation
  - ▶ Infection control

Must include 20 hours of lecture and testing for knowledge of basic Phlebotomy.

Must include 20 hours of lecture and testing for knowledge of advanced Phlebotomy.

- Analytical skills to perform waived and moderate complexity testing including:
  - ▶ Quality control
  - ▶ Test calibration
  - ▶ Quality assurance
  - ▶ Safety
  - ▶ Troubleshooting and maintenance
  - ▶ Reagent preparation and storage
  - ▶ Recordkeeping and retrieval
- Post analytical skills
  - ▶ Knowledge of factors that influence a patient's test results and the ability to verify the validity of the test through review of quality control values prior to reporting the test results.
- Test methods commonly used
  - ▶ Method used in chemistry, hematology, immunology, and microbiology
  - ▶ Clinical significance of tests
  - ▶ Tests used for diagnosis and treatments
  - ▶ Quality assessment of test

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<sup>46</sup> These training requirements were provided by the Laboratory Field Services Program Manager, Shahrzad Radahd to the California Community Colleges via a Webinar presentation on October 10, 2008.

## Appendix F: Frequently Asked Questions Related to MLT Licensing and Certification



State of California-Health and Human Services Agency,  
California Department of Public Health

### FAQ - Medical Laboratory Technicians (MLT)

**Q: How can I apply to get my MLT license?**

**A:** Go online to <https://secure.cps.ca.gov/cltreg/index.asp> and apply online.

**Q: How much is the application fee?**

**A:** \$203. The application fee is non refundable.

**Q: How long is the licensing process?**

**A:** The licensing process is 150 days based upon the receipt of a completed application and all official documents.

**Q: Can I send my transcripts to LFS?**

**A:** No, transcripts must be sent directly from the office of registrar.

**Q: What are the academic requirements?**

**A:** AA degree in chemical, physical, biological or clinical laboratory science, including a minimum of 36 semester units of physical or biological science from an accredited college or university.

**Q: What are the required courses?**

**A:** 36 semester units of physical and biological sciences, including 6 semester units of chemistry and 6 semester units in biology.

**Q: I am a non-United States (foreign) graduate, what is the process?**

**A:** You must send a copy of your official transcript to AACRAO for evaluation.  
[www.AACRAO.org](http://www.AACRAO.org)

**Q: What are the training/experience requirements?**

**A:** Graduating from a NAACLS or LFS approved training program or United States of America military program.

**Q: I have more than 3 years on-the-job practical experience in a California Physician Office laboratory, do I qualify for licensure?**

**A:** You need to show documentation of work experience performing moderate complexity tests in the specialties of chemistry, hematology, microbiology, and immunology, signed by the physician.

**Q: I have military experience. Do I qualify for licensure?**

**A:** You need to show documentation of six-months work experience performing moderate complexity tests or completion of phase I and phase II (basic and advanced) training in the specialties of chemistry, hematology, microbiology, and immunology.

**Q: I failed the CA-CLS examination. Am I qualified for the Certifying Organization exam?**

**A:** Yes. You need to apply for the MLT license and pass the MLT Cert. Org. exam administered by the American Association of Bioanalysts (AAB) or American Society of Clinical Pathologists (ASCP).

**Q: I am CLS/MLT licensed out side of California. Can I get my CA license?**

**A:** If you are certified by AAB prior to January 1, 2003 or ASCP prior to June 1, 2003, you need to re-take the MLT AAB or ASCP exam after submitting an online electronic application and fee to State of California ? Department of Public Health ? Laboratory Field Services (LFS).

**Q: Do I have to be in California to take the certifying Organization examination?**

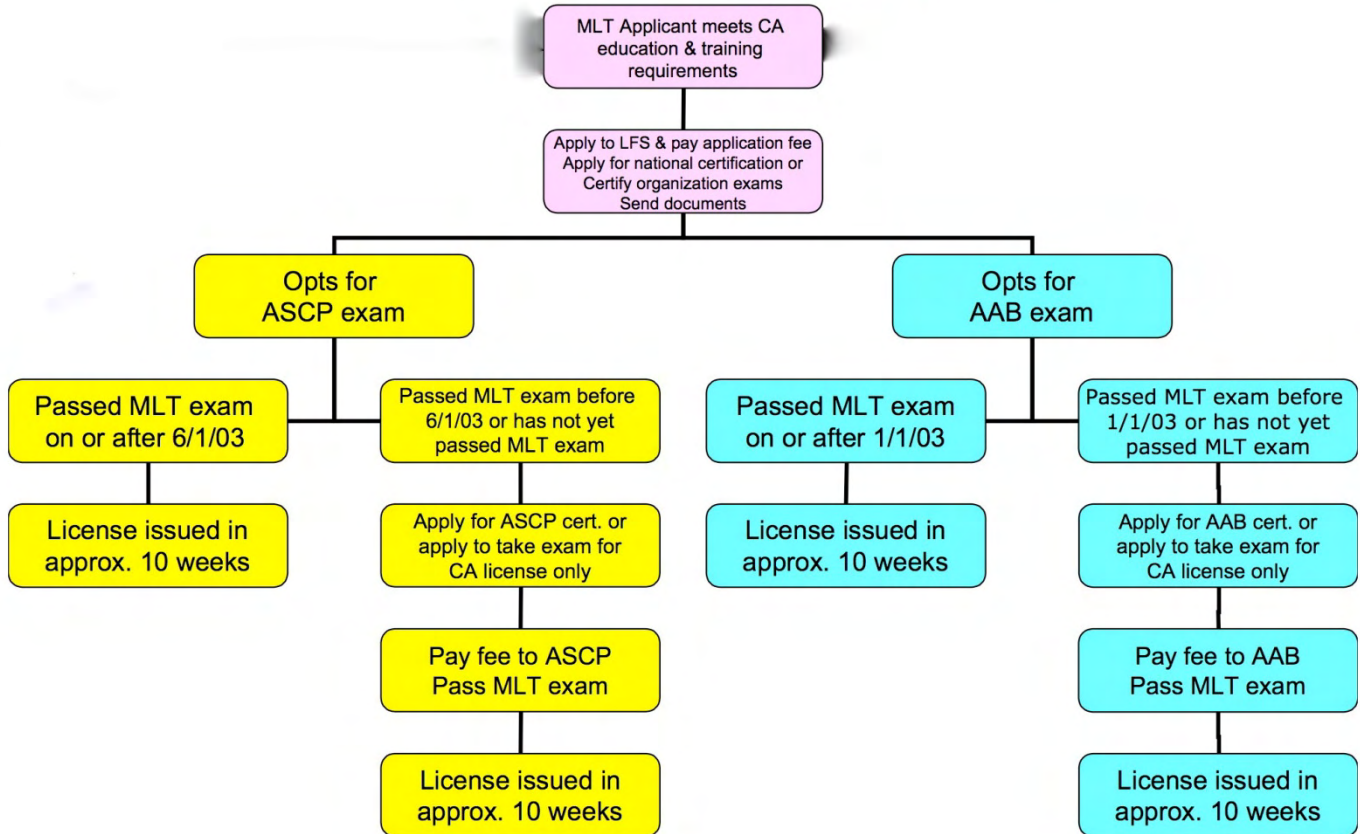
**A:** No, contact the AAB or ASCP certifying organizations for information regarding the examination for MLT California licensure. The AAB and ASCP contact information can be located on the internet.

If you have more questions regarding the MLT Program, please email [LFSpersonnel@cdph.ca.gov](mailto:LFSpersonnel@cdph.ca.gov).

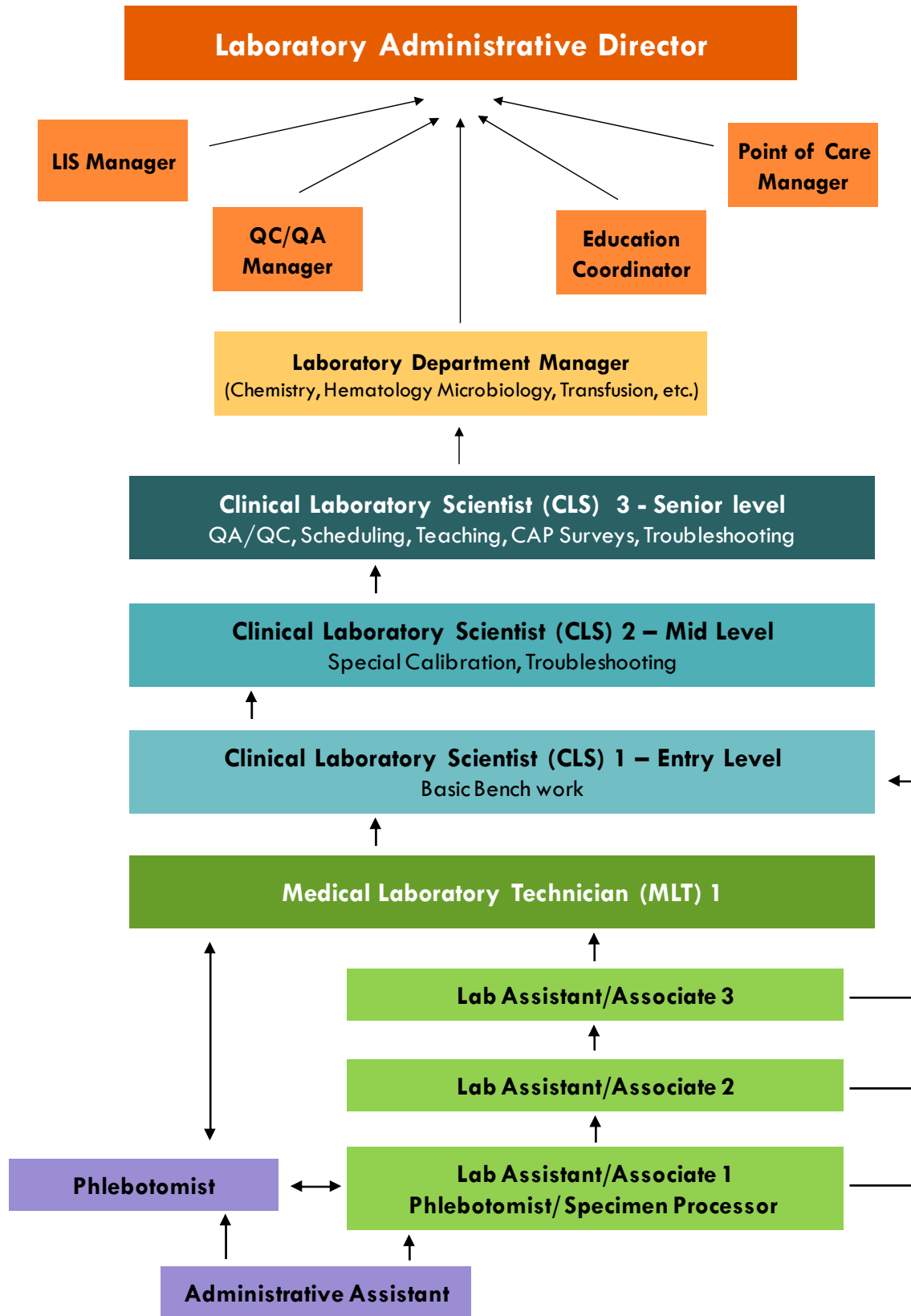
## Appendix G: California MLT Licensing Exam Routes

### California MLT Licensing Exam Routes

(updated 12-12-07 by CAMLT)



**Appendix H: Career Pathways in Clinical Laboratory Science**



## Appendix I: Interviews and Other Sources

### Employers Interviewed

**Santa Clara Valley Medical Center**

*JoDe Smith, Administrative Director, Laboratory,  
Department of Pathology & Laboratory Medicine*

**Satellite Laboratory Services, Redwood City**

*Patti Hunsader, Vice President, Operations  
Martin Blair, Director of Quality Assurance*

**Community Hospital of Monterey Peninsula**

*Jay Wilkerson, Director, Laboratory Services*

**Exelixis, South San Francisco**

*Anthony Redmond, Director of Staffing*

**Washington Hospital Healthcare System, Fremont**

*Martha Giggelman, Senior Director, Clinical  
Workforce Development  
Mary Reynolds, Director of Laboratory Services  
Elizabeth Deguinia, Lab Supervisor/Education  
Coordinator*

**Kaiser Foundation Hospital,**

*Santa Clara Medical Center  
Stephanie Higgins, Administrative Director,  
Clinical Laboratory*

### Additional Information from Other Sources

**DeAnza College, Cupertino**

*Medical Laboratory Technician Program  
Debbie Wagner, Director and Instructor*

**California Hospital Association**

*Coalition on Shortages of Allied Health Professionals  
Cathy Martin, Workforce Project Director*

**Naval School of Health Sciences, San Diego**

*(Site visit conducted)  
A. Carolyn Marquez, Program Director,  
Medical Laboratory Technician School*

**Hospital Council of Northern and Central California**

*Rebecca Rozen, Regional Vice President,  
East Bay Section*

**BayBio Institute, South San Francisco**

*Lori Lindburg, Director of Workforce &  
Education*

**California Applied Biotechnology Centers (CalABC)**

*Peter Matlock, Hub Manager*

**John Muir Health, Walnut Creek**

*Jan Hunter, Director of Workforce  
Planning and Development  
Bunny Fisher, Manager of Education,  
Laboratory Services*

## Appendix J: DeAnza College MLT Program

**DeAnza College**  
 21250 Stevens Creek Blvd., Cupertino, CA  
 Contact: Debbie Wagner, wagnerdebbie@fhda.edu, (408) 864-8790  
 www.deanza.edu/mlt

### Medical Laboratory Technician

A.A Degree: 88-91 Units including Prerequisites + General Education Requirements

Certificate of Achievement – Advanced: 31 – 34 Units + Prerequisites

<p>Medical Laboratory Technology                  Certificate of Achievement – Advanced                  Prerequisite: Possession of California                  Phlebotomy Certification</p> <p>Human Anatomy and Physiology (15) or                  Form and Function in the Biological                  World (6)                  Cell and Molecular Biology (6)                  Evolution and Ecology (6)                  15 – 18 Units                  Introductory Microbiology (6)                  Survey of Chemistry I (5)                  Survey of Chemistry II (5)                  Prerequisite Units Required 31 – 35 Units</p>	<p>Medical Laboratory Technology                  A.A. Degree – 88 -91 Units                  plus meet A.A/A.S. degree requirements                  Clinical Hematology Lecture (4.5)                  Clinical Hematology Laboratory (1.5)                  Clinical Urinalysis Lecture (1.5)                  Clinical Urinalysis Laboratory (0.75)                  Clinical Coagulation Lecture (1.5)                  Clinical Coagulation Laboratory (0.75)                  Clinical Microbiology Lecture (4.5)                  Clinical Microbiology Laboratory (1.5)                  Clinical Immunology/                  Immunohematology Lecture (4.5)                  Clinical Immunology/                  Immunohematology Laboratory (1.5)                  Clinical Chemistry I Laboratory (1.5)                  Clinical Chemistry II Laboratory (1.5)                  Clinical Chemistry I Lecture (4.5)                  Clinical Chemistry II Lecture (4.5)                  Clinical Hematology/Urinalysis/                  Coagulation Practicum (6)                  Clinical Microbiology Practicum (6)                  Clinical Immunology/                  Immunohematology Practicum (4.5)                  Clinical Chemistry Practicum (6)</p> <p>Total Units Required Including Prerequisites: 88 -91</p>
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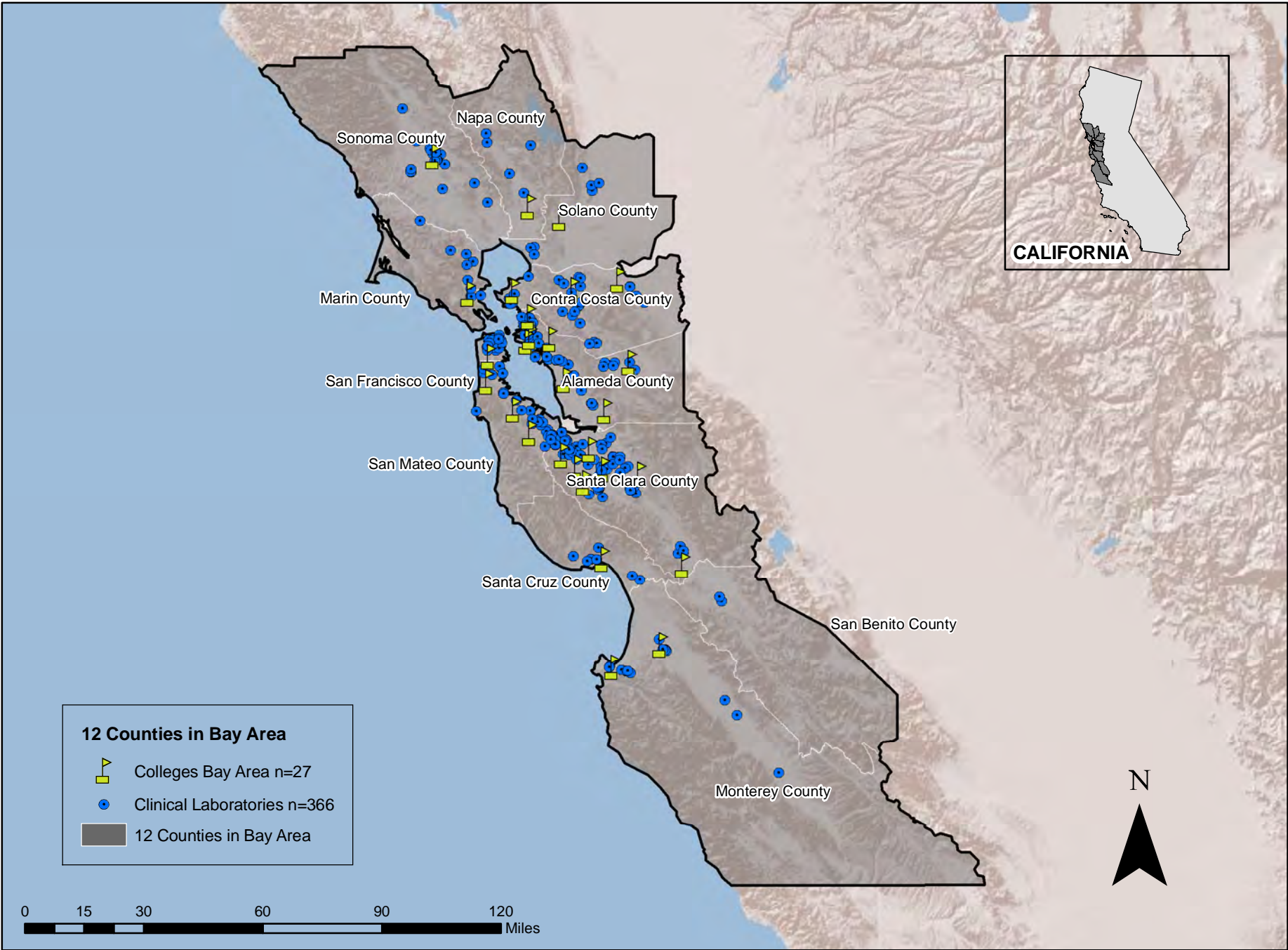
## Appendix K: Status of Program Development for Other California Community Colleges

Other California Colleges			
College	Program Development Status	Start Date	Contact
<b>College of the Canyons</b>	Program development underway; curriculum going to committee in next few weeks; will be submitting application for NAACLS accreditation	Spring 2010	Sue Albert, Dean sue.albert@canyons.edu (661) 362-3366
<b>Folsom Lake</b>	Program development underway; curriculum being developed; will be submitting application for NAACLS accreditation	Spring 2010 – Phlebotomy Program Fall 2010 - MLT Program	Stuart Von Horn, Dean Career & Technical Education vanhornsf@flc.losrios.edu (916) 608-6500 x6686 Louise Winkelblack winkell@losrios.edu (916) 563-3228
<b>Modesto Junior</b>	Not currently going forward with program development at this time.	N/A	Catherine Green, Faculty greenec@yosemite.cc.ca.us
<b>Saddleback</b>	Program development underway; plan to obtain LFS program approval first, then pursue NAACLS accreditation	Fall 2009	Scott Tharpe, Faculty stharpe@saddleback.edu (949) 582-4701
<b>Santa Rosa Junior</b>	Not currently going forward with program development at this time.	N/A	Ezbon Jen, Dean ejen@santarosa.edu (707) 524-1591
<b>Southwestern</b>	Have applied for NAACLS accreditation and LFS approval. Enrollment capacity limited to 25.	Fall 2009	Luis Nunez lnunez@swccd.edu (619) 216-6673
<b>Victor Valley</b>	Not currently going forward with program development at this time.	N/A	Pat Luther, Dean lutherp@vvc.edu (760) 245-4271, x2412 Bill White, Faculty whiteb@vvc.edu (760) 245-4271 x2417

## Appendix L: Number of CLIA Certified and California Licensed Laboratories by County in Bay Region

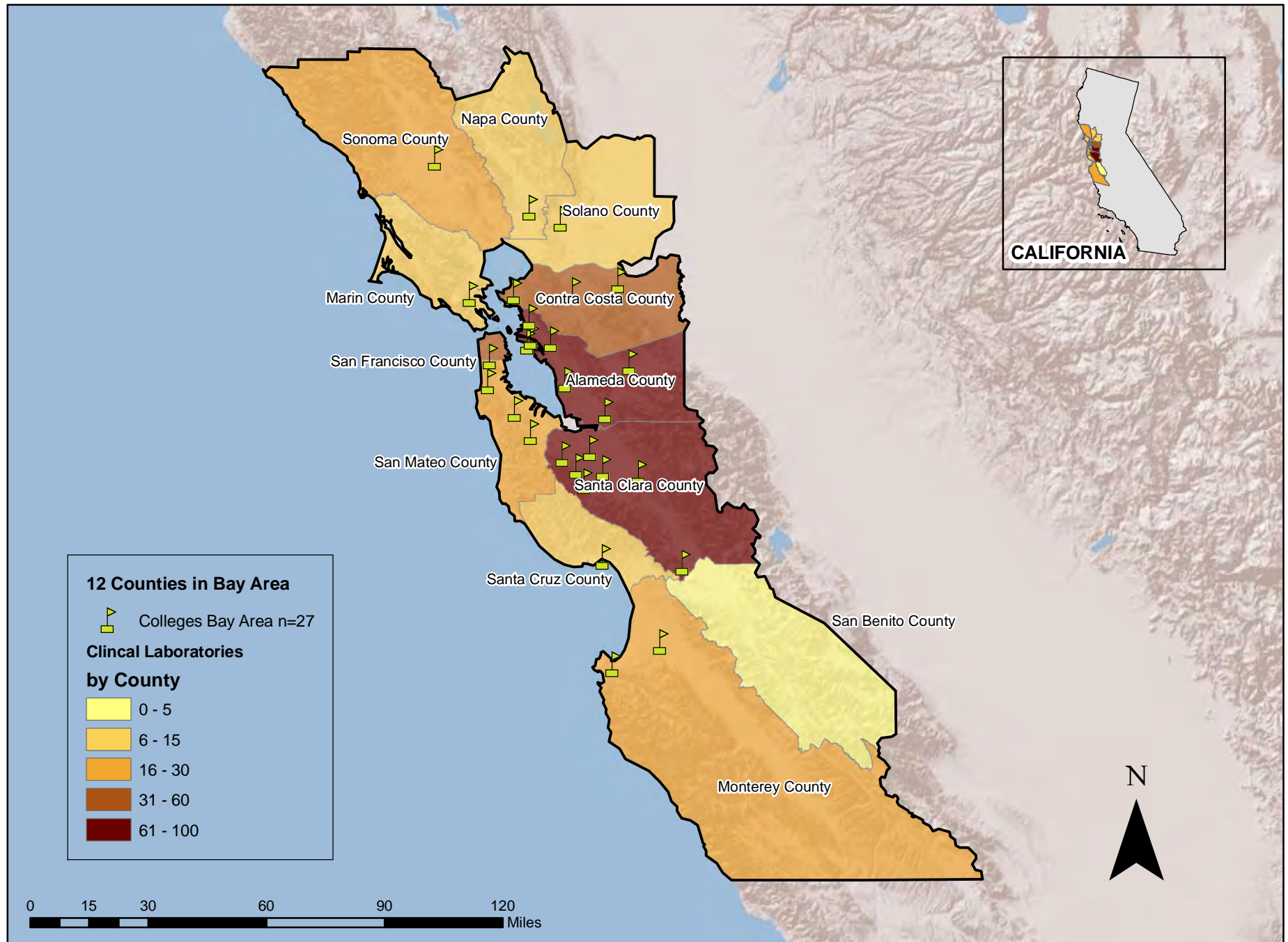
County	Number of Laboratories
Alameda	69
Contra Costa	36
Marin	11
Monterey	22
Napa	7
San Benito	2
San Francisco	55
San Mateo	27
Santa Clara	90
Santa Cruz	10
Solano	15
Sonoma	22
<b>TOTAL LABS</b>	<b>366</b>

# CLIA Certified and California Licensed Clinical Laboratories in the Bay Area, 2009



Source: California Department of Public Health, Laboratory Field Service, April 13, 2009.  
Developed by: Center of Excellence, California Community College Software and data provided by ESRI, Inc

# CLIA Certified and California Licensed Clinical Laboratories in the Bay Area, 2009



Source: California Department of Public Health, Laboratory Field Service, April 13, 2009.

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